HEALTH SURVEILLANCE SYSTEM SERIES

ICD-9 to ICD-10 Coding with Reference to Causes of Death Grouping in Alberta

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Public Health Surveillance and Environmental Health Branch
Public Health Division, Alberta Health & Wellness

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Alberta
HEALTH AND WELLNESS

For more information contact:

Public Health Surveillance and Environmental Health
Alberta Health and Wellness
P.O. Box 1360
10025 - Jasper Avenue
Edmonton, Alberta T5J 2N3
Canada

Phone: (780) 427-4518
Fax: (780) 427-1470
Email: Health.Surveillance@gov.ab.ca
Internet: www.health.gov.ab.ca

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This work was completed by Fu-Lin Wang and Ken Morrison on behalf of the following team:

Donald Schopflocher, PhD., Senior Biostatistician, Senior Manager
Larry Svenson, B.Sc., Manager, Epidemiologic Surveillance Unit
Ken Morrison, B.A., Data and Information Coordinator
Fu-Lin Wang, B.Med., PhD, Epidemiologist

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EXECUTIVE SUMMARY

Disease coding and grouping, typically based on the International Classification of Diseases (ICD), is an important initial step in health statistics reporting. Many health surveillance functions, such as monitoring health trends of Albertans, measuring the burden of disease, comparing temporal and spatial trends of mortality and morbidity indicators, assessing the health impact of environmental, behavioral and other risk factors, and evaluating the outcomes of screening programs and medical interventions, depend upon a meaningful classification scheme.

The development of a consistent classification scheme for mortality and morbidity is a challenge. The scheme needs to reflect health priorities of the Province, and the common concerns and interests of the public, while remaining consistent with classifications in other jurisdictions to facilitate comparisons at national and international levels.

The recent implementation of International Statistical Classification of Disease and Related Health Problems, 10th revision (ICD-10) has added to this challenge. Converting between the "old" and "new" versions of ICD is complicated by significant differences between the versions. These differences appear not only in disease classification, but also in the rules of classification and coding. Bridge-coding studies of mortality have been conducted to describe and minimize the disparity between ICD-10 and ICD-9 and to allow maximally consistent time trends when data have been coded with different versions of ICD.

Building on the work of Statistics Canada, World Health Organization (WHO), and studies from the United Kindom and United States, we defined 120 cause of death groupings with equivalent ICD-9 and ICD-10 coding to be used for routine health surveillance reporting in Alberta. This grouping (HSG hereafter) and coding scheme is consistent with the majority of the Mortality Tabulation List presented by Statistics Canada. We also compiled comparability ratios from studies in Canada, the United States, and the United Kingdom, for ease of reference. A set of computer programs was developed to facilitate analysis by region.

The findings of this report, while encouraging, should be regarded as preliminary. Validation at regional and subpopulation group level may be required for accurate comparisons.

This report also discusses issues in ICD-10 and ICD-9 conversion, guidelines in disease grouping and coding, and the potential impact on Alberta mortality data since implementation of ICD-10. The expansion of the classification scheme described here to include morbidity data will be presented in a future companion report.

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INTRODUCTION

Background

Health Surveillance is the process of on-going collection, analysis, interpretation and dissemination of data and information about health events, health determinants, and access to health services for selected public health purposes. Over time, a consistent and systematic methodology for data collection, analysis, and presentation has been evolving for Health Surveillance in Alberta.[1-5] The current report contributes to this standard surveillance methodology.

Disease grouping and coding in Canada is performed according to the International Classification of Diseases (ICD) developed by the World Health Organization (WHO). It is the basis of many of the health indicators that are under routine surveillance. The implementation of new versions of ICD in recent years has forced the development of a new grouping and coding scheme that can be simultaneously applied to both the "old" and "new" versions of ICD. Ideally, this grouping scheme would meet the requirements of both mortality and morbidity surveillance reporting.

The development of a consistent coding scheme has proven to be a challenge. There are large differences between the "new" and "old" versions of ICD in both the classification schemes and the rules of classification and coding. Conversion between the new and old schemes is inadequate for many classification groups, and this occurs differentially within mortality and morbidity statistics. Such differences make it difficult to create a single unique grouping and coding scheme to be used for both mortality and morbidity surveillance reporting. As such, we decided to develop separate disease grouping and coding schemes for mortality and morbidity.

This document will discuss the grouping of causes of death and the corresponding ICD-9 to ICD-10 crosswalk for mortality reporting.

Classification of Disease and Medical Interventions

Several classification systems of diseases and medical interventions have been developed by various countries and agencies (**Appendix A**).[6] The International Classification of Diseases (ICD), developed through international collaboration, is designed to promote international comparability in the collection, processing, classification, analysis, interpretation, and presentation of data. It is used for classification of diseases and related health problems recorded on many types of health and vital records. The International Classification of Diseases (ICD) is the classification used to code and classify mortality data from death certificates and stillbirth certificates. The companion version - The International Classification of Diseases, Clinical Modification (ICD-CM) is used to code and classify morbidity data from inpatient and outpatient records, physician offices, and surveys.

The World Health Organization (WHO) has revised the ICD approximately every 10 years since 1900 to stay abreast of medical advances in disease nomenclature, pathology and etiology. The

Tenth Revision (ICD-10), was first released in 1993 and was updated in 2003.[7-12] This is the most substantial revision of the ICD to date, with 60% more categories for classifying causes of death than ICD-9.

ICD-10 is being implemented in countries all over the world. In Canada, ICD-10 has been used to code the cause of death and stillbirth in Vital Statistics records since 2000. ICD-10 replaces ICD-9 which was used in Canada from 1979 until 1999. For morbidity data, the Canadian Institute for Health Information (CIHI) developed an Enhanced Canadian version of ICD-10 (ICD-10-CA) in 1999.[13] Since April 2002, ICD-10-CA has replaced the earlier ICD-9-CM classification, which was used to code the Inpatient Hospital System and the Ambulatory Care Classification System (ACCS) in Alberta. The details of disease grouping and coding for morbidity data will be discussed in a companion methodology document to be developed at a later date.

Major Differences between ICD-10 and ICD-9

ICD-10 is considerably different from ICD-9. These differences occur in the underlying classification, number of disease and diagnostic codes, code structure, rules of coding and selection of underlying cause of death, and titling of disease chapters and categories.[7]

Changes in classification

The most obvious change is in the structure of codes. ICD-10 uses alpha-numeric codes that allow for a considerable expansion of the number of categories and sub-categories and therefore a more detailed disease classification in this and future revisions. There are about 8000 categories for classifying cause of death in ICD-10, compared with about 5000 in ICD-9.

There are many other changes in ICD-10: some diseases have moved between chapters to reflect current ideas about etiology and pathology; some chapters have been split, and some others reordered or renamed. In ICD-10, conditions have been grouped in a way determined to be most suitable for general epidemiological purposes and the evaluation of health care. The use of codes with first letter "U" has been reserved for the provisional assignment of new diseases of uncertain etiology, and for research purposes. For instance, in early 2003, a provisional category U04 was created for the newly-identified Severe Acute Respiratory Syndrome (SARS).

Changes in the underlying cause selection and modification rules

Mortality statistics are customarily tabulated on the underlying cause of death, which is defined by WHO as "(a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury".[6] From a public health perspective, in a sequence of events leading to death, it is most effective to prevent the initiating event – the underlying cause of death. When only one condition is listed on the death certificate, that condition is the underlying cause of death. When more than one

condition (80% of death certificates)[8] is listed, a set of rules has been developed by WHO to select the underlying cause of death among all the conditions on the certificate. In addition to the Selection Rules, a set of Modification Rules are also applied when appropriate to improve the utility of information.

Both the Selection Rules and Modification Rules have changed in ICD-10 (**Appendix B**). These changes may have had the most significant impact on mortality statistics.

Table 1 highlights the changes between ICD-10 and ICD-9. The changes and modifications at the chapter level are presented in **Table 2**.

Table 1 Comparison of ICD-10 and ICD-9 in the Content, Structure and Rules of Coding

Indicators of Comparison	**ICD-10**	**ICD-9**	**Comments**
Number of diagnostic codes	About 13,600	About 9,000	51% increase due to code expansion, specification, and addition for new diseases
Number of categories for classifying causes of death	About 8,000	About 5,000	60% increase in type and site of disease expansion
Number of ICD chapters of diagnosis	21	19	ICD-9 Chapter 6 Nervous System Diseases is split into 3 chapters in ICD-10 (i.e. 6,7,8)
Code structure for classification	4-digit alpha-numeric, A00.0-T98.3	4-digit numeric, 001.0-999.9	Enabled the expansion of the number of codes for new and old conditions
Code structure for classification of external cause of morbidity and mortality	4-digit alpha-numeric, V01.0-Y98	4-digit alpha-numeric, E800-E999	ICD-10 Chapter XX is no longer considered supplementary. Injury codes are expanded. The "E" of the E-codes of ICD-9 is not entered in the Vital Statistics death registry.
Code structure for supplementary classification of factors influencing health status and contact with health services	4-digit alpha-numeric, Z00.0-Z99.9	4-digit alpha-numeric, V01.0-V82.9	V-codes of ICD-9 are often not well reported and populated in the death registry and morbidity files.
Rules governing selection of the underlying cause of death (see **Appendix B**)	Five rules, broader in scope and clearer in definition	Nine rules	**Rule 3** – coding of direct sequels has the most impact on the decrease of some underlying causes of death, such as pneumonia, HIV, …
Provisional Codes for disease of uncertain etiology	First letter of 'U'	None	A flexibility to code new diseases of uncertain etiology, e.g., SARS
Changes in the modification rules in underlying cause of death (see **Appendix B**)	Rules A, B, C, D, and E	Rules 4, 5, 6, 7, 8, and 9	**Rule A** – defining ill-defined conditions leads to more senility classified
Renamed title and grouping for some chapters			See Table 2
Renamed title and grouping for some categories	• Lower chronic respiratory diseases • Assault • Self-harm	• COPD • Homicide • Suicide	

Table 2 List of ICD-10 and ICD-9 Chapters with Changes and Modifications

Chapter Number and Title in ICD-10	Chapter Number and Title in ICD-9	Comment
I. Certain infectious and parasitic diseases	1. Infectious and parasitic diseases	Title change
II. Neoplasms	2. Neoplasms	No change
III. Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	4. Diseases of the blood and blood-forming organs	• Changes in chapter number and title • Chapter III in ICD-10 includes Immunity Disorders • Myelodysplastic syndrome (ICD-9=289.8) moved to Chapter II in ICD-10 (D46)
IV. Endocrine, nutritional and metabolic diseases	3. Endocrine, nutritional and metabolic diseases and immunity disorders	• Change in chapter number and title • Chapter IV in ICD-10 excluds Immunity Disorders
V. Mental and behavioral disorders	5. Mental disorders	Title change
VI. Diseases of the nervous system VII. Diseases of the Eye and Adnexa VIII. Diseases of the Ear and Mastoid Process	6. Diseases of the nervous system and sense organs	One chapter in ICD-9 split into three chapters in ICD-10 • Addition of Chapters VII and VIII in ICD-10 • Transient cerebral ischemic attacks (ICD-9 = 435) moved to Chapter VI in ICD-10 (G45.8-G45.9)
IX. Diseases of the circulatory system	7. Diseases of the circulatory system	Change in chapter number
X. Diseases of the respiratory system	8. Diseases of the respiratory system	Change in chapter number
XI. Diseases of the digestive system	9. Diseases of the digestive system	Change in chapter number
XII. Diseases of the skin and subcutaneous tissue	12. Diseases of the skin and subcutaneous tissue	No change
XIII. Diseases of the musculoskeletal system and connective tissue	13. Diseases of the musculoskeletal system and connective tissue	No change
XIV. Diseases of the genitourinary system	10. Diseases of the genitourinary system	Change in chapter number
XV. Pregnancy, childbirth, and the puerperium	11. Complications of pregnancy, childbirth, and the puerperium	Changes in chapter number and title
XVI. Certain conditions originating in the perinatal period	15. Certain conditions originating in the perinatal period	Change in chapter number
XVII. Congenital malformations, deformations and chromosomal anomalies	14. Congenital Anomalies	Changes in chapter number and title
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	16. Symptoms, signs and ill-defined conditions	• Changes in chapter number and title • Septic shock (ICD-9=785.5) moved to Chapter I in ICD-10 (A41.9) • Respiratory failure (ICD-9=799.1) moved to Chapter X in ICD-10 (J96)
XIX Injury, poisoning and certain other consequences of external causes	17. Injury and poisoning	• Changes in chapter number and title • Transport accidents regrouped by characteristics of injured person (e.g., pedestrian, pedal cyclist, motorcycle rider, car occupant)
XX. External Causes of Morbidity and Mortality	Supplementary classification of external causes of injury and poisoning (E800-E999)	• Reassignment of supplementary classification in ICD-9 to chapter in ICD-10 • Status and title change
XXI. Factors influencing health status and contact with health services	Supplementary classification of factors influencing health status and contact with health services (V01-V82)	• Reassignment of supplementary classification in ICD-9 to chapter in ICD-10 • Title change

More detailed information is available at WHO (http://www.who.int/classifications/icd/en/) and CDC (http://www.cdc.gov/nchs/about/major/dvs/icd10des.htm) websites.

Conversion and Comparability between ICD-10 and ICD-9

To facilitate the analysis of data coded with different versions of ICD, a conversion table with equivalent ICD codes for both new and old versions is required. The WHO (1997) has published an ICD-10 and ICD-9 translation file which was designed to reach an equivalence between 4-character (ICD-10) and 4-digit (ICD-9) codes.[9] However, it is far from accurate for many categories and sub-categories of classification due to the presence of many-to-one or one-to-many relationships between ICD-10 and ICD-9 codes for some diseases. Moreover, the conversion table cannot measure the impact of rule changes between ICD-10 and ICD-9 and the impact of different definitions for similarly-named categories in the two revisions.[14]

A number of bridge coding studies have generated ICD-10/ICD-9 comparability ratios to quantify the net effect of the change in ICD-10.[14-21] Bridge-coding studies involve the dual classification of a single year's mortality data, i.e., classifying the underlying cause of death on mortality records by both the new version and the previous version. The ratio is calculated by the number of deaths coded to a particular cause in ICD-10 divided by the number of deaths coded to that cause in ICD-9. A ratio greater than 1.00 or less than 1.00 suggests an increased or a decreased classification in ICD-10, respectively. To limit the error due to chance alone, a test of statistical significance may be considered.[15]

In general, the comparability ratio may be used to adjust the number of deaths coded with different versions of ICD for trend analysis. It is important to note, however, that the ratio may vary for some causes of death across countries/geographic area, age/sex groups of population, and/or time periods.[14-21] Using the ratio generated from the same source of data may allow accurate adjustment of the effect due to ICD-10 implementation. **Appendix C** summarizes the ICD-10/ICD-9 comparability ratios for selected causes of death among all ages of population for Canada, the United Kingdom, and the United States. The 95% confidence interval of the comparability ratio is also included for statistical inference. Age/sex-specific comparability ratios are not available for Canada and the USA.

METHODOLOGY

Data Sources and Literature Review

Disease grouping and coding, especially bridge-coding, requires expertise in disease, disease classification and coding, and large resources. To fully utilize the existing information in the literature, we searched for scientific papers in Medline as well as reports from governments and various organizations and agencies, using "ICD-10", "classification of diseases", "bridge-coding", "comparability ratio", and "comparability" as title words or key words. We selected reports from Statistics Canada, WHO, CDC in the United States, and National Statistics in the United Kingdom as key references.

To examine the time trend of mortality and the potential impact of implementation of ICD-10 in Alberta, we used the following data sources:

- The Alberta Vital Statistics Death Registry, 1986-2003: This registry contains information about causes of death, age, sex, residence, etc. It is maintained by Alberta Registries and is computer accessible since 1983.
- Alberta Health Care Insurance Plan (AHCIP) Stakeholder Registry-based mid-year population files, 1986-2003: This registry contains information about registrants of the Alberta Health Care Insurance Plan (AHCIP) maintained by Alberta Health and Wellness. Mid-year population files were derived from this registry and are computer accessible since 1983.

Guidelines for Disease Grouping and Coding in Alberta

The grouping of disease and conditions of mortality and morbidity is the first step in the tabulation and reporting of health statistics; it is essential for health priority setting and health surveillance reporting. How disease codes are grouped in analysis may have a significant impact on findings. For instance, the top 10 causes of death or hospitalization in Alberta and their ordering will likely depend on the groupings used.

Valid grouping and coding is therefore needed in order to establish technical and analytical foundations for health surveillance. In turn, this will facilitate:

- setting health priorities in Alberta;
- monitoring health trends among Albertans;
- assessing the health impact of environmental, behavioural and other risk factors;
- identifying disease trends and emerging issues;
- examining the burden of disease on the Alberta health care system;
- facilitating data analysis and the comparison of data across time and geographic areas, and
- providing high-quality information for policy-making, program development and program evaluation.

While WHO has recommended Tabulation Lists for mortality and morbidity, many countries have developed country-specific tabulation lists to meet the surveillance and reporting needs of their countries. In Canada, Statistics Canada has developed a list of 152 causes of death with corresponding ICD-10 and ICD-9 codes for reporting (**Appendix D**).[14] The United States has developed seven sets of tabulation lists for mortality statistics.[23-24]

In 2005, Alberta's population was 3.3 million people. To meet the needs of health surveillance and reporting in Alberta, we developed 120 groups of cause of death, named Public Health Surveillance and Environmental Health Groups (HSG) hereafter, using the following guidelines. Specifically this disease grouping should

1. reflect the existing health priorities of Alberta;

2. reflect diseases and conditions with high frequencies and/or severities or that have a significant impact on the Alberta health care system;
3. reflect diseases and conditions of public interest and community concern in Alberta;
4. allow evaluation of screening and medical prevention programs, either specific to Alberta or Canada-wide;
5. include preventable diseases and conditions;
6. have sufficient numbers for epidemiological and/or statistical comparisons; and
7. allow national or international comparisons of health statistics for routine reporting.

The key issue in coding groups of cause of death at chapter or sub-chapter level is to determine comparable classification codes between ICD-10 and ICD-9 as discussed in the next section.

Grouping and Coding Causes of Death and SAS Programming

We evaluated cause-of-death groups for general mortality tabulation from WHO (n=103), UK (female=117, male=116), US (n=113) and Statistics Canada (n=152). We checked the frequency of death for each group and compared the list of the cause-of-death groups from each of the jurisdictions. We selected specific cause-of-death groups from among those reported by Statistics Canada and/or requested by stakeholders and the public at large in Alberta. In the process of the development and validation, we excluded cause-of-death groups with few number (usually less than 30) of deaths that would not allow reliable rate estimation. We added additional groups that are either of Albertan's interest and/or reported by UK or WHO, including:

1. Vascular and unspecified dementia;
2. Mental and behavioral disorders due to psychoactive substance use;
3. Mental and behavioral disorders due to use of alcohol;
4. Motor neuron disease;
5. Chapter 7 - Diseases of the eye;
6. Chapter 8 - Diseases of the ear;
7. Hypertensive disease;
8. Intracranial haemorrhage;
9. Cerebral infarction;
10. Unspecified stroke;
11. Diverticular disease of intestine;
12. Diseases of the liver;
13. Other diseases of intestines (vascular, obstruction, diverticular disease) and peritoneum;
14. Congenital anomalies of the circulatory system;
15. Senility;
16. Land transport accidents;
17. Falls, excluding cause unspecified;
18. Accidental poisoning by drugs;
19. Suicide by exposure to gases and vapors; and
20. Suicide by hanging, strangulation, suffocation.

In addition, we added one other group (residual-category) within each chapter to allow internal data validation and summary analysis.

Finally, we selected and defined 120 groups for routine reporting of mortality in Alberta. This includes 19 chapters, 100 sub-chapter groups, and one group of all causes of death combined. About 80% of these groups are consistent with Statistics Canada (Table 3), excluding within-chapter residual categories. The naming and grouping was based on ICD-10. Sometimes, a shorter or non-technical term (such as heart attack) was also included to ease the reading.

The group is based on a 4-level hierarchical model, from chapter as the highest level of grouping, to sub-chapter grouping, and to sub-group grouping. For each group, the corresponding ICD-10 and ICD-9 codes were assigned using the works of Statistics Canada[14] and the bridge-coding studies of the United Kingdom and the United States.[15-19] Consistency with Statistics Canada categories was given the highest weighting. This will allow the comparison of data between Alberta and Canada.

There were two major processes in the development of the computer program: 1) grouping of equivalent codes in ICD-10 and ICD-9, and 2) counting the number of deaths in each group. Although the first sub-chapter level of groups may sum up to the chapter total, the 2nd or 3rd sub-chapter level groups (sub-group) are not necessarily mutually exclusive. Thus, attempting to sum sub-groups for a chapter level total or group level total is not advised. Using SAS software, we developed a set of codes that will automate the process of grouping and counting. The first part of the SAS code (HSG_MulGroup.sas) consists of seven groups of classification tables created by Proc SQL and Create Table Statements and controlled by macros, which will classify the underlying causes of death into 120 groups by ICD-10 and ICD-9 codes. The second part of the SAS code (HSG_CountGrp.sas) consists of one Proc SQL-Create Table statement, two data statements and one Proc Append statement, which will count the number of deaths in each group by year, sex, single year of age, and regional health authority (RHA). This SAS code yields a temporary SAS data file – Vital_Cnt, which can be used for further analysis. The two parts of SAS codes for grouping and counting causes of death are included in **Appendix E**.

Epidemiological and Statistical Measures

We calculated the number of death per 100,000 population by year, sex, age group, and RHA of residence for each group of 120 HSGs, 1986-2003. The standardized mortality rate (SMR) by year, sex and RHA was calculated by adjusting the effect of population structure differences through time and across regions. The direct method of age-sex standardization was used, with weights derived from the 1996 Canadian census population distribution. The standard error of the SMR and its 95 % confidence intervals were also calculated.[25]

To examine the impact of ICD-10 implementation, we examined percent difference measures for the ICD-10/ICD-9 comparability ratio of causes of death. These were taken from the bridge-coding studies for Canada, the United Kingdom (UK) and the United States (US), and calculated at both chapter and sub-chapter levels. For Alberta data, we calculated the annual percent difference in SMR of each of 120 HSGs before and after using ICD-10 for the period 1996-1999 and 2000-2003, respectively. Two sources of variations were examined: the within-period

variation - when the same classification and coding scheme is used in the study period (i.e. 1996 through 1999 or 2000 through 2003) and the between-period variation - when different classification and coding schemes are used between the study period (i.e. 1996-1999 versus 2000-2003). The within-period variation is a moving average of the SMR ratio within each period, which was calculated by dividing SMR of a later year by SMR of a previous year, and then averaging the ratios, i.e.,

$$(SMR_{1999}/SMR_{1998} + SMR_{1998}/SMR_{1997} + SMR_{1997}/SMR_{1996})/3, \text{ or}$$

$$(SMR_{2003}/SMR_{2002} + SMR_{2002}/SMR_{2001} + SMR_{2001}/SMR_{2000})/3.$$

The between-period variation is a ratio of the 4-year (2000-2003) average of SMRs after using ICD-10 over the 4-year average (1996-1999) before using ICD-10; that was calculated by dividing the 4-year average of SMRs of 2000-2003 by the 4-year average of SMRs of 1996-1999, i.e.,

$$(SMR_{2000}+SMR_{2001}+ SMR_{2002}+ SMR_{2003})/(SMR_{1996}+ SMR_{1997}+SMR_{1998}+SMR_{1999}).$$

The total variation is the sum of the 1) within-period variation (variation using the same classification and coding scheme), 2) classification (by ICD-10 and ICD-9) variation, and 3) error variation. The between-period variation should be equal to the within-period variation if no classification variation has been introduced. To screen the groups that are potentially impacted by implementation of ICD-10, the groups with the between period variation greater than the within-period variation were identified and further analyzed. Bar charts of the per cent difference were generated for visual comparison.

CAUSE-OF-DEATH LIST FOR REPORTING AND IMPACT OF USING ICD-10

The List of Disease Groupings and Coding for General Surveillance Reporting

Table 3 presents the list of 120 cause-of-death groups with the corresponding codes for ICD-10 and ICD-9 (including the total deaths). The groups with significant differences in previous studies due to changes in classification are noted. The changes at the chapter level are based primarily on findings of the Canada and UK studies (since the US study presented the comparability ratio of ICD-10 chapters for four chapters only). The groups without significant differences are noted with references. Other specifics of each group are also noted as appropriate.

This list includes most of the cause-of-death groups reported by Statistics Canada and will be used for the general analysis of mortality data and routine surveillance reporting. It may also be used for ranking leading causes of death at the chapter or sub-chapter level.

For a comparison of cause-of-death groups with Statistics Canada, please refer to **Appendix D** and ICD-10 Cause-of-Death Lists for Tabulation Mortality Statistics.[14]

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
001	Yes	Total (All Causes of Death)	A00-Y98	001-799, E800-E999	Decreasing trend due to medical intervention
002	Yes	Chapter 1 - Infectious Disease	A00-B99	001-139	6-11% increase in ICD-10 (UK, Stats Can)
003	Yes	Tuberculosis	A15-A19	010-018	Excludes late effects (B90/137) for consistency with Stats Can/US (0-4 cases/yr), 12-15% decrease in ICD-10 (Canada and US)
004	Yes	Meningococcal infection	A39	036	No change (UK, US)
005	Yes	Septicemia	A40-A41	038	10-20% increase in ICD-10
006	Yes	Viral hepatitis	B15-B19	070	17% decrease in ICD-10 (US)
007	Yes	HIV/AIDS	B20-B24	042-044	4-19% increase in ICD-10
008	Yes	All other infectious disease	A00-A09,A20-A38,A42-B09,B25-B99	001-009,020-035,037,039-041,045-066,071-139	Codes included are not comparable with Stats Can due to inclusion of more diseases
009	Yes	Chapter 2 – Neoplasms	C00-D48	140-239	1-3% increase in ICD-10 (Stats Can, UK)
010	Yes	Cancer	C00-C97	140-208	1% increase in ICD
011	Yes	Cancer of the esophagus	C15	150	No change
012	Yes	Stomach cancer	C16	151	No change
013	Yes	Colo-rectal cancer	C18-C21	153-154	No change
014	Yes	Cancer of the liver (and intrahepatic bile ducts)	C22	155	1.5% decrease in ICD-10 (Stats Can)
015	Yes	Pancreatic cancer	C25	157	No change
016	Yes	Lung cancer	C33-C34	162	1.6-2.0% decrease in ICD-10 (Stats Can, US)
017	Yes	Skin cancer	C43	172	3-7% decrease in ICD-10 (US, Stats Can)
018	Yes	Breast cancer	C50	174-175	1% increase in ICD-10 (Stats Can)
019	Yes	Cervical cancer	C53	180	No change
020	Yes	Ovarian cancer	C56	183.0	No change
021	Yes	Prostate cancer	C61	185	3% increase in ICD-10 (Stats Can)
022	Yes	Cancer of the kidney (and renal pelvis)	C64-C65	189.0-189.1	No change
023	Yes	Bladder cancer	C67	188	No change
* Publich Health Surveillance and Environmental Health Branch Groupings.					

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
024	Yes	Brain cancer (meninges, brain, and other CNS)	C70-C72	191-192	No change
025	Yes	Lymph cancer	C81-C96	200-208	No change
026	Yes	Non-Hodgkin's lymphoma	C82-C85	200,202	No change
027	Yes	Multiple myeloma	C88,C90	203	5-6% increase in ICD-10 (UK, Stats Can)
028	Yes	Leukemia	C91-C95	204-208	5-6% increase in ICD-10 (UK)
029	Yes	All other cancers	C00-C14,C17,C23-C24,C26-C32,C37-C41,C44-C49,C51-C52,C54-C55,C57-C60,C62-C63,C66,C68-C69,C73-C80,C97	140-149,152,156,158-161,163-171,173,176-179,181-182,183.2-183.9,184,186-187,189.2-189.9,190,193-199	Not comparable with other jurisdictions; C45 mesothelioma, C46 Kaposi's sarcoma, and C97 independent primary multiple sites are new codes
030	Yes	In situ, benign, uncertain, and unknown neoplasms	D00-D48	210-239	30-67% increase in ICD-10 (Stats Can, US)
031	Yes	Chapter 3 - Diseases of the blood and certain immune disorders	D50-D89	280-289	Immune disorders (ICD-9 code 279) not included to be consistent with other jurisdictions; 9-50% decrease in ICD-10 (Stats Can, UK)
032	Yes	Anemias	D50-D64	280-285	4% decrease in ICD-10 (US, UK)
033	No	All other diseases of the blood	D65-D89	286-289	Not comparable with other jurisdictions
034	Yes	Chapter 4 - Endocrine, nutritional, & metabolic diseases	E00-E90	240-279	Immune disorders (ICD-9=279) included for consistency with other jurisdictions; 3-4% increase in ICD-10 (UK, Stats Can)
035	Yes	Diabetes	E10-E14	250	1-5% increase in ICD-10
036	Yes	Nutritional deficiencies	E40-E64	260-269	16% increase in ICD-10 driven by other nutritional deficiencies (US)
037	Yes	Malnutrition	E40-E46	260-263	No change
038	No	All other endocrine/nutritional/metabolic	E00-E07,E15-E35,E65-E90	240-246,251-259,270-279	Not comparable with other jurisdictions
039	Yes	Chapter 5 - Mental and behavioral disorders	F00-F99	290-319	20% increase with UK but 16% decrease with Stats Can
040	No	Vascular and unspecified dementia	F01-F03	290	Not in Stats Can coding; 60% increase (UK)
041	No	Mental and behavioral disorders due to psychoactive substance use	F10-F19	291-292,303-305	Not in Stats Can coding, In UK study
042	No	Mental and behavioral disorders due to use of alcohol	F10	291,303,305.0	Not in Stats Can coding, In UK study

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
043	No	All other mental and behavioral disorders	F04-F09,F20-F99	293-302,306-319	Not comparable with other jurisdictions
044	Yes	Chapters 6-8 - Diseases of the nervous system and sense organs	G00-H95	320-389	Three chapters in ICD-10; single chapter in ICD-9
045	Yes	Chapter 6 - Diseases of the nervous system	G00-G99	320-359	30-50% increase using ICD-10. Eye/Ear now separate - not comparable with old Nervous System chapter
046	No	Motor neuron disease	G12.2	335.2	Not in Stats Can coding; 12% increase in ICD-10 (UK)
047	Yes	Parkinson's disease	G20-G21	332	6-50% increase (Stats Can, UK); UK use only G20
048	Yes	Alzheimer's disease	G30	331.0	55-110% increase using ICD-10 (UK, US, Stats Can)
049	No	All other diseases of the nervous system	G00-G11,G12.0-G12.1, G12.8-G12.9,G13,G22-G26,G31-G99	320-330,331.1-331.9,333-334,335.0-335.1,335.8-335.9,336-359	Not comparable with other jurisdictions
050	No	Chapter 7 - Diseases of the eye	H00-H59	360-379	Part of Chapter 6 in ICD-9; new chapter in ICD-10
051	No	Chapter 8 - Diseases of the ear	H60-H95	380-389	Part of Chapter 6 in ICD-9; new chapter in ICD-10
052	Yes	Chapter 9 - Diseases of the circulatory system	I00-I99	390-459	3-4% increase in ICD-10 (UK)
053	Yes	Major cardiovascular diseases	I00-I78	390-434, 436-448	New group to match Stats Can, no change in ICD-10
054	No	Hypertensive diseases	I10-I15	401-405	Not in Stats Can coding; 1% increase in ICD-10 (UK)
055	Yes	Hypertensive heart disease	I11	402	9% decrease (Stats Can)
056	Yes	Ischemic heart diseases	I20-I25	410-414, 429.2	Includes ICD-9 code 429.2 for ICD-10 comparability; matches Stats Can alt. coding, no change (Stats Can)
057	Yes	Acute Myocardial Infarction (Heart Attack)	I21-I22	410	3-7% decrease using ICD-10 (Stats Can, UK, US)
058	Yes	Other forms of chronic ischemic heart disease	I20,I25	412-414, 429.2	1% increase in ICD-10 (Stats Can)
059	Yes	Atherosclerotic cardiovascular disease	I25.0	429.2	9% decrease in ICD-10 (Stats Can)
060	Yes	Heart failure	I50	428	4% increase in ICD-10 (US)

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
061	Yes	* Diseases of the heart	I00-I09,I11,I13,I20-I51	390-398,402,404,410-429	* Separate group; ICD-9 group modified to match Stats Can; 1.5-2.0% decrease (US, Stats Can)
062	Yes	Cerebrovascular disease (Stroke)	I60-I69	430-434,436-438	6-13% increase using ICD-10; Excludes ICD-9 code 435 (Transient cerebral ischemic attacks); matches Stats Can alt. coding
063	No	Intracranial haemorrhage	I60-I62	430-432	Not in Stats Can coding, In UK study
064	No	Cerebral infarction	I63	433-434	Not in Stats Can coding; 40-50% increase in UK
065	No	Stroke, not specified as haemorrhage or infarction	I64	436	Not in Stats Can; 3-6% increase (UK)
066	Yes	Diseases of arteries, arterioles, and capillaries	I70-I78	440-448	Full group not in Stats Can coding, 16% decrease (Stats Can) of partial coding (ICD-9=442-448, ICD-10=I72-I79)
067	Yes	Atherosclerosis (hardening of the arteries)	I70	440	4% decrease (US) vs. 3-16% increase (UK, Stats Can)
068	Yes	Aortic Aneurysm	I71	441	No change (Stats Can)
069	Yes	All other diseases of the circulatory system	I80-I99	435, 451-459	Stats Can does not include ICD-9 code 435; it is included here to capture all codes in the chapter
070	Yes	Chapter 10 - Diseases of the respiratory system	J00-J99	460-519	22% decrease using ICD-10 (see below)
071	Yes	Influenza and pneumonia	J10-J18	480-487	ICD-10 pneumonia rule change creates significant (approx 35%) decrease in cases
072	Yes	Influenza	J10-J11	487	4% decrease (Stats Can)
073	Yes	Pneumonia	J12-J18	480-486	A condition reported in Part I or II of the death certificate takes precedence over the condition selected using the other coding rules. For example, some pneumonia occurring after accidental injury, such as bronchopneumonia, are now coded to accidental injury. 30% decrease in ICD-10
074	Yes	Chronic lower respiratory diseases (COPD)	J40-J47	490-494,496	Excludes ICD-9 code 495 (extrinsic allergic alveolitis); matches Stats Can; 5-9% increase (UK, Stats Can)

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
075	Yes	Emphysema	J43	492	3-13% decrease in ICD-10 (US, Stats Can)
076	Yes	Asthma	J45-J46	493	10-23% decrease in ICD-10 (US, Stats Can)
077	Yes	Pneumonitis due to solids and liquids (food and vomit)	J69	507	12-31% increase in ICD-10 (UK, Stats Can)
078	Yes	All other diseases of the respiratory system	J00-J06,J20-J39,J60-68, J70-J99	460-478,495,500-506,508-519	Not comparable with other jurisdictions due to inclusion of more diseases
079	Yes	Chapter 11 - Diseases of the digestive system	K00-K93	520-579	1-2% increase in ICD-10 (UK, Stats Can)
080	No	Other diseases of intestines (vascular, obstruction, diverticular disease) and peritoneum	K55-K67	560-569	Not in Stats Can coding; significant cases
081	No	Diverticular disease of intestine	K57	562	No change (UK)
082	No	Diseases of the liver	K70-K77	570-573	Full group not in Stats Can coding
083	Yes	Chronic liver disease and cirrhosis	K70,K73-K74	571	4-6% increase in ICD-10 (Stats Can, US, UK)
084	Yes	Alcoholic liver disease	K70	571.0-571.3	2-9% increase in ICD-10 (Stats Can, US, UK)
085	No	All other diseases of the digestive system	K00-K52,K80-K93	520-558,574-579	Not comparable with other jurisdictions
086	Yes	Chapter 12 - Diseases of the skin	L00-L99	680-709	5% increase in ICD-10 (Stats Can)
087	Yes	Chapter 13 - Diseases of the musculoskeletal system	M00-M99	710-739	40% increase in ICD-10 (Stats Can, UK)
088	Yes	Chapter 14 - Diseases of the genitourinary system	N00-N99	580-629	No change (Stats Can, UK)
089	Yes	Nephritis and Nephrosis (kidney disease)	N00-N07,N17-N19,N25-N27	580-589	5-23% increase in ICD-10 (Stats Can, US)
090	Yes	Renal failure	N17-N19	584-586	6-30% increase in ICD-10 (Stats Can, US)
091	No	All other diseases of the genitourinary system	N08-N16,N20-N23,N28-N99	590-629	Not comparable with other jurisdictions
092	Yes	Chapter 15 - Pregnancy and childbirth	O00-O99	630-676	Excludes code 677 (late effects) (no cases)
093	Yes	Chapter 16 - Certain conditions of the perinatal period	P00-P96	760-779	Stats Can excludes 771.3 (tetanus neonatorum, no cases); 2-7% increase in ICD-10 (Stats Can, US)
094	Yes	Chapter 17 - Congenital malformations	Q00-Q99	740-759	9-15% decrease in ICD-10(Stats Can, US)
095	No	Congenital malformations of the circulatory system	Q20-Q28	745-747	Not in Stats Can coding
096	No	All other congenital malformations	Q00-Q18, Q30-Q99	740-744,748-759	Not comparable with other jurisdictions
097	Yes	Chapter 18 - Symptoms and signs	R00-R99	780-799	No change (Stats Can, UK)
098	No	Senility	R54	797	Not in Stats Can coding; In UK study

Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
099	Yes	Sudden infant death syndrome (SIDS)	R95	798.0	No change in ICD-10 (Stats Can)
100	No	All other symptoms and signs	R00-R53,R55-R94,R96-R99	780-796,798.1-798.9,799	Not comparable with other jurisdictions
101	Yes	Chapter 20: External Causes (Injury)	V01-Y98	E800-E999	No change (Stats Can, UK)
102	Yes	Unintentional Injury (accidents)	V01-X59,Y85-Y86	E800-E869, E880-E929	3% increase in ICD-10 (US)
103	Yes	Transport accidents	V01-V99,Y85	E800-E848,E929.0-E929.1	No change (Stats Can, UK); 1% decrease in ICD-10 (US)
104	No	Land transport accidents	V01-V89	E800-E829	Land Transport matchs better than MVA; 95% of Land Transport is MVA. Not in Stats Can coding but in UK
105	Yes	Motor vehicle accidents	V02-V04,V09.0, V09.2, V12-V14,V19.0-V19.2, V19.4-V19.6,V20-V79, V80.3-V80.5,V81.0-V81.1, V82.0-V82.1, V83-V86,V87.0-V87.8, V88.0-V88.8, V89.0,V89.2	E810-E825	15% decrease using ICD-10: (1) Many codes of ICD-10 of motor vehicle accidents are not included (e.g.V01, V05-V08, V09.1, V09.3-V09.9, V10-V11, V15-V18); (2) Number of drivers and passengers identified by ICD-10 reduced 15% and 35% respectively, as some deaths were coded to car occupant injured in unspecified traffic accident (V49.9); (3) the word "motor" or the type of vehicle may not be stated in registration thus are coded as other land transport accident
106	Yes	* Falls, including fracture cause unspecified	W00-W19	E880- E888	Fracture, causes unspecified (E887), which accounts for a large proportion of fatal falls among the elderly, is not classified as Falls in ICD-10. The code is included here for Stats Can comparability; 16-50% decrease in ICD-10 (US, Stats Can)
107	No	Falls, excluding cause unspecified	W00-W19	E880-E886, E888	For ICD-10 comparability, ICD-9 coding adjusted to exclude E887 - fracture, cause unspecified; consistent with U.S. recommendation (http://www.cdc.gov/mmwr/pdf/rr/rr4614.pdf)
108	Yes	Accidental drowning	W65-W74	E910	4% increase (Stats Can)
109	Yes	Exposure to smoke, fire and flames	X00-X09	E890-E899	3% decrease in ICD-10 (US)

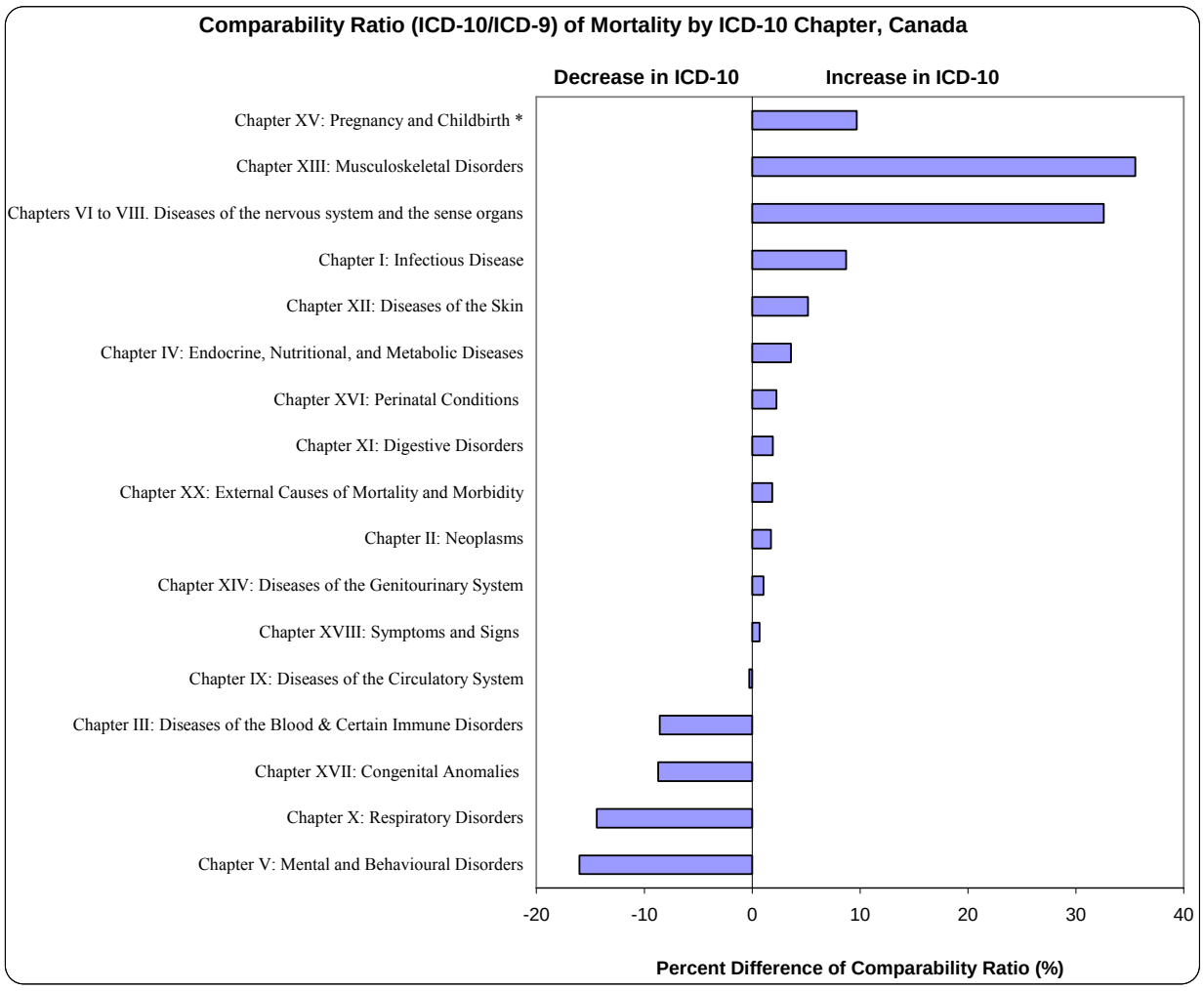
Table 3 Cause-of-Death List for Surveillance Reporting and Corresponding ICD-10 and ICD-9 Codes, Alberta Health and Wellness					
HSG* List	Stats Can report	Underlying Cause of Death	ICD Code		Notes
			ICD-10	ICD-9	
110	Yes	Accidental poisoning	X40-X49	E850-E869	Stats Can includes E924.1 (caustic and corrosive substances) (very few cases), 8% decrease (Stats Can)
111	No	Accidental poisoning by drugs	X40-X44	E850-E858	Stats Can doesn't list group; is in UK
112	No	Accidental exposure to unspecified factor	X59	No equivalent code	In UK
113	No	All other unintentional injury	W20-W64,W75-W99,X10-X39,X50-X58,Y86	E900-E909,E911-E929	Not comparable with other jurisdictions
114	Yes	Suicide (Intentional self-harm)	X60-X84,Y87.0	E950-E959	1% decrease in ICD-10 (US)
115	No	Suicide by exposure to gases & vapours (incl CO)	X67	E952	Stats Can doesn't list group
116	No	Suicide by hanging, stangulation, suffocation	X70	E953	Stats Can doesn't list group
117	Yes	Suicide by firearm	X72-X74	E955.0-E955.4	0-1% decrease in ICD-10 (Stats Can, US)
118	Yes	Homicide (assault)	X85-Y09,Y87.1	E960-E969	1% decrease (US) vs. 4% increase (Stats Can)
119	Yes	Complications of medical and surgical care	Y40-Y84,Y88	E870-E879, E930-E949	No change (Stats Can)
120	No	All other injury	Y10-Y36,Y87.2,Y89-Y98	E970-E999	Not comparable with other jurisdictions

ICD-10 and ICD-9 Coded Mortality by ICD-10 Chapter at a Glance

Findings from the bridge-coding studies in Canada and the United Kingdom show significant changes in classification of death for most of the ICD-10 chapters. While the overall direction of change is consistent between the two countries, changes in two chapters (V Mental and behavioral disorders, XVIII symptoms and signs) are in opposite directions.

Fig. 1 presents the comparability ratio (in percent) by ICD-10 chapters in Canada. Eight chapters (chapter XIII, VI-VIII combined, XV, I, XII, IV, XVI, XI, and II in order) show an increase of 2 to 36 per cent ($p < 0.05$). In contrast, four chapters (chapter V, X, XVII, and III in order) show a decrease of 8 to 16 per cent ($p < 0.05$). No significant change is seen for other chapters (chapter XX, XIV, XVIII, and IX). As noted, changes at a chapter level are driven by changes within a chapter; no overall change at the chapter level may mask the changes within a chapter, as discussed in other sections.

Fig. 1



* This chapter was extracted from the report by Statistics Canada entitled "Comparability of ICD-10 and ICD-9 for Mortality Statistics in Canada" (2005; ISBN 0-662-41940-5).

Table 4 presents the percent change of the 4-year average of the age-standardized mortality rate (SMR) ratio between 2000-2003 and 1996-1999 by ICD-10 chapter for Alberta. Prior to 2000, the cause of death was coded with ICD-9; since 2000 it has been coded with ICD-10. While the SMR ratio can not be compared with the comparability ratio, it may point to the direction of change when interpreted in the context of the existing literature.

As shown, the changes in direction are consistent with the literature for all chapters except Chapter II and Chapter IX. Neoplasms (II) show a decrease of 1.2% for the period of 2000-2003, driven by cervical and breast cancer death rates. Diseases of the circulatory system (IX) also decreased for the period of 2000-2003, driven by acute myocardial infarction (heart attack) and unspecified stroke. The possible reasons of change for each chapter are briefly described in **Table 4**.

Although there is no overall change for Chapter XI, one specific group (i.e., all other diseases of the digestive system) is significantly under-classified in 2000-2003.

Table 4 Changes in Mortality by ICD-10 Chapter between ICD-10 and ICD-9, Alberta, 2000-2003 vs. 1996-1999

Short Name of ICD-10 Chapter	Change (%) *	Possible Reasons of Change
I - Infectious and parasitic diseases	7.9	Consistent with Stats Can and UK, a 7.9% of increase is largely attributed to over-classification of septicemia in ICD-10 (Fig. 4.1, 4.2). The tendency of decreased TB in 2000-2003 agrees with Stats Can. The increase and then decrease in HIV/AIDS (Fig. 5.1) disagrees with Stats Can and UK.
II - Neoplasms	-1.2	Different from Stats Can and UK, a decrease of 1.2% is evident, which is likely due to the decrease of breast and cervical cancer in this chapter (Fig. 5.2, 5.3). In situ neoplasms are over-classified in ICD-10 (Fig. 4.3) and cancer of bladder increased in 2000 but dropped thereafter (Fig. 4.4).
III - Diseases of the blood and certain immune disorders	-26.1	As reported by Stats Can and UK, a 26% decrease is probably due to the assignment of some blood disorders to Chapter II in ICD-10 and the decrease of non-anemia blood disorders (Fig. 5.4).
IV - Endocrine, nutritional, and metabolic diseases	2.4	Supported by Stats Can and UK, a 2.4% increase is likely attributed to the over-classification of diabetes in ICD-10. Malnutrition has decreased since 2000.
V - Mental and behavioral disorders	-18.6	As with Stats Can, a decrease of 18% is largely driven by over-classification of all other mental and behavioral disorders combined (Fig. 5.5, 5.6). Substantial increase of vascular dementia (Fig. 4.5) agrees with the UK study.
VI - Diseases of the nervous system	52.5	Consistent with Stats Can and UK, the 52.5% increase is likely driven by over-classification of Alzheimer's disease and other diseases in ICD-10 (Fig. 4.6-4.9).
VII - Diseases of the eye	NA	Less than 5 deaths. No significant change was found from the UK study.
VIII - Diseases of the ear	NA	Less than 5 deaths. No significant change was found from the UK study.
IX - Diseases of the circulatory system	-10.4	Different from Stats Can and UK, a decrease of 10.4% is observed, likely driven by ischemic heart disease (particularly heart attack) and unspecified stroke (Fig. 5.8-5.10). The increase of hypertensive disease in 2000-2003 (Fig. 4.10) agrees with Stats Can, UK and US studies.
X - Diseases of the respiratory system	-26.8	As reported by Stats Can and UK, a 26.8% decrease is likely driven by under-classification of pneumonia, asthma, and emphyzema in ICD-10(Fig. 5.10-5.12). Pneumonia due to solids and liquids is over-classifed in 2000-2003 (Fig. 4.11), which is consistent with Stats Can and US.
XI - Diseases of the digestive system	0.9	Consistent with UK but different from Stats Can, the small and non-significant increase is likely driven by other diseases of intestine and peritoneum (Fig. 4.12) and chronic liver disease and cirrhosis. All other diseases of the digestive system combined is under-classified in 2000-2003 (Fig. 5.14).
XII - Diseases of the skin	52.0	Consistent with Stats Can but different from UK, there appears an increase of 52% (though not significant) with a 20-30 death each year in 2000-2003 (Fig. 4.13)
XIII - Diseases of the musculoskeletal system	36.3	Consistent with Stats Can and UK, there is a 36.3% increase in 2000-2003 (Fig. 4.14). UK study found the increase of this chapter is due to over-classification of arthritis and osteoporosis.
XIV - Diseases of the genitourinary system	2.6	Consistent with Stats Can and UK, the small and non-significant increase is likely driven by kidney diseases, particularly renal failure (Fig. 4.15, 4.16) .
XV - Pregnancy and childbirth	NA	Less than 5 deaths does not meet standards of reliability or precision.
XVI - Certain conditions of the perinatal period	39.8	Consistent with Stats Can and US, there is an increase in 2000-2003 (Fig. 4.17). Disorders related to short gestation and low birthweight, intrauterine hypoxia and birth asphyxia, respiratory distress of newborn, newborn affected by complications of pregnancy, newborn affected by complications of placenta, cord, and memberanes are the drive of such an increase (CDC, 2001).
XVII - Congenital malformations	-4.2	Same as Stats Can and US, the 4.2% decrease is likely due to under-classification of respiratory system malformations, hydrocephalus, spina bifida, and diaphragmatic hernia (CDC, 2001).
XVIII - Symptoms and signs	14.4	As reported by Stats Can and UK, the 14.4% increase (Fig. 4.18), though not significant, is likely due to over-classification of senility and other signs and symptoms combined in 2000-2003. Sudden infant death syndrome tended to decrease, which agrees with the UK study.
XX - External Causes (Injury and Poisoning)	-3.2	Consistent with Stats Can and UK, there is no significant change of this chapter. However, motor vehicle accidents, falls including fracture cause unspecified, all other unintentional injury, and all other injury have decreased due to under-classification in 2000-2003 (Fig. 5.15-5.18). No significant change is found for intentional self-harm and assault, consistent with US and UK study. Stats Can found a 4% increase of Assault.

* The $SMR_{2000-2003}/SMR_{1996-1999}$ ratio is expressed in percentage.

Highlights of the ICD-10/ICD-9 Comparability Ratio for 152 Causes of Death, Canada

A recent study by Statistics Canada[15] examined the ICD-10/ICD-9 comparability ratio at the chapter and sub-chapter levels, including 152 cause-of-death groups. Of these, 131 groups have data for analysis. **Fig. 2** shows the pattern of over- and under-estimation. As shown, about half (51%) of cause-of-death groups with data (n=131) have 0-4 per cent of difference, while the remaining half (49%) may have either an increase (21%) or a decrease (28%) after the implementation of ICD-10. The details of these changes are discussed in the next section.

Fig. 2

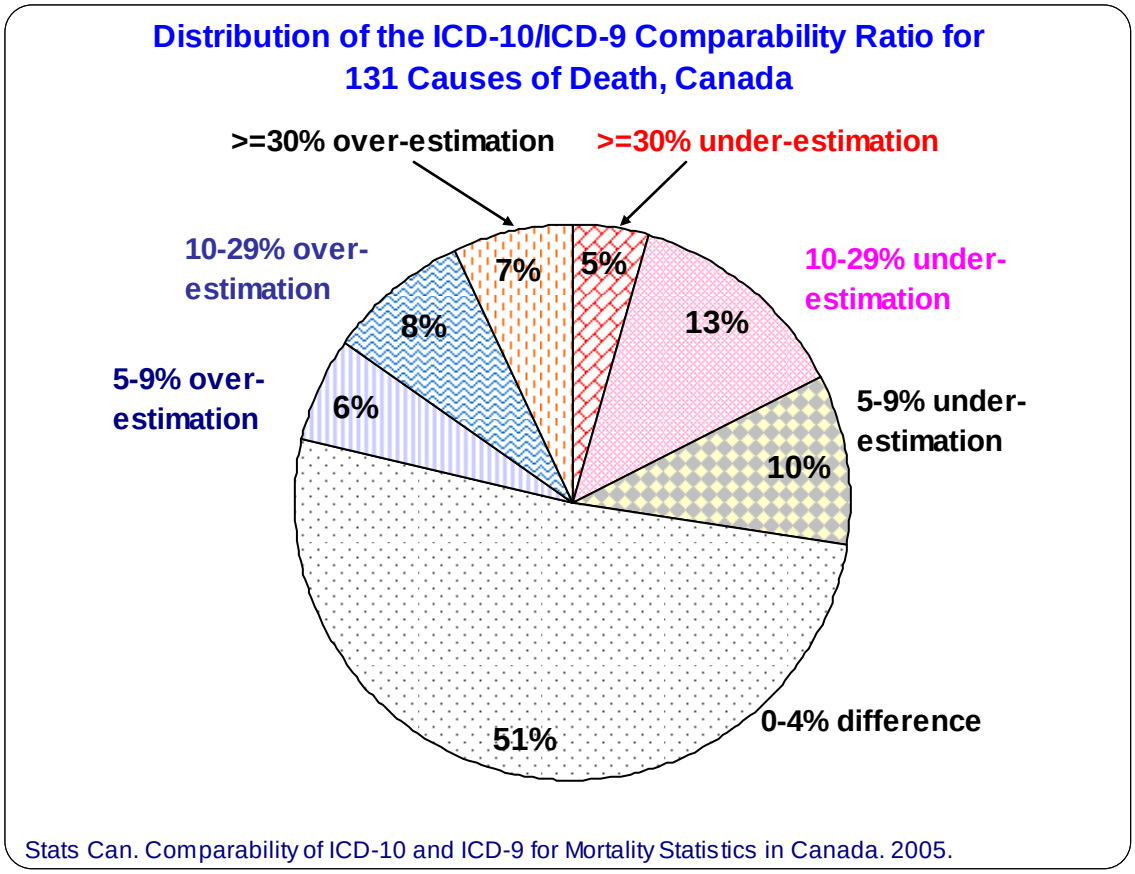


Table 5 presents the comparability ratio (in percent) of 49 cause-of-death groups, with at least six per cent change, statistically significant ($p<0.05$), after the implementation of ICD-10 in Canada. The table is arranged in descending order for cause-of-death groups; groups at the top of the list have the largest increase in ICD-10 and those at the bottom have the largest decrease. As shown, the cause-of-death group – other and unspecified nontransport accidents and their sequelae (192.6%) has the largest increase, and the group – falls (including fracture cause unspecified) has the largest decrease (-49.8%). The reasons for the changes have been documented in the literature.[14-19]

Table 5 Causes of Death with 6% or more Difference of the Comparability Ratio, Canada

ICD-10 Title	Ratio (%)
Other and unspecified nontransport accidents and their sequelae	192.6
Other land transport accidents	131.6
Other acute lower respiratory infections	72.5
Alzheimer's disease	58.5
Other acute ischaemic heart diseases	56.8
Pneumonitis due to solids and liquids	31.2
In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behaviour	30.5
Hyperplasia of prostate	24.2
Septicaemia	24.1
Pneumoconioses and chemical effects	18.2
Essential (primary) hypertension and hypertensive renal disease	17.2
Other chronic lower respiratory diseases	15.2
All other and unspecified malignant neoplasms	12.7
Acute and subacute endocarditis	10.8
Hernia	10.6
Human immunodeficiency virus (HIV) disease	10.1
Alcoholic liver disease	9.5
Chronic lower respiratory diseases	8.6
Assault (homicide) by other and unspecified means and their sequelae	8.4
Cerebrovascular diseases	6.9
Renal failure	6.6
Chronic liver disease and cirrhosis	6.3
Cerebrovascular diseases	6.1
Other diseases of circulatory system	-6.2
Malignant melanoma of skin	-7.3
Other heart diseases	-7.3
Assault (homicide) by discharge of firearms	-7.7
Accidental poisoning and exposure to noxious substances	-8.2
Hypertensive heart disease	-8.9
Atherosclerotic cardiovascular disease, so described	-9.5
Other tuberculosis	-10.6
Tuberculosis	-12.3
Emphysema	-12.4
Viral hepatitis	-12.7
Respiratory tuberculosis	-13.0
Events of undetermined intent	-14.4
All other forms of heart disease	-14.4
Other and unspecified events of undetermined intent and their sequelae	-14.8
Other diseases of arteries, arterioles and capillaries	-16.2
Accidental discharge of firearms	-16.7
Acute rheumatic fever and chronic rheumatic heart diseases	-17.8
Asthma	-22.0
Other disorders of circulatory system	-24.9
Acute bronchitis and bronchiolitis	-34.2
Chronic glomerulonephritis, nephritis and nephropathy NS, and renal sclerosis unspecified	-42.5
Influenza and pneumonia	-43.8
Bronchitis, chronic and unspecified	-44.3
Pneumonia	-46.8
Falls	-49.8

Causes of Death with 6% or more Difference after ICD-10 Implementation in Alberta

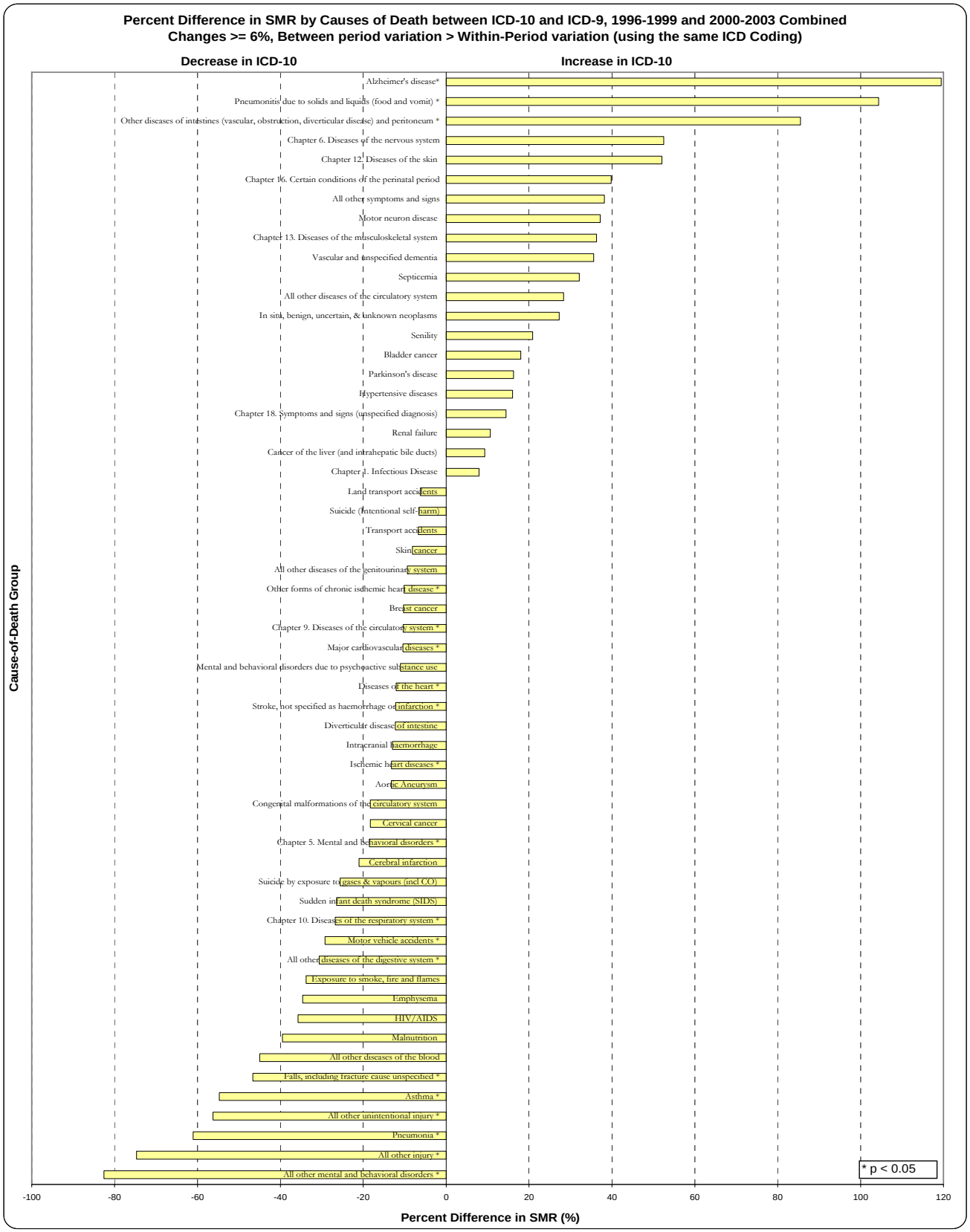
Of 120 cause-of-death groups we examined, 60 (50.0%) have at least 6% change between the periods prior (1996-1999) and after (2000-2003) the implementation of ICD-10. These changes are greater than the within-period variation when the same classification scheme was used, though the changes are not statistically significant for some groups. The cause-of-death groups that are statistically significant are marked with an asterisk (**Fig 3**).

As shown in **Fig. 3**, death from Alzheimer's disease shows the largest increase (119.4%) followed by pneumonia due to solids and liquids (104.4%), other diseases of the intestines (85.5%), and diseases of the nervous system (52.5%).

Deaths from all other mental and behavioral disorders (-82.6%) shows the largest decrease, followed by all other injury (-74.7%), pneumonia (-61.1%), all other unintentional injury (-56.2%), asthma (-54.7%), and falls including fracture cause unspecified (-46.7%).

It is important to note that while the findings of the current analysis of Alberta data are consistent with bridge-coding studies for the majority of causes of death examined[14-19] the SMR ratios of this study only suggest the direction of the change after ICD-10 implementation in the Province and these ratios cannot be assumed to be due to classification change only.

Fig. 3.


Percent Difference in SMR by Causes of Death between ICD-10 and ICD-9, 1996-1999 and 2000-2003 Combined
Changes >= 6%, Between period variation > Within-Period variation (using the same ICD Coding)
Decrease in ICD-10
Increase in ICD-10
Cause-of-Death Group
Alzheimer's disease*
Pneumonitis due to solids and liquids (food and vomit) *
Other diseases of intestines (vascular, obstruction, diverticular disease) and peritoneum *
Chapter 6. Diseases of the nervous system
Chapter 12. Diseases of the skin
Chapter 16. Certain conditions of the perinatal period
All other symptoms and signs
Motor neuron disease
Chapter 13. Diseases of the musculoskeletal system
Vascular and unspecified dementia
Septicemia
All other diseases of the circulatory system
In situ, benign, uncertain, & unknown neoplasms
Senility
Bladder cancer
Parkinson's disease
Hypertensive diseases
Chapter 18. Symptoms and signs (unspecified diagnosis)
Renal failure
Cancer of the liver (and intrahepatic bile ducts)
Chapter 1. Infectious Disease
Land transport accidents
Suicide (intentional self-harm)
Transport accidents
Skin cancer
All other diseases of the genitourinary system
Other forms of chronic ischemic heart disease *
Breast cancer
Chapter 9. Diseases of the circulatory system *
Major cardiovascular diseases *
Mental and behavioral disorders due to psychoactive substance use
Diseases of the heart *
Stroke, not specified as haemorrhage or infarction *
Diverticular disease of intestine
Intracranial haemorrhage
Ischemic heart diseases *
Aortic Aneurysm
Congenital malformations of the circulatory system
Cervical cancer
Chapter 5. Mental and behavioral disorders *
Cerebral infarction
Suicide by exposure to gases & vapours (incl CO)
Sudden infant death syndrome (SIDS)
Chapter 10. Diseases of the respiratory system *
Motor vehicle accidents *
All other diseases of the digestive system *
Exposure to smoke, fire and flames
Emphysema
HIV/AIDS
Malnutrition
All other diseases of the blood
Falls, including fracture cause unspecified *
Asthma *
All other unintentional injury *
Pneumonia *
All other injury *
All other mental and behavioral disorders *
* p < 0.05
-100
-80
-60
-40
-20
0
20
40
60
80
100
120
Percent Difference in SMR (%)

INTERPRETATION OF THE TIME TREND OF MORTALITY IN ALBERTA

Caution must be exercised in interpreting time trends of mortality. While real decrease or increase of some causes of death may have been occurred over time, changes in selection of the underlying cause of death, in coding, and in the classification of diseases since the implementation of ICD-10, may be the major reasons for any observed decrease or increase for some cause-of-death groups.[14-19] The following sections will examine the cause-of-death groups with significant changes in the 4-year average of the age-standardized mortality rate (SMR) between the periods prior (1996-1999) and after (2000-2003) ICD-10 implementation, where these changes may be in part attributable to the implementation of ICD-10 in Alberta.

HSG Causes of Death with Significant Increase in Age-Standardized Mortality Rate (SMR) after the Implementation of ICD-10, Alberta, 1986-2003

After the implementation of ICD-10, there have been significant increases in the age-standardized mortality rate (SMR) for 15 HSG causes of death as discussed in the following.

HSG 002 and 005: Chapter I Certain Infectious and Parasitic Diseases and Septicemia
An increase of 7.9% is noted after the implementation of ICD-10, likely driven by septicemia **(Fig. 4.1, 4.2).** The increase of septicemia is due to the application of Rule 3 (see **Appendix B**) under which some deaths involving pneumonia or infections previously coded to non-specific chapter codes have now been coded to septicemia.[14-17]

HSG 030: In Situ Neoplasms
Although there is a slight decrease for Chapter II (Neoplasms) overall, in situ neoplasms show a 27.5% increase due to the application of Rule 3 **(Fig. 4.3)**.[14-17] Bladder cancer shows an increase in the year 2000 then a drop thereafter **(Fig. 4.4).**

HSG 034: Chapter IV Endocrine, Nutritional and Metabolic Diseases
Consistent with the literature, a small and non-significant increase of death in Chapter IV is noted after the implementation of ICD-10 **(Fig. 4.5)**, likely driven by diabetes. The increase of diabetes is due to the application of Rule A and 3.[14-17] Some deaths that were coded in ICD-9 to cardiac arrest (427.5) are being coded in ICD-10 to diabetes.[15]

HSG 040: Vascular and Unspecified Dementia
Although there was a decrease in Chapter V (Mental and Behavioral Disorders) overall, vascular dementia shows a 35.6% increase due to the application of Rule 3 **(Fig. 4.6)**.[16-17] All other mental and behavioral disorders combined has shown a significant decrease, which will be discussed in the next section**.**

HSG 045, 046 and 048: Chapter VI Nervous System Diseases, Motor Neuron Disease, and Alzheimer's Disease
As found in the Statistics Canada and UK studies,[14, 16-17] diseases of the nervous system show the largest increase (52.0%, **Fig. 4.7**) among all chapters due to the application of Rule 3. This increase is primarily driven by Alzheimer's disease (119.4%) and motor neuron disease (37.2%, **Fig. 4.8-4.9**).

HSG 054: Hypertensive Diseases
Hypertensive diseases show an increase (16.0%, **Fig. 4.10**) due to over-classification of essential hypertension and hypertensive renal disease in ICD-10.[14-17]

HSG 077: Pneumonia due to Solids and Liquids
As reported in the Statistics Canada and UK studies,[14, 16-17] pneumonia due to solids and liquids shows a large increase (104%, **Fig. 4.11**)**.** Chapter X (Diseases of the Respiratory System) as a whole is shown to decrease as discussed in the next section.

HSG 080: Other Diseases of Intestines and Peritoneum
Consistent with the literature,[16-17] other diseases of intestines and peritoneum combined, such as vascular obstruction and diverticular disease, show an increase in ICD-10 (85%, **Fig. 4.12**)**.**[16-17] Chapter XI (Diseases of the Digestive System) overall does not show significant changes.

HSG 086: Chapter XII Diseases of the Skin
As reported,[16-17] diseases of the skin shows an increase of 52% (**Fig. 4.13**), although the difference is not statistically significant due to the small number of cases**.**

HSG 087: Chapter XIII Diseases of the Musculoskeletal System
Overall, there is a 36% increase for Chapter XIII musculoskeletal disorders (**Fig. 4.14**) with a similar pattern reported in the Statistics Canada and UK studies.[14, 16-17] The increase is likely due to over-classification of arthritis and osteoporosis**.**[16-17]

HSG 089: Kidney Diseases
Death from kidney diseases shows an apprimate 8% increase in 2000-2003, likely driven by the over-classification of renal failure in ICD-10 (**Fig. 4.15-4.16**).[14, 16-17] Chapter XIV overall shows about a 2.6% increase in 2000-2003.

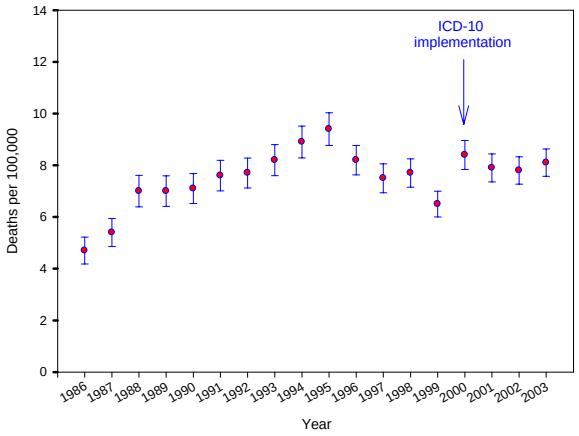
HSG 093: Chapter XVI Certain Conditions Originating in the Perinatal Period
As found in the US and UK studies,[15-17] Chapter XVI shows an increase in ICD-10 (40%, **Fig. 4.17**). The increase is likely due to over-classification of disorders related to short gestation and low birth weight, intrauterine hypoxia and birth asphyxia, respiratory distress of newborn, and others.[15]

*HSG 097**: Chapter XVIII Symptoms, Signs and Abnormal Clinical and Laboratory Findings***
Similar to the Statistics Canada and UK studies,[14, 16-17] there is about a 14% increase in Chapter XVIII (**Fig. 4.18**), which is likely due to over-classification of senility and other signs and symptoms combined.[16-17]

Fig. 4. SMR of HSG Groups with Significant Increase after ICD-10, Alberta, 1986-2003

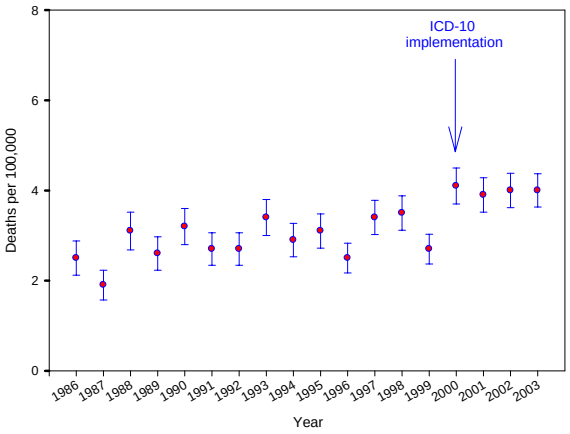
4.1 HSG002 Infectious and Parasitic Diseases

ICD-10=A00-B99, ICD-9=001-139



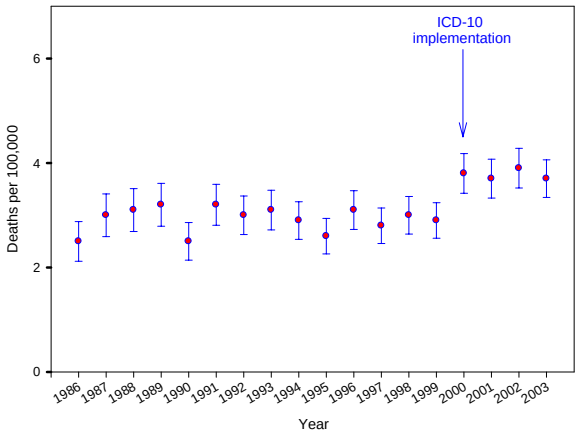
4.2 HSG005 Septicemia

ICD-10=A40-A41, ICD-9=038



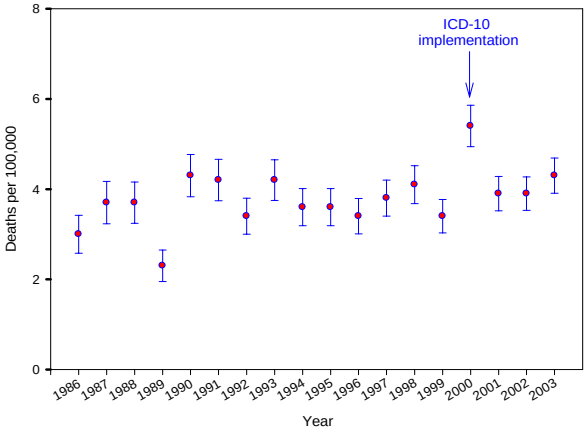
4.3 HSG030 In Situ Neoplasms

ICD-10=D00-D48, ICD-9=210-239



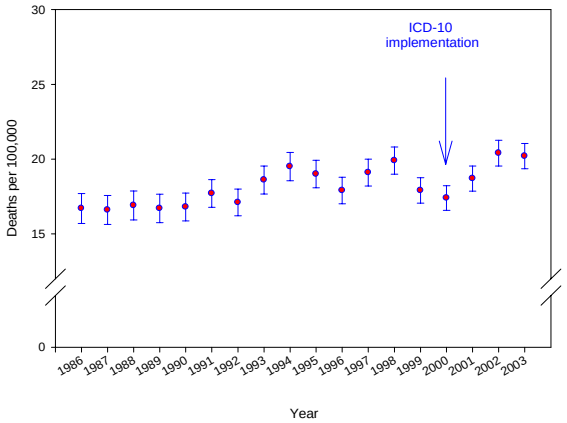
4.4 HSG023 Bladder Cancer

ICD-10=C67, ICD-9=188



4.5 HSG034 Endocrine, Nutritional & Metabolic Diseases

(ICD-10=E00-E90, ICD-9=240-278)



4.6 HSG040 Vascular & Unspecified Dementia

ICD-10=F01-F03, ICD-9=290

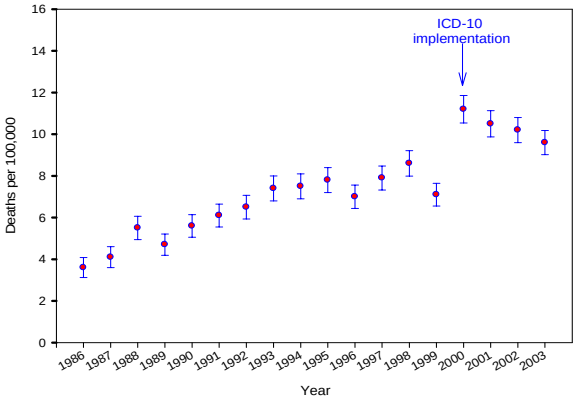
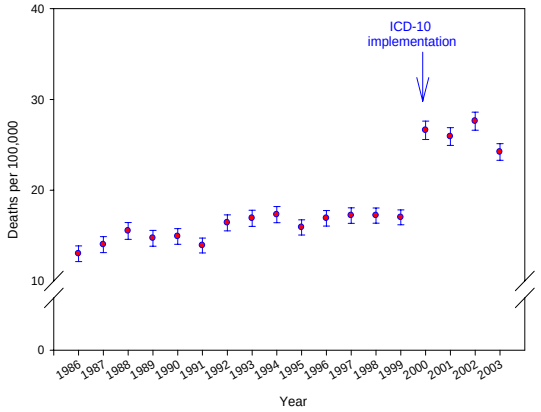


Fig. 4. SMR of HSG Groups with Significant Increase after ICD-10, Alberta, 1986-2003 (cont'd)

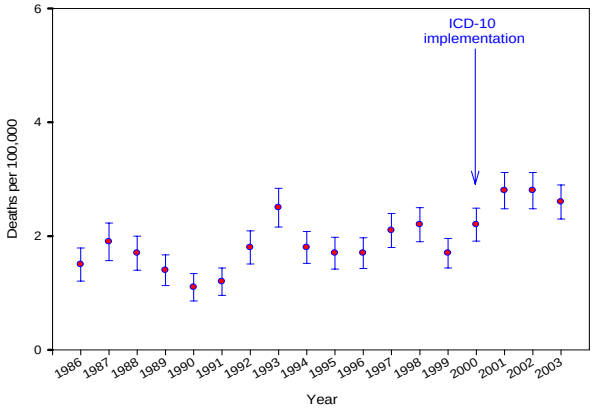
4.7 HSG045 Nervous System Diseases

ICD-10=G00-G99, ICD-9=320-359



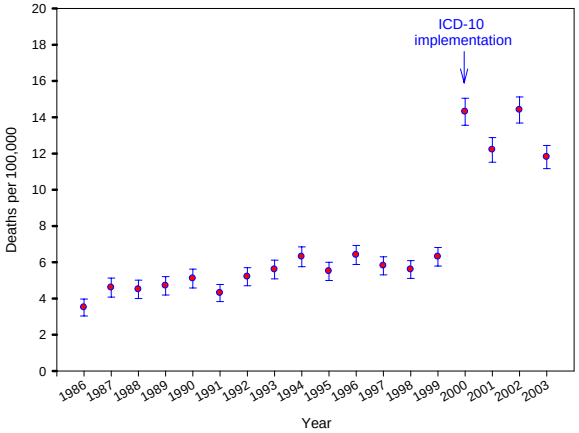
4.8 HSG046 Motor Neuron Disease

ICD-10=G12.2, ICD-9=335.2



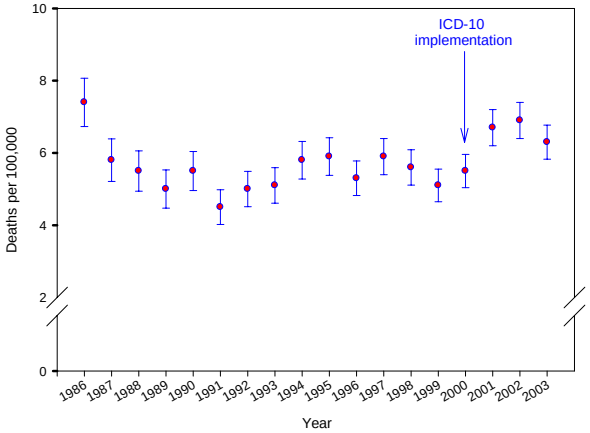
4.9 HSG048 Alzheimer's Disease

ICD-10=G30, ICD-9=331.0



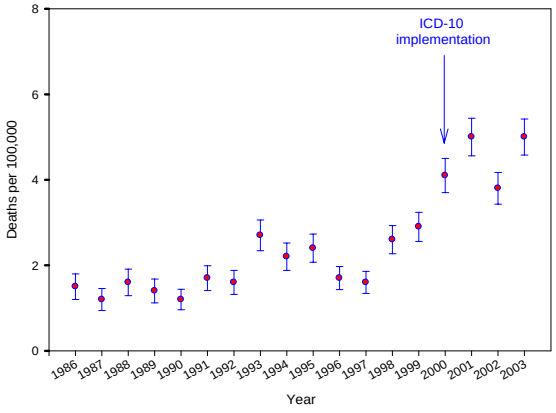
4.10 HSG054 Hypertensive Diseases

ICD-10=I10-I15, ICD-9=401-405



4.11 HSG077 Pneumonia due to Solids and Liquids

ICD-10=J69, ICD-9=507



4.12 HSG080 Other Diseases of Intestines

ICD-10=K55-K67, ICD-9=560-569

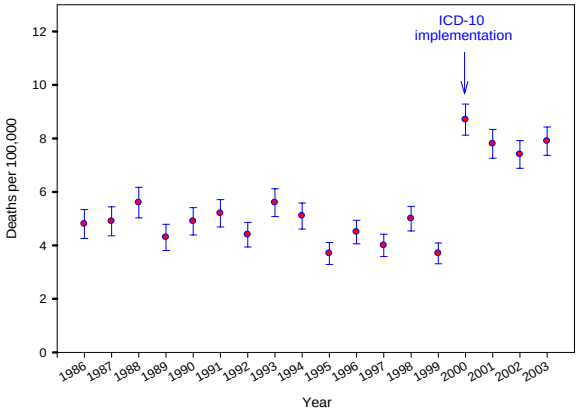
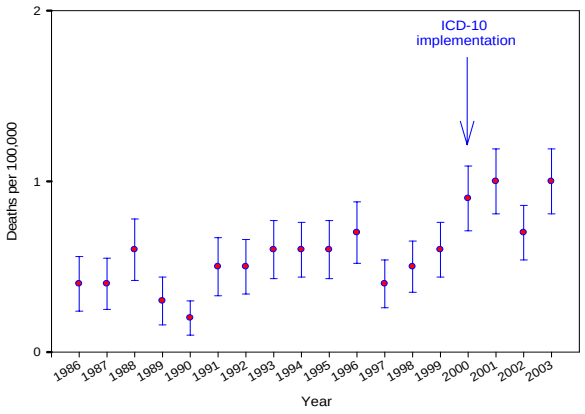


Fig. 4. SMR of HSG Groups with Significant Increase after ICD-10, Alberta, 1986-2003 (cont'd)

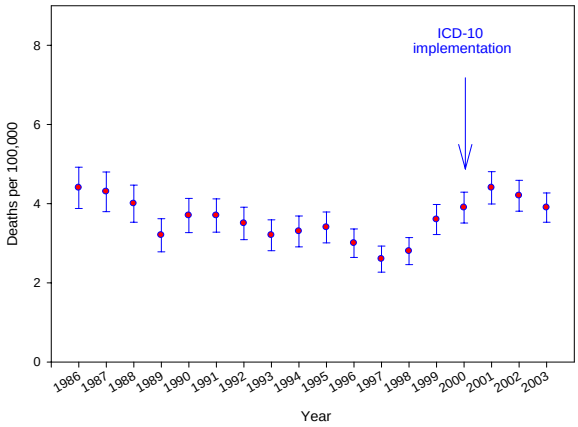
4.13 HSG086 Diseases of the Skin

ICD-10=L00-L99, ICD-9=680-709



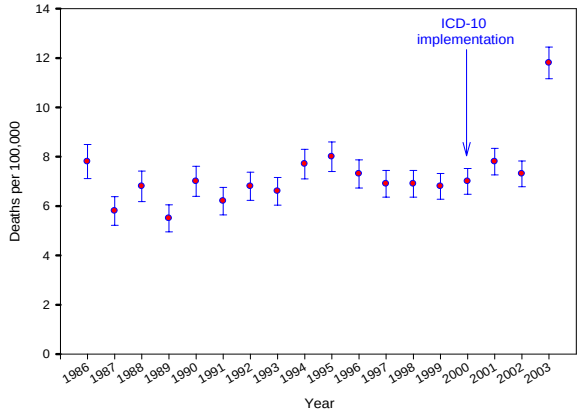
4.14 HSG087 Musculosckeletal Diseases

ICD-10=M00-M99, ICD-9=710-739



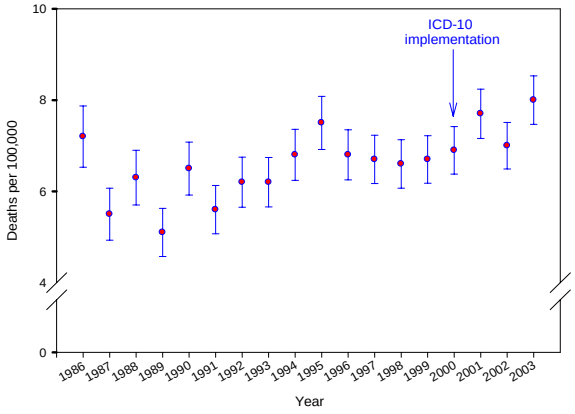
4.15 HSG089 Kidney Diseases

ICD-10=N00-N07, N17-N19, N25-N27, ICD-9=580-589



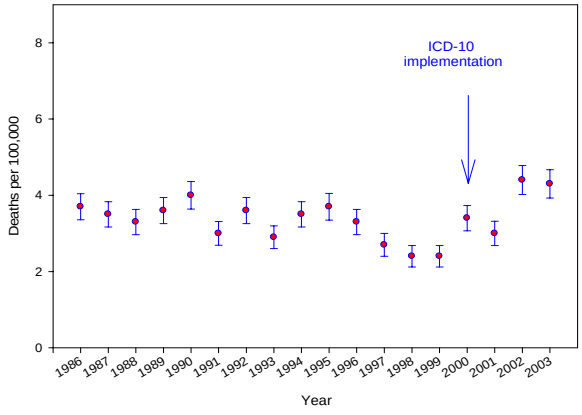
4.16 HSG090 Renal Failure

ICD-10=N17-N19, ICD-9=584-586



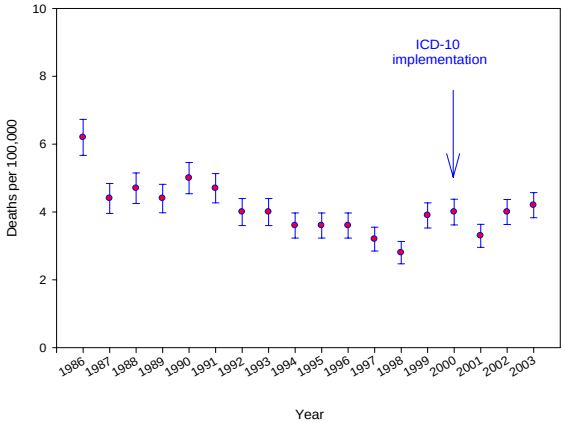
4.17 HSG093 Perinatal Conditions

ICD-10=P00-P96, ICD-9=760-779



4.18 HSG097 Symptoms and Signs

ICD-10=R00-R99, ICD-9=780-799



HSG Causes of Death with Significant Decrease in Age-Standardized Mortality Rate (SMR) after the Implementation of ICD-10, Alberta, 1986-2003

The following discusses 18 HSG causes of death with the significant decrease in the age-standardized mortality rate after the implementation of ICD-10 (**Fig. 5**).

HSG 007: HIV/AIDS
Death from HIV/AIDS shows an increase in the year 2000 and a decrease thereafter (**Fig. 5.1**); this is not well explained solely by the implementation of ICD-10. Other reasons for this pattern need to be examined.

HSG 018 and 019: Female Breast Cancer and Cervical Cancer
Death from female breast cancer shows a decrease in the year 2000 (**Fig. 5.2**) while death from cervical cancer tends to decrease, though not significant, since 2000 (**Fig. 5.3**). Reasons for these patterns are unclear.

HSG 031: Chapter III Diseases of Blood and Certain Disorders Involving the Immune System
As found in the Statistics Canada and UK studies,[14, 17,19] Chapter III shows a decrease of 26% (**Fig. 5.4**); this is likely due to the assignment of some blood disorders to Chapter II and the under-classification of anemia[15] and other blood disorders.

HSG 039 and 043: Chapter V Mental and Behavioral Disorders and Other Mental and Behavioral Disorders
As shown by Statistics Canada,[14] Chapter V shows a decrease of 19%; this is likely due in part to under-classification of all other mental and behavioral disorders combined (**Fig. 5.5**).

HSG 056, 057, 065: Ischemic Heart Disease, Heart Attack, and Unspecified Stroke
Ischemic heart disease shows a decrease of 13%, which is likely due to under-classification of acute myocardial infarction (heart attack, **Fig. 5.7-5.8**).[15-18] Changes in Rule A are the likely reason for the under-classification.[15-18] Unspecified stroke also shows a pattern of decrease, particularly in the year 2001 (**Fig. 5.9),** though the reasons are unclear.

HSG 070, 073, 075, 076: Chapter X Diseases of the Respiratory System, Pneumonia, Emphysema, and Asthma
Overall, Chapter X shows a decrease of 26%; this is driven primarily by pneumonia, and also by emphysema and asthma, due to application of Rule 3 in ICD-10 (**Fig. 5.11-5.13**).[15-18]

HSG 085: All Other Digestive Disorders
All other digestive disorders combined show a decrease of 30% which is likely due to under-classification of this group in ICD-10 (**Fig. 5.14**).

HSG 105, 106, 113, 120: Motor Vehicle Accidents (MVA), Falls including Fracture Cause Unspecified, All Other Unintentional Injury, and All Other Injury Combined
A decrease is evident for motor vehicle accidents *(*29.2%), falls including fracture cause unspecified (46.6%), all other unintentional injury (56.2%), and all other injury combined

(74.7%). The under-classification of these conditions is due to changes in coding and the application of Rule 3 in ICD-10 (**Fig. 5.11-5.13**).[15-18] No significant change is seen for the overall Chapter XX (External Causes) group.

Considerations in Interpretation

Of the 120 cause-of-death groups examined, we identified 36 groups (30.2%) which may require attention in interpretation due to the possible impact of the implementation of ICD-10. Because of possible regional variations in the process of coding and reporting in ICD-10, findings from this analysis should be used only as a reference for regions.

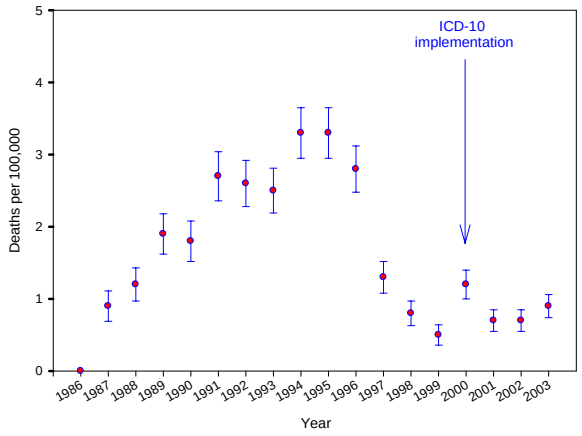
In general, findings of bridge-coding studies from Statistics Canada and other countries[14-19] should be referenced for the possible impact due to changes in ICD-10. It should be noted, however, that the comparability ratio for all sex/age groups combined may not apply for some specific sex/age groups.[17] The issue of real changes, versus differences due to changes in ICD-10 or in reporting, should always be kept in mind.

To ease the technical difficulties in coding and calculation and to facilitate the use of the information, we have developed a set of SAS programs for grouping and counting the number of death in each group. These programs can be modified to meet the needs of regions. The conversion of cause-of-death groups between Statistics Canada and Alberta is also presented (**Appendix D**).

Fig. 5. SMR of HSG Groups with Significant Decrease after ICD-10, Alberta, 1986-2003

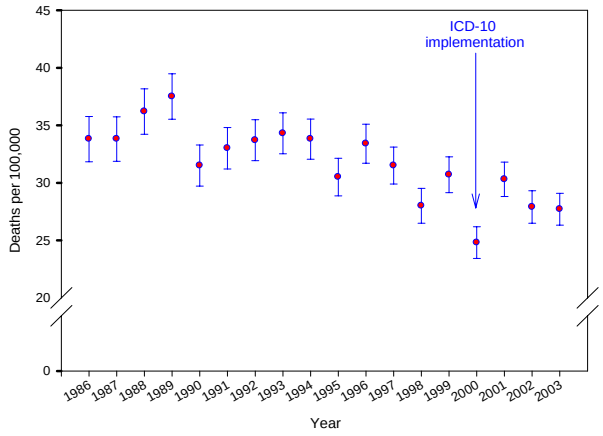
5.1 HSG007 HIV/AIDS

ICD-10=B20-B24, ICD-9=042-044



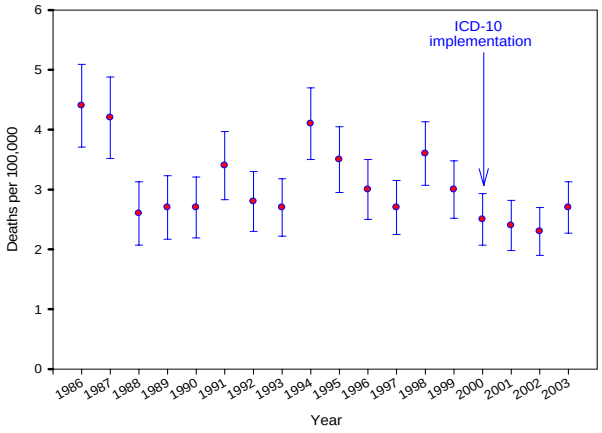
5.2 HSG018 Female Breast Cancer

ICD-10=C50, ICD-9=174



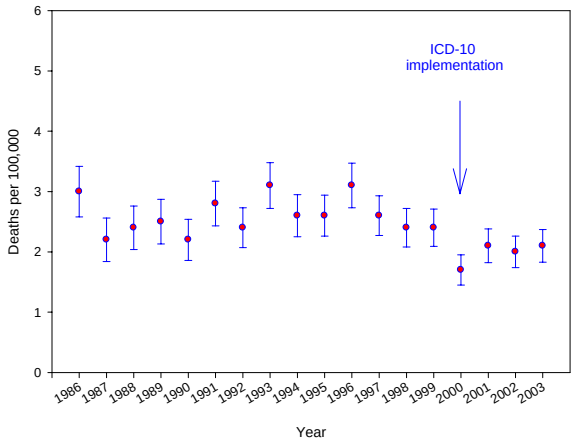
5.3 HSG019 Cervical Cancer

ICD-10=C53, ICD-9=180



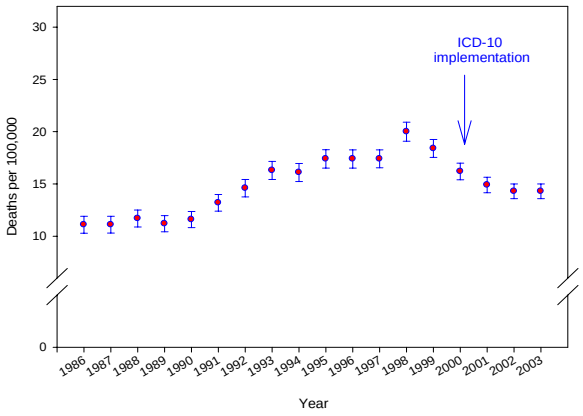
5.4 HSG031 Diseases of Blood and Certain Disorders involving Immune Mechanism

ICD-10=D50-D89, ICD-9=280-289



5.5 HSG039 Mental and Behavioral Disorders

ICD-10=F00-F99, ICD-9=290-319



5.6 HSG043 All Other Mental & Behavioral Disorders

ICD-10=F04-F09, F20-F99, ICD-9=293-302, 306-319

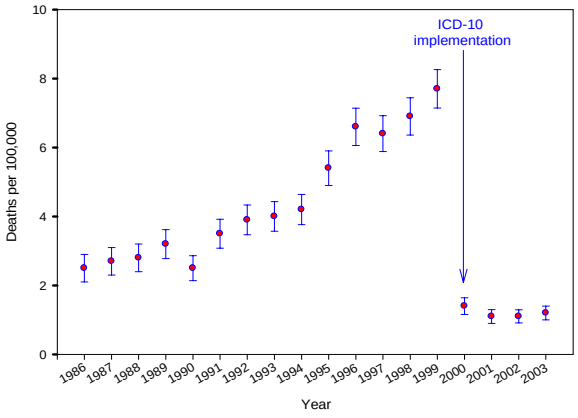
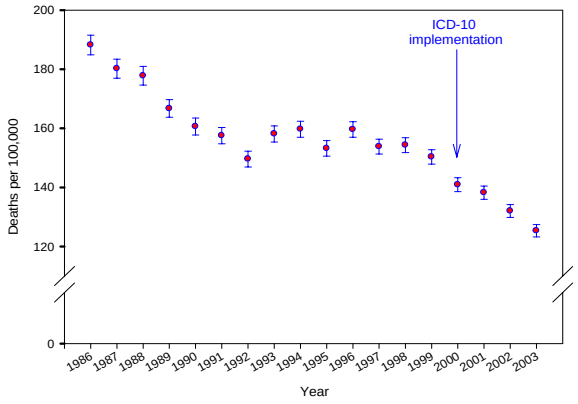


Fig. 5 SMR of HSG Groups with Significant Decrease after ICD-10, Alberta,1986-2003 (cont'd)

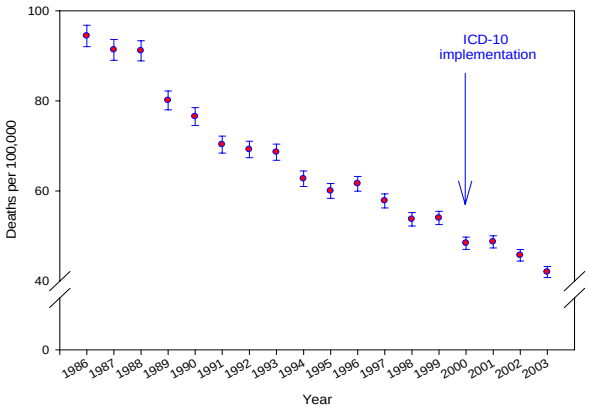
5.7 HSG056 Ischemic Heart Disease

ICD-10=I20-I25, ICD-9=410-414, 429.2



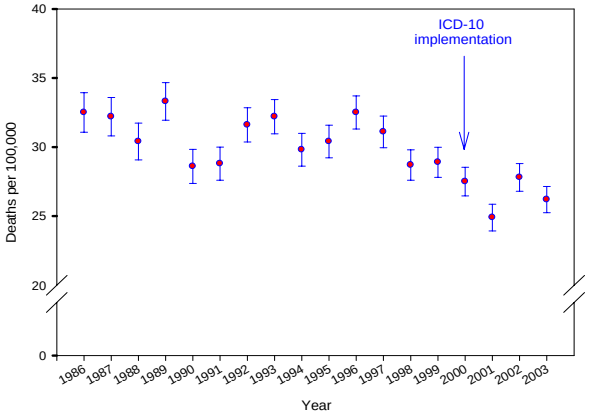
5.8 HSG057 Heart Attack (AMI)

ICD-10=I210-I22, ICD-9=410



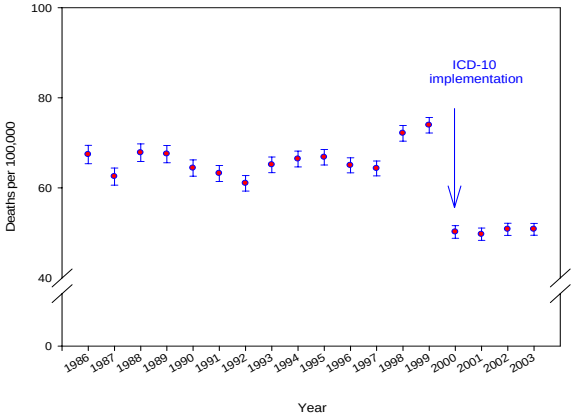
5.9 HSG065 Stroke, Unspecified

ICD-10=I64, ICD-9=436



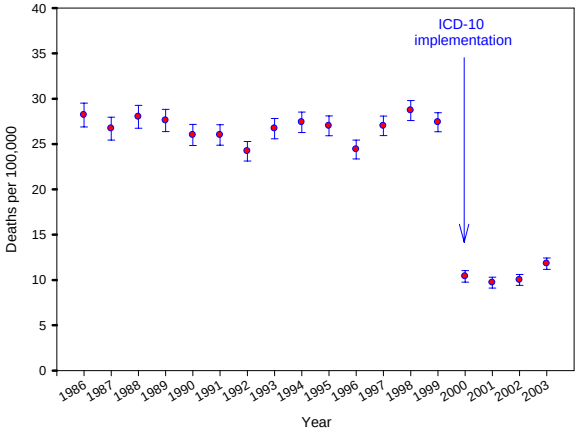
5.10 HSG070 Respiratory Disorders

ICD-10=J00-J99, ICD-9=460-519



5.11 HSG073 Pneumonia

ICD-10=J12-J18, ICD-9=480-486



5.12 HSG075 Emphysema

ICD-10=J43, ICD-9=492

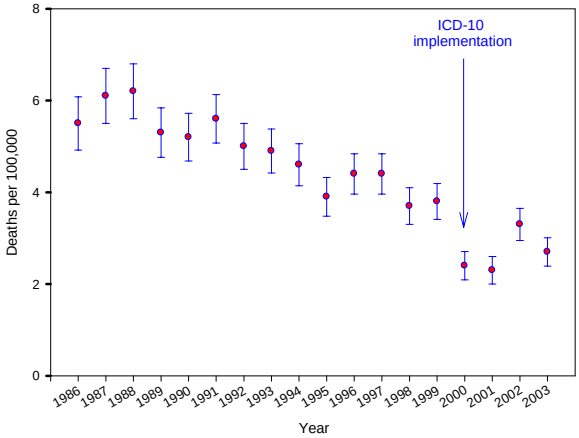
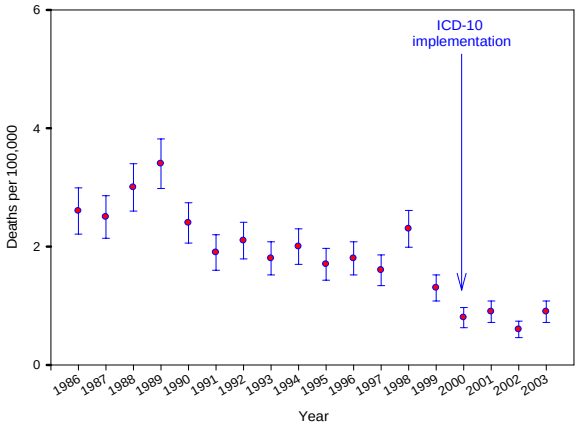


Fig. 5 SMR of HSG Groups with Significant Decrease after ICD-10, Alberta,1986-2003 (cont'd)

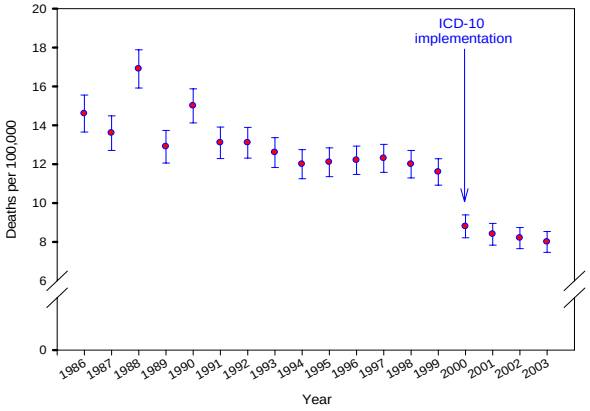
5.13 HSG076 Asthma

ICD-10=J45-J46, ICD-9=493



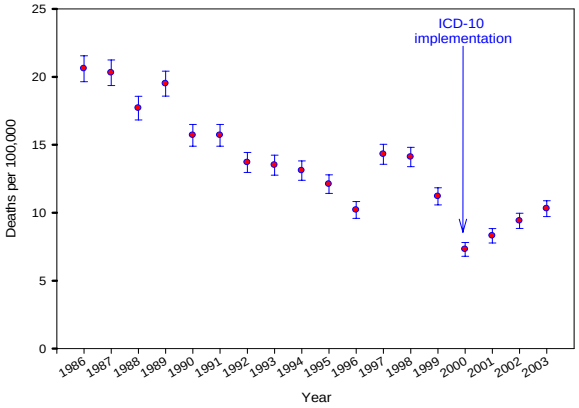
5.14 HSG085. All Other Digestive Diseases

ICD-10=K00-K52, K80-K93, ICD-9=520-558, 574-579



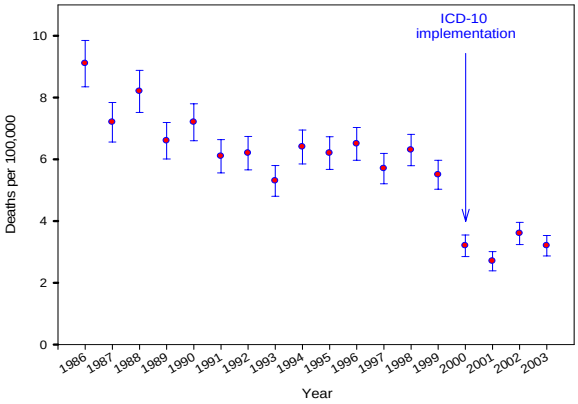
5.15 HSG105. Motor Vehicle Accidents (MVA)

ICD-10=HSG list, ICD-9=E810-E825



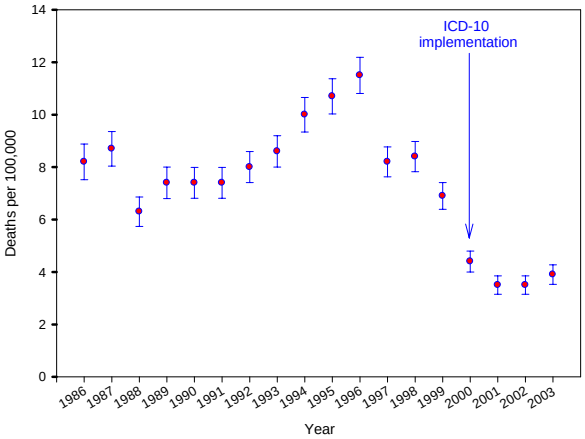
5.16 HSG106. Falls, including fracture cause unspecified

ICD-10=W00-W19, ICD-9=E880-E888



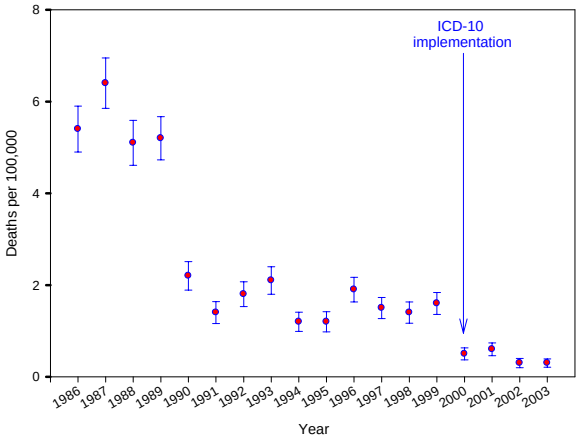
5.17 HSG113. All Other Unintentional Injury

ICD-10=HSG list, ICD-9=E900-E909, E911-E929



5.18 HSG120 All Other Injury

ICD-10=Y10-Y36, Y87.2, Y89-Y98, ICD-9=E970-E999



CONCLUSIONS

This study has provided a framework for grouping, and the corresponding ICD-9 to ICD-10 translation codes, for 120 causes of death. The crude and age-standardized mortality rates are calculated for each group by year, sex, and health region, 1986-2003.

The findings of this study, though preliminary, are consistent with the literature for the majority of cause-of-death groups. There are 15 cause-of-death groups showing significant increase in the standardized mortality rate (SMR) due to, in part, the implementation of ICD-10 in Alberta, particularly:

- HSG 005: Septicemia
- HSG 030: In Situ Neoplasms
- HSG 040: Vascular and Unspecified Dementia
- HSG 045: Chapter VI Nervous System Diseases
- HSG 048: Alzheimer's Disease
- HSG 077: Pneumonia due to Solids and Liquids
- HSG 080: Other Diseases of Intestines and Peritoneum
- HSG 093: Chapter XVI Certain Conditions Originating in the Perinatal Period

In contrast, there are 18 cause-of-death groups showing a signgificant decrease, particularly:

- HSG 039: Chapter V Mental and Behavioral Disorders
- HSG 043: Other Mental and Behavioral Disorders combined
- HSG 056: Ischemic Heart Disease
- HSG 057: Heart Attack
- HSG 070: Chapter X Diseases of the Respiratory System
- HSG 073: Pneumonia
- HSG 085: All Other Digestive Disorders
- HSG 105: Motor Vehicle Accidents (MVA)
- HSG 106: Falls including Fracture Cause Unspecified
- HSG 113: All Other Unintentional Injury
- HSG 120: All Other Injury Combined

We did not attempt to adjust the number of death by the ICD-10/ICD-9 comparability ratio due to potential differences in population demograpics and geography between Alberta and other regions; but the ratios using Canadian data and data of other countries are attached.

The current work should be viewed as preliminary. Changes in grouping and coding will be made as further information accumulates.

We recommend implementation of the HSG Disease Grouping and Coding for routine reporting of mortality statistics in Alberta. We also recommend the reporting of data without adjustment by the ICD-10/ICD-9 ratio for time trends, but noting the date of ICD-10 implementation.

Further work will include:

- Updating the Epidemiological Measures Database to include the new groupings;
- Expanding the disease grouping and coding presented here to morbidity data; and
- Conducting validation studies of the ICD-10/ICD-9 comparison for specific morbidity groups and/or sub-population groups as appropriate.

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APPENDICES

Appendix A. Description of Coding Systems

Classification Systems: Similar conditions/interventions are grouped together and assigned the same code number.

Classification	Abbreviation	Description	Number of Codes
International Classification of Diseases - Ninth Revision	ICD-9	A classification system of diseases. Does not include an intervention classification. Released in 1975 by the World Health Organization (WHO).	9,000 diagnoses
International Statistical Classification of Diseases and Related Health Problems - Tenth Revision	ICD-10	A classification system of diseases. Does not include an intervention classification. Usually used to code and classify mortality data from death certificate. Approved for use in 1989 and developed by WHO.	13,600 diagnoses
International Classification of Diseases - Ninth Revision - Clinical Modification	ICD-9-CM	A classification system including diagnoses and interventions. Developed in the US and was ready for use in 1979. The disease classification component is an expansion based on the ICD-9. Usually used to code and classify data from the inpatient and outpatient records, physician offices, and most surveys. Updated annually.	12,000 diagnoses 4,000 interventions
International Classification of Diseases - Tenth Revision - Clinical Modification	ICD-10-CM	A classification system of diseases. Does not include an intervention classification. Developed by the National Centre for Health Statistics in the US with implementation targeted for 2000.	unknown
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada	ICD-10-CA	A classification system of diseases based upon the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10). ICD-10-CA was developed by Canadian Institute for Health Information (CIHI). Some 3-digit codes used in ICD-10 are invalid in ICD-10-CA, thus require using the 4-digits coding in disease grouping, which may be unavailable in some data sources, such as the Vital Statistics Death registry. Four-digit codes may roll-up to the 3-digit codes but vice not versa.	17,000 diagnoses

Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures	CCP	A classification of interventions. Developed and published by Statistics Canada to accompany ICD-9.	4,000 interventions
Canadian Classification of Health Interventions	CCI	A classification of interventions. Developed by CIHI to accompany ICD-10. Implemented in most of provinces since 2002.	15,000 interventions
Procedure Classification System	PCS	A classification of interventions. Developed by 3M with the intent to accompany ICD-10-CM.	unknown

Nomenclature Systems: Each diagnosis and intervention is assigned a unique code.

Nomenclature	Abbreviation	Description	Number of Codes
Read Codes	Not applicable	A comprehensive list of terms intended for use by all health care professionals to describe care and treatment of their patients. They enable the capture and retrieval of data in natural clinical language within computer systems. Updated quarterly. Developed by the UK Department of Health, National Health Service Centre for Coding and Classification. Updated quarterly.	100,000 diagnoses and intervention codes
Systematized Nomenclature of Human and Veterinary Medicine	SNOMED	A comprehensive system constructed around 11 conceptual models including disease, chemicals, occupations, social context, interventions, etc. Developed by the College of American Pathologists. Updated biannually.	140,000 diagnoses and intervention codes

Appendix B. Comparison of ICD-9 and ICD-10 rules for selection of underlying cause of death

ICD-9	ICD-10
Selection rules	
General Rule: Select the condition entered alone on the lowest used line of Part I unless it is highly improbable that this condition could have given rise to all the condition entered above it.	**General Principle**: When more than one condition is entered on the certificate, the condition entered alone on the lowest used line of Part I should be selected only if it could have given rise to all the conditions entered above it.
Rule 1: If there is a reported sequence terminating in the condition first entered on the certificate, select the underlying cause of this sequence. If there is more than one such sequence, select the underlying cause of the first-mentioned sequence.	**Rule 1**: If the general Principle does not apply and there is a reported sequence terminating in the condition first entered on the certificate, select the originating cause of this sequence. If there is more than one sequence terminating in the condition mentioned first, select the originating cause of the first-mentioned sequence.
Rule 2: If there is no reported sequence terminating in the condition first entered on the certificate, select this first mentioned condition.	**Rule 2**: If there is no reported sequence terminating in the condition first entered on the certificate, select this first-mentioned condition.
Rule 3: If the condition selected by the General rule or Rules 1 or 2 can be considered a direct sequel of another reported condition, whether in Part I or Part II, select this primary condition. If there are two or more such primary condition, select the first mentioned cause.	**Rule 3**: If the condition selected by the General Principle or by Rule 1 or Rule 2 is obviously a direct consequence of another reported condition, whether in Part I or Part II, select this primary condition.
Modification Rules	
Rule 4, Senility: Where the selected underlying cause is classifiable to 797 (Senility) and a condition classifiable elsewhere than to 780-799 is reported on the certificate, reselect the underlying cause as if the senility had not been reported, except to take account of the senility if it modifies the coding. **Rule 5**, III-defined ocnditions: Where the selected underlying cause is classifiable to 780-796, 798-799 (the ill-defined conditions) and a condition classifiable elsewhere than to 780-799 is reported on the certificate, reselect the underlying cause as if the ill-defined condition had not been reported, except to take account of the ill-defined condition if it modifies the coding.	**Rule A**, Senility and other ill-defined conditions: Where the selected cause is classifiable to Chapter XVIII (Symptoms, sighns and abnormal clinical and laboratory finding, not elsewhere classified) except for R95 (Sudden infant death syndrome), and a condition classified elsewhere than to R00-R94 is reported on the certificate, reselect the cause of death as if the condition classified to Chapter XVIII had not been reported, except to take account of that condition if it modifies the coding.

ICD-9	ICD-10
Modification Rules	
Rule 6, Trivial conditions: Where the selected underlying cause is a trivial condition unlikely to cause death, proceed as follows: (a) if the death was the result of an adverse reaction to treatment of the trivial condition, select the adverse reaction; (b) if the trivial condition is not reported as the cause of more serious complication, and a more unrelated condition is reported on the certificate, reselect the underlying cause as if the trivial condition had not been reported.	**Rule B**, Trivial conditions: Where the selected cause is a trivial condition unlikely to cause death and a more serious condition is reported, reselect the underlying cause as if the trivial condition had not been reported. If the death was the result of an adverse reaction to treatment of the trivial condition, select the adverse reaction.
Rule 7, Linkage: Where the selected underlying cause is linked by a provision in the classification in the Notes for use in primary mortality coding on pages 713-721 with one or more of the other conditions on the certificate, code the combination. Where the linkage provision is only for the combination of one condition specified as due to another, code the combination only when the correct causal relationship is stated or can be inferred from application of the selection rules. Where a conflict in linkages occurs, link with the condition that would have been selected if the underlying cause initially selected had not been reported. Apply any further linkage that is applicable.	**Rule C**, Linkage: Where the selected cause is linked by a provision in the classification or in the notes for use in underlying cause mortality coding with one or more of the other conditions on the certificate, code the combination. Where the linkage provision is only for the combination of one condition specified as due to another, code the combination only when the correct causal relationship is stated or can be inferred from application of the selection rules. Where a conflict in linkages occurs, link with the condition that would have been selected if the cause initially selected had not been reported. Make any further linkage that is applicable.
Rule 8, Specificity: Where the selected underlying cause describes a condition in general terms and a term which provides more precise information about the site or nature of this condition is reported on the certificate, prefer the more informative term. This rule will often apply when the general term can be regarded as an adjective qualifying the more precise term.	**Rule D**, Specificity: Where the selected cause describes a condition in general terms and a term that provides more precise information about the site or nature of this condition is reported on the certificate, prefer the more informative term. This rule will often apply when the general term becomes an adjective, qualifying the more precise term.
Rule 9, Early and late stages of disease: Where the selected underlying cause is an early stage of a disease and a more advanced stage of the same disease is reported on the certificate, code to the more advanced stage. This rule does not apply to a "chronic" form reported as due to an "acute" form unless the Classification gives special instructions to that effect.	**Rule E**, Early and late stages of disease: Where the selected cause is an early stage of a disease and a more advanced stage of the same disease is reported on the certificate, code to the more advanced stage. This rule does not apply to a "chronic" form reported as due to an "acute" form unless the classification gives special instructions to the effect.

ICD-9	ICD-10
Modification Rules	
Rule 10, Late effects: Where the selected underlying cause is an early form of a condition for which the Classification provides a separate late effects category and there is evidence that death occurred from residual effects of this condition rather than in its active phase, code to the appropriate late effects category. The following late effects categories, including those in the Supplementary E code, have been provided: 137, 138, 139, 268.1, 326, 438, 905-909, E929, E959, E969, E977, E989, and E999.	**Rule F**, Sequelae: Where the selected cause is an early form of a condition for which the classification provides a separate "Sequelae of…" category, and there is evidence that death occurred from residual effects of this condition rather than from those of its active phase, code to the appropriate "Sequelae of…" category. "Sequelae of…" categories are as follows: B90-B94, E64.-, E68, G09, I69, O97, and Y85-Y89.
Rule 11, Old pneumonia, influenza and maternal conditions: Where the selected underlying cause is pneumonia or influenza (480-487) and there is evidence that the date of onset was 1 year or more prior to death or a resultant chronic condition is reported, reselect the underlying cause as if the pneumonia or influenza had not been reported. Where the selected underlying cause is a maternal cause (630-678) and there is evidence that death occurred more than 42 days after termination of pregnancy or a resultant chronic condition is reported, reselect the underlying cause as if the maternal cause had not been reported. Take into account the pneumonia, influenza or maternal condition if it modifies the coding.	No corresponding rule.
Rule 12, Errors and accidents in medical care: Where the selected underlying cause was subject to medical care and the reported sequence in Part I indicates explicitly that the death was the result of an error or accident occurring during medical care (conditions classificable to categories E850-E858, E870-E876), regard the sequence of events leading to death as starting at the point as which the error or accident occurred. This does not apply to attempts at resuscitation.	No corresponding rule.

ICD-10 rule revisions	
Selection Rule 3	
As originally publishe by WHO in 1993	As revised, effective 2003
Assumed direct consequences of another condition: Pneumonia and bronchopneumonia may be accepted as complictions of any disease. In particular, bronchopneumonia should be assumed to be an obvious consequence of wasting diseases (such as malignant neoplasm and malnutrition) and diseases causing paralysis (such as brain or spinal cord injuries, cerebral haemorrhage or thrombosis, and poliomyelitis), as well as communicable diseases and non-trivial injuries.	Assumed direct consequences of another condition: Any pneumonia in J12-J18 should be considered an obvious consequence of conditions that impair the immunie system. Pneumonia in J18.0 and J18.2-J18.9 should be considered an obvious consequence of wasting diseases (such as malignant neoplasm and malnutrition) and diseases causing paralysis (such as cerebral haemorrhage or thrombosis), as well as serious respiratory condition, communicable diseases, and serious injurines. Pneumonia in J18.0 and J18.2-J18.9, J69.0, and J69.8 should also be considered an obvious consequence of conditions that affect the process of swallowing.
Modification Rule A	
As originally published by WHO in 1993	As revised, effective 2001
Where the selected cause is classifiable to Chapter XVIII (Sumptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified) except for R95 (Sudden infant death syndrome), and a condition classified elsewhere than to R00-R94 or R96-R99 is reported on the certificate, reselect the cause of death as if the condition classified to Chapter XVIII had not been reported, except to take account of that condition if it modifies the coding.	Where the selected cause is ill-defined and a condition classified elsewhere is reported on the certificate, reselect the cause of death as if the ill-defined condition had not been reported, except to take account of that condition if it modifies the coding. The following conditions are regarded as ill-defined: I46.9 (Cardiac arrest, unspecified); I99 (Other and unspecified disorders of circulatory system); J96.0 (Acute respiratory failure); J96.9 (Respiratory failure, unspecified); P28.5 (Respiratory failure of newborn); R00-R94 or R96-R99 (Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified). Not that R95 (Sudden infant death syndrome) is not regarded as ill-defined.

Appendix C. Comparability Ratios for selected causes of death

1. Comparability ratio for 152 causes of death, Canada

Source: Statistics Canada (2005). Bridge-coding of 1999 deaths: ICD-10/ICD-9 comparability ratios. Catalogue No. 84-548.

Group No.	ICD Codes		Causes of Deaths (ICD-10 titles)	ICD-10/ ICD-9 Ratio	SE	95% CI	
	ICD-9	ICD-10				Lower	Higher
0	001-799, E800-E999	A00-R99, V01-Y89	All causes	…	…	…	…
1	**001-139**	**A00-B99**	**Chapter I. Certain infectious and parasitic diseases**	**1.087**	**0.010**	**1.068**	**1.107**
2	002-003	A01-A02	Salmonella infections	F	F	F	F
3	004, 006	A03, A06	Shigellosis and amoebiasis	…	…	…	…
4	007-009	A04, A07-A09	Certain other intestinal infections	0.924	0.050	0.827	1.021
5	010-018	A16-A19	Tuberculosis	0.877	0.009	0.860	0.894
6	010-012	A16	Respiratory tuberculosis	0.870	0.000	…	…
7	013-018	A17-A19	Other tuberculosis	0.894	0.030	0.835	0.953
8	33	A37	Whooping cough	F	F	F	F
9	034.1-035	A38, A46	Scarlet fever and erysipelas	F	F	F	F
10	36	A39	Meningococcal infection	F	F	F	F
11	38	A40-A41	Septicaemia	1.241	0.019	1.203	1.279
12	090-097	A50-A53	Syphilis	F	F	F	F
13	45	A80	Acute poliomyelitis	…	…	…	…
14	062-064	A83-A84, A85.2	Arthropod-borne viral encephalitis	F	F	F	F
15	55	B05	Measles	…	…	…	…
16	70	B15-B19	Viral hepatitis	0.873	0.024	0.826	0.921
17	042-044	B20-B24	Human immunodeficiency virus (HIV) disease	1.101	0.020	1.062	1.140
18	84	B50-B54	Malaria	…	…	…	…
19	001, 005, 020-032, 037, 039-041, 046-054, 056-061, 065-066, 071-083, 085-088, 098-134, 136-139, 771.3	A00, A05, A20-A36, A42-A44, A48-A49, A54-A79, A81-A82, A85.0-A85.1, A85.8, A86-B04, B06-B09, B25-B49, B55-B99	Other and unspecified infectious and parasitic diseases and their sequelae	1.045	0.023	0.999	1.091
20	**140-239**	**C00-D48**	**Chapter II. Neoplasms**	**1.018**	**0.002**	**1.014**	**1.021**
21	140-208	C00-C97	Malignant neoplasms	1.012	0.002	1.009	1.016
22	140-149	C00-C14	Malignant neoplasms of lip, oral cavity and pharynx	0.983	0.012	0.960	1.005
23	150	C15	Malignant neoplasm of esophagus	0.975	0.025	0.927	1.023
24	151	C16	Malignant neoplasm of stomach	1.022	0.018	0.987	1.058
25	153-154	C18-C21	Malignant neoplasms of colon, rectum and anus	0.996	0.013	0.970	1.021
26	155	C22	Malignant neoplasms of liver and intrahepatic bile ducts	0.986	0.005	0.976	0.995
27	157	C25	Malignant neoplasm of pancreas	1.005	0.003	0.999	1.011
28	161	C32	Malignant neoplasm of larynx	0.986	0.026	0.935	1.038
29	162	C33-C34	Malignant neoplasms of trachea, bronchus and lung	0.981	0.001	0.978	0.984
30	172	C43	Malignant melanoma of skin	0.927	0.023	0.882	0.973
31	174-175	C50	Malignant neoplasm of breast	1.013	0.003	1.007	1.019
32	180	C53	Malignant neoplasm of cervix uteri	0.969	0.018	0.933	1.005
33	179, 182	C54-C55	Malignant neoplasms of corpus uteri and uterus, part unspecified	1.017	0.010	0.997	1.037
34	183	C56	Malignant neoplasm of ovary	0.956	0.025	0.908	1.004
35	185	C61	Malignant neoplasm of prostate	1.032	0.014	1.004	1.060

Group No.	ICD Codes		Causes of Deaths (ICD-10 titles)	ICD-10/ ICD-9 Ratio	SE	95% CI	
	ICD-9	ICD-10				Lower	Higher
36	189.0-189.1	C64-C65	Malignant neoplasms of kidney and renal pelvis	1.001	0.007	0.987	1.014
37	188	C67	Malignant neoplasm of bladder	0.990	0.007	0.976	1.004
38	191-192	C70-C72	Malignant neoplasms of meninges, brain and other parts of central nervous system	1.001	0.005	0.992	1.009
39	200-208	C81-C96	Malignant neoplasms of lymphoid, haematopoietic and related tissue	1.005	0.009	0.986	1.023
40	201	C81	Hodgkin's disease	0.951	0.019	0.914	0.988
41	200, 202	C82-C85	Non-Hodgkin's lymphoma	0.972	0.019	0.934	1.010
42	204-208	C91-C95	Leukaemia	1.009	0.007	0.994	1.023
43	203	C88, C90	Multiple myeloma and immunoproliferative neoplasms	1.057	0.021	1.017	1.097
44	…	C96	Other and unspecified malignant neoplasms of lymphoid, haematopoietic and related tissue	…	…	…	…
45	152, 156, 158-160, 163-171, 173, 181, 183.2-184, 186-187, 189.2-190, 193-199	C17, C23-C24, C26-C31, C37-C41, C44-C49, C51-C52, C57-C60, C62-C63, C66, C68-C69, C73-C80, C97	All other and unspecified malignant neoplasms	1.127	0.010	1.108	1.146
46	210-239	D00-D48	In situ neoplasms, benigh neoplasms and neoplasms of uncertain or unknown behaviour	1.305	0.035	1.236	1.374
47	**280-289**	**D50-D89**	**Chapter III. Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism**	**0.914**	**0.017**	**0.881**	**0.948**
48	280-285	D50-D64	Anaemias	0.968	0.028	0.912	1.023
49	**240-279**	**E00-E90**	**Chapter IV. Endocrine, nutritional and metabolic diseases**	**1.036**	**0.004**	**1.028**	**1.044**
50	250	E10-E14	Diabetes mellitus	1.040	0.005	1.031	1.049
51	260-269	E40-E64	Nutritional deficiencies	1.119	0.067	0.987	1.250
52	260-263	E40-E46	Malnutrition	1.029	0.075	0.883	1.175
53	264-269	E50-E64	Other nutritional deficiencies	F	F	F	F
54	**290-319**	**F00-F99**	**Chapter V. Mental and behavioural disorders**	**0.840**	**0.007**	**0.826**	**0.854**
55	**320-389**	**G00-H95**	**Chapters VI-VIII. Diseases of the nervous system and the sense organs**	**1.326**	**0.019**	**1.288**	**1.363**
56	320, 322	G00, G03	Meningitis	0.955	0.029	0.898	1.013
57	332	G20-G21	Parkinson's disease	1.055	0.009	1.037	1.073
58	331.0	G30	Alzheimer's disease	1.585	0.006	1.574	1.596
59	**390-459**	**I00-I99**	**Chapter IX. Diseases of the circulatory system**	**0.997**	**0.003**	**0.992**	**1.003**
60	390-434, 436-448	I00-I78	Major cardiovascular diseases	1.000	0.003	0.995	1.006
61	390-398, 402, 404, 410-429	I00-I09, I11, I13, I20-I51	Diseases of heart	0.981	0.003	0.975	0.988
62	390-398	I00-I09	Acute rheumatic fever and chronic rheumatic heart diseases	0.822	0.037	0.749	0.894
63	402	I11	Hypertensive heart disease	0.911	0.016	0.879	0.943
64	404	I13	Hypertensive heart and renal disease	1.051	0.065	0.924	1.178
65	410-414	I20-I25	Ischaemic heart diseases	1.032	0.001	1.030	1.033
66	410-414, 429.2 (Alt)	I20-I25	Ischaemic heart diseases	0.999	0.001	0.997	1.000
67	410	I21-I22	Acute myocardial infarction	0.974	0.002	0.971	0.977
68	411	I24	Other acute ischaemic heart diseases	1.568	0.102	1.368	1.769
69	412-414, 429.2	I20, I25	Other forms of chronic ischaemic heart disease	1.012	0.002	1.009	1.016
70	429.2	I25.0	Atherosclerotic cardiovascular disease, so described	0.905	0.010	0.887	0.924
71	412-414	I20, I25.1-I25.9	All other forms of chronic ischaemic heart disease	1.019	0.002	1.015	1.023
72	415-429.1, 429.3-429.9	I26-I51	Other heart diseases	0.927	0.015	0.898	0.956

Group No.	ICD Codes		Causes of Deaths (ICD-10 titles)	ICD-10/ ICD-9 Ratio	SE	95% CI	
	ICD-9	ICD-10				Lower	Higher
73	421	I33	Acute and subacute endocarditis	1.108	0.055	1.001	1.215
74	420, 422-423	I30-I31, I40	Diseases of pericardium and acute myocarditis	1.125	0.068	0.992	1.258
75	428	I50	Heart failure	1.035	0.036	0.965	1.105
76	415-417, 424, 427, 429.0-429.1, 429.3-429.9	I26-I28, I34-I38, I42-I49, I51	All other forms of heart disease	0.856	0.011	0.834	0.878
77	401, 403	I10, I12	Essential (primary) hypertension and hypertensive renal disease	1.172	0.087	1.001	1.343
78	430-438	I60-I69	Cerebrovascular diseases	1.061	0.008	1.045	1.077
79	430-434, 436-438 (Alt)	I60-I69	Cerebrovascular diseases	1.069	0.008	1.053	1.085
80	440	I70	Atherosclerosis	1.027	0.007	1.013	1.040
81	441-448	I71-I78	Other diseases of circulatory system	0.939	0.007	0.925	0.952
82	441	I71	Aortic aneurysm and dissection	1.002	0.004	0.995	1.009
83	442-448	I72-I78	Other diseases of arteries, arterioles and capillaries	0.838	0.017	0.805	0.870
84	451-459	I80-I99	Other disorders of circulatory system	0.751	0.000	…	…
85	**460-519**	**J00-J99**	**Chapter X. Diseases of the respiratory system**	**0.856**	**0.004**	**0.848**	**0.863**
86	480-487	J10-J18	Influenza and pneumonia	0.562	0.029	0.506	0.618
87	487	J10-J11	Influenza	0.961	0.020	0.922	0.999
88	480-486	J12-J18	Pneumonia	0.532	0.031	0.472	0.592
89	466	J20-J22	Other acute lower respiratory infections	1.725	0.176	1.380	2.069
90	466	J20-J21	Acute bronchitis and bronchiolitis	0.658	0.082	0.498	0.818
91	…	J22	Unspecified acute lower respiratory infection	…	…	…	…
92	490-494, 496	J40-J47	Chronic lower respiratory diseases	1.086	0.029	1.030	1.142
93	490-491	J40-J42	Bronchitis, chronic and unspecified	0.557	0.017	0.524	0.591
94	492	J43	Emphysema	0.876	0.018	0.840	0.911
95	493	J45-J46	Asthma	0.780	0.038	0.706	0.854
96	494, 496	J44, J47	Other chronic lower respiratory diseases	1.152	0.035	1.084	1.221
97	500-506	J60-J66, J68	Pneumoconioses and chemical effects	1.182	0.059	1.067	1.297
98	507	J69	Pneumonitis due to solids and liquids	1.312	0.029	1.256	1.368
99	034.0, 460-465, 470-478, 495, 508-519	J00-J06, J30-J39, J67, J70-J98	Other diseases of respiratory system	1.009	0.020	0.970	1.048
100	**520-579**	**K00-K93**	**Chapter XI. Diseases of the digestive system**	**1.019**	**0.004**	**1.011**	**1.028**
101	531-534	K25-K28	Peptic ulcer	0.964	0.009	0.946	0.982
102	540-543	K35-K38	Diseases of appendix	0.795E	0.146E	0.508E	1.081E
103	550-553	K40-K46	Hernia	1.106	0.031	1.045	1.167
104	571	K70, K73-K74	Chronic liver disease and cirrhosis	1.063	0.012	1.040	1.087
105	571.0-571.3	K70	Alcoholic liver disease	1.095	0.016	1.065	1.126
106	571.4-571.9	K73-K74	Other chronic liver disease and cirrhosis	1.032	0.020	0.993	1.071
107	574-575	K80-K82	Cholelithiasis and other disorders of gallbladder	1.001	0.008	0.986	1.017
108	**680-709**	**L00-L99**	**Chapter XII. Diseases of the skin and subcutaneous tissue**	**1.052**	**0.026**	**1.000**	**1.103**
109	**710-739**	**M00-M99**	**Chapter XIII. Diseases of the musculoskeletal system and connective tissue**	**1.355**	**0.017**	**1.323**	**1.388**
110	**580-629**	**N00-N99**	**Chapter XIV. Diseases of the genitourinary system**	**1.011**	**0.007**	**0.997**	**1.025**
111	580-589	N00-N07, N17-N19, N25-N27	Nephritis, nephrotic syndrome and nephrosis	1.049	0.010	1.029	1.068
112	580-581	N00-N01, N04	Acute and rapidly progressive nephritic and nephrotic syndrome	F	F	F	F

Group No.	ICD Codes		Causes of Deaths (ICD-10 titles)	ICD-10/ ICD-9 Ratio	SE	95% CI	
	ICD-9	ICD-10				Lower	Higher
113	582-583, 587	N02-N03, N05-N07, N26	Chronic glomerulonephritis, nephritis and nephropathy not specified as acute or chronic, and renal sclerosis unspecified	0.576	0.059	0.460	0.691
114	584-586	N17-N19	Renal failure	1.066	0.011	1.046	1.087
115	588-589	N25, N27	Other disorders of kidney	F	F	F	F
116	590	N10-N12, N13.6, N15.1	Infections of kidney	0.997	0.023	0.951	1.043
117	600	N40	Hyperplasia of prostate	1.242	0.059	1.127	1.358
118	614-616	N70-N76	Inflammatory diseases of female pelvic organs	F	F	F	F
119	**630-676**	**O00-O99**	**Chapter XV. Pregnancy, childbirth and the puerperium**	**F**	**F**	**F**	**F**
120	630-639	O00-O07	Pregnancy with abortive outcome				
121	640-676	O10-O99	Other complications of pregnancy, childbirth and the puerperium	F	F	F	F
122	**760-771.2, 771.4-779**	**P00-P96**	**Chapter XVI. Certain conditions originating in the perinatal period**	**1.023**	**0.012**	**1.000**	**1.045**
123	**740-759**	**Q00-Q99**	**Chapter XVII. Congenital malformations, deformations and chromosomal abnormalities**	**0.913**	**0.014**	**0.886**	**0.940**
124	**780-799**	**R00-R99**	**Chapter XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**	**1.007**	**0.006**	**0.994**	**1.019**
125	798	R95	Sudden infant death syndrome	1.000	0.000	…	…
126	780-797, 798.1-799	R00-R94, R96-R99	Other symptoms, signs and abnormal clinical and laboratory findings	1.007	0.007	0.994	1.020
127	Residual	Residual	All other diseases	0.968	0.008	0.953	0.984
128	**E800-E999**	**V01-Y98**	**Chapter XX. External causes of morbidity and mortality**	**1.019**	**0.015**	**0.990**	**1.047**
129	E800-E869, E880-E929	V01-X59, Y85-Y86	Accidents (unintentional injuries)	1.033	0.021	0.992	1.073
130	E800-E848, E929.0, E929.1	V01-V99, Y85	Transport accidents	1.002	0.004	0.995	1.009
131	E810-E825	V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1,V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2	Motor vehicle accidents	0.981	0.006	0.971	0.992
132	E800-E807, E826-E829	V01, V05-V06, V09.1, V09.3-V09.9, V10-V11, V15-V18, V19.3, V19.8-V19.9, V80.0-V80.2, V80.6-V80.9, V81.2-V81.9,V82.2-V82.9, V87.9, V88.9, V89.1, V89.3, V89.9	Other land transport accidents	2.316	0.149	2.024	2.609
133	E830-E848, E929.0, E929.1	V90-V99, Y85	Water, air and space, and other and unspecified transport accidents and their sequelae	1.009	0.050	0.911	1.107
134	E850-E869, E880-E928, E929.2-E929.9	W00-X59, Y86	Nontransport accidents	1.052	0.034	0.986	1.119
135	E880-E888	W00-W19	Falls	0.502	0.009	0.485	0.519
136	E922	W32-W34	Accidental discharge of firearms	0.833	0.000		
137	E910	W65-W74	Accidental drowning and submersion	1.041	0.019	1.003	1.078
138	E890-E899	X00-X09	Accidental exposure to smoke, fire and flames	0.994	0.000		
139	E850-E869, E924.1	X40-X49	Accidental poisoning and exposure to noxious substances	0.918	0.028	0.860	0.973
140	E900-E909, E911-E921, E923-E924.0, E924.8-E928, E929.2-E929.9	W20-W31, W35-W64, W75-W99, X10-X39, X50-X59, Y86	Other and unspecified nontransport accidents and their sequelae	2.926	0.175	2.583	3.269
141	E950-E959	X60-X84, Y87.0	Intentional self-harm (suicide)	1.000	0.000	…	…

Group No.	ICD Codes		Causes of Deaths (ICD-10 titles)	ICD-10/ ICD-9 Ratio	SE	95% CI	
	ICD-9	ICD-10				Lower	Higher
142	E955.0-E955.4	X72-X74	Intentional self-harm (suicide) by discharge of firearms	0.971	0.018	0.936	1.006
143	E950-E954, E955.5-E959	X60-X71, X75-X84, Y87.0	Intentional self-harm (suicide) by other and unspecified means and their sequelae	1.012	0.007	0.997	1.026
144	E960-E969	X85-Y09, Y87.1	Assault (homicide)	1.042	0.019	1.004	1.079
145	E965.0-E965.4	X93-X95	Assault (homicide) by discharge of firearms	0.923	0.000	…	…
146	E960-E964, E965.5-E969	X85-X92, X96-Y09, Y87.1	Assault (homicide) by other and unspecified means and their sequelae	1.084	0.026	1.034	1.135
147	E970-E978	Y35, Y89.0	Legal intervention	F	F	F	F
148	E980-E989	Y10-Y34, Y87.2, Y89.9	Events of undetermined intent	0.856	0.031	0.796	0.916
149	E985.0-E985.4	Y22-Y24	Discharge of firearms, undetermined intent	F	F	F	F
150	E980-E984, E985.5-E989	Y10-Y21, Y25-Y34, Y87.2, Y89.9	Other and unspecified events of undetermined intent and their sequelae	0.852	0.032	0.790	0.913
151	E990-E999	Y36, Y89.1	Operations of war and their sequelae	…	…	…	…
152	E870-E879, E930-E949	Y40-Y84, Y88	Complications of medical and surgical care	0.819[E]	0.134[E]	0.556[E]	1.081[E]

… Not applicable

[E] Use with caution

[F] Too unreliable to be published

2. Comparability Ratios for major causes of death, by sex, England and Wales

Reference: National Statistics (2002). Reports: Results of the ICD-10 bridge coding study, England and Wales, 1999. Health Statistics Quarterly; 14: 75-83.

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Females (N=117)			
A00-B99	**001-139**	**Certain infectious and parasitic diseases**	**1.107**	**1.075**	**1.139**
A00-A09	001-009	Intestinal infectious diseases	1.340	1.226	1.464
A15-A19, B90	010-018, 137	All tuberculosis (including sequelae)	1.080	0.994	1.174
A15-A16	010-012	Respiratory tuberculosis	1.021	0.897	1.162
A17-A19	013-018	Non-respiratory tuberculosis	0.909	0.716	1.154
A39	036	Meningococcal infection	0.991	0.952	1.031
A40-A41	038	Septicaemia	1.130	1.085	1.177
B15-B19	070	Viral hepatitis	1.108	0.999	1.228
B20-B24	042-044	Human immunodeficiency virus (HIV) disease	1.038	0.854	1.263
C00-D48	**140-239**	**Neoplasms**	**1.031**	**1.030**	**1.033**
C00-C97	140-208	Malignant neoplasms	1.022	1.020	1.023
C00-C14	140-149	Malignant Neoplasm of lip, oral cavity and pharynx	0.960	0.931	0.989
C15	150	Malignant Neoplasm of oesophagus	1.003	0.997	1.010
C16	151	Malignant Neoplasm of stomach	1.001	0.993	1.010
C17	152	Malignant Neoplasm small intestine	0.917	0.840	1.000
C18	153	Malignant Neoplasm of colon	1.015	1.009	1.021
C19-C21	154	Malignant Neoplasm of rectosigmoid junction, rectum, anus and anal canal	1.017	1.008	1.027
C22	155	Malignant Neoplasm of liver and intrahepatic bile ducts	0.977	0.958	0.996
C23-C24	156	Malignant Neoplasm of gallbladder and biliary tract	0.988	0.958	1.019
C25	157	Malignant Neoplasm of pancreas	0.999	0.994	1.004
C32	161	Malignant Neoplasm of larynx	1.051	0.995	1.110
C33-C34	162	Malignant Neoplasm of trachea, bronchus and lung	0.996	0.993	0.998
C43	172	Malignant melanoma of skin	0.955	0.934	0.977
C44	173	Other Malignant Neoplasm of skin	1.140	1.041	1.248
C45	No equivalent codes	Mesothelioma			
C46	No equivalent codes	Kaposi's sarcoma			
C50	174-175	Malignant Neoplasm of breast	1.027	1.022	1.031
C53	180	Malignant Neoplasm of cervix uteri	0.997	0.982	1.013
C54-C55	179, 182	Malignant Neoplasm of other and unspecified parts of uterus	1.021	1.003	1.039
C56	183	Malignant Neoplasm of ovary	0.992	0.986	0.998
C64	189.0	Malignant Neoplasm of kidney, except renal pelvis	1.015	1.000	1.030
C67	188	Malignant Neoplasm of bladder	1.016	1.002	1.030
C69-C72	190-192	Malignant Neoplasm of eye, brain and other parts of central nervous system	1.003	0.986	1.021
C71	191	Malignant Neoplasm of brain	1.009	0.992	1.027
C81-C96	200-208	Malignant Neoplasm of lymphoid, haematopoietic and related tissue	1.047	1.039	1.056
C81	201	Hodgkin's disease	1.079	1.012	1.151
C82-C85	200, 202	Non-Hodgkin's lymphoma	1.001	0.989	1.013
C90	203	Multiple myeloma and malignant plasma cell neoplasms	1.058	1.039	1.077
C91-C95	204-208	Leukaemia	1.049	1.035	1.064

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Females (N=117)			
C97	No equivalent codes	Malignant Neoplasm of independent (primary) multiple sites			
D00-D48	210-239	In situ,benign neoplasms and neoplasms of uncertain and unknown behaviour	1.582	1.516	1.651
D50-D89	**280-289**	**Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism**	**0.647**	**0.607**	**0.689**
D50-D64	280-285	Anaemias	0.958	0.917	1.000
E00-E90	**240-279**	**Endocrine, nutritional and metabolic diseases**	**1.045**	**1.032**	**1.058**
E10-E14	250	Diabetes mellitus	1.042	1.030	1.054
F00-F99	**290-319**	**Mental and behavioural disorders**	**1.219**	**1.198**	**1.239**
F01-F03	290	Vascular and unspecified dementia	1.526	1.493	1.561
F10-F19	291-292, 303-305	Mental and behavioural disorders due to psychoactive substance use	0.965	0.903	1.031
F10	291, 303, 305.0	Mental and behavioural disorders due to use of alcohol	0.887	0.798	0.986
F11-F16, F18-F19	292, 304, 305.2-305.9	Mental and behavioural disorders due to drug use (excluding alcohol and tobacco)	1.027	0.960	1.100
G00-G99	**320-359**	**Diseases of the nervous system**	**1.497**	**1.472**	**1.522**
G00-G03	320, 322	Meningitis (excluding meningococcal)	1.012	0.938	1.091
G12.2	335.2	Motor neuron disease	1.129	1.097	1.163
G20	332.0	Parkinson's disease	1.489	1.440	1.540
G30	331.0	Alzheimer's disease	1.889	1.828	1.953
G35	340	Multiple sclerosis	1.257	1.205	1.312
H00-H59	**360-379**	**Diseases of the eye and adnexa**	**1.000**	**0.662**	**1.512**
H60-H95	**380-389**	**Diseases of the ear and mastoid process**	**0.714**	**0.447**	**1.141**
I00-I99	**390-459**	**Diseases of the circulatory system**	**1.043**	**1.041**	**1.044**
I05-I09	393-398	Chronic rheumatic heart diseases	0.917	0.889	0.945
I10-I15	401-405	Hypertensive diseases	1.014	1.002	1.025
I20-I25	410-414	Ischaemic heart diseases	1.007	1.006	1.008
I21-I22	410	Acute myocardial infarction	0.926	0.922	0.929
I26-I51	415-429	Other heart diseases	0.997	0.989	1.005
I60-I69	430-438	Cerebrovascular diseases	1.090	1.086	1.094
I60-I62	430-432	Intracranial haemorrhage	1.000	0.993	1.008
I63	433-434	Cerebral infarction	1.405	1.374	1.437
I64	436	Stroke, not specified as haemorrhage or infarction	1.031	1.027	1.036
I70	440	Atherosclerosis	1.147	1.114	1.181
I71	441	Aortic aneurysm and dissection	0.999	0.994	1.003
J00-J99	**460-519**	**Diseases of the respiratory system**	**0.765**	**0.761**	**0.769**
J10-J11	487	Influenza	1.000	0.987	1.013
J12-J18	480-486	Pneumonia	0.644	0.639	0.649
J40-J47	490-494, 496	Chronic lower respiratory diseases	1.034	1.029	1.039
J40-J44	490-492, 496	Bronchitis, emphysema and other chronic obstructive pulmonary disease	1.035	1.030	1.041
J40-J43	490-492	Bronchitis (chronic) and emphysema	0.787	0.759	0.817
J44	496	Other chronic obstructive pulmonary disease	1.065	1.058	1.072
J45-J46	493	Asthma	1.056	1.026	1.087
K00-K93	**520-579**	**Diseases of the digestive system**	**1.013**	**1.008**	**1.019**
K25-K28	531-534	Gastric, duodenal and jejunal ulcer	0.994	0.985	1.003
K25-K27	531-533	Gastric and duodenal ulcer	0.992	0.983	1.001
K40-K46	550-553	Hernia	1.057	1.024	1.092

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Females (N=117)			
K57	562	Diverticular disease of intestine	0.997	0.986	1.009
K70-K76	570-573	Diseases of the liver	1.078	1.061	1.094
K70, K73-K74	571	Chronic liver disease	1.030	1.011	1.049
K70	571.0-571.3	Alcoholic liver disease	1.052	1.032	1.073
L00-L99	**680-709**	**Diseases of the skin and subcutaneous tissue**	**0.994**	**0.963**	**1.026**
M00-M99	**710-739**	**Diseases of the musculoskeletal system and connective tissue**	**1.391**	**1.360**	**1.423**
M05-M08	714	Rheumatoid arthritis and juvenile arthritis	1.574	1.495	1.657
M80-M81	733.0	Osteoporosis	1.357	1.311	1.406
N00-N99	580-629	Diseases of the genitourinary system	1.001	0.992	1.010
N00-N28	580-594	Diseases of kidney and ureter	1.003	0.987	1.019
N00-N15	No equivalent codes	Glomerular and renal tubulo-interstitial diseases			
N17-N19	584-586	Renal failure (without stated cause)	1.079	1.056	1.103
O00-O99	**630-676**	**Pregnancy, childbirth and the puerperium**	**1.097**	**0.988**	**1.218**
P00-P96	**760-779**	**Certain conditions originating in the perinatal period**			
Q00-Q99	**740-759**	**Congenital malformations, deformations and chromosomal abnormalities**			
Q00-Q07	740-742	Congenital malformations of the nervous system			
Q20-Q28	745-747	Congenital malformations of the circulatory system			
R00-R99	**780-799**	**Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**	**1.003**	**1.001**	**1.005**
R54	797	Senility (without mention of dementia)	0.993	0.990	0.996
R95	798.0	Sudden infant death syndrome			
V01-Y89	**E800-E999**	**External causes of morbidity and mortality**	**1.008**	**0.999**	**1.017**
V01-X59	E800-E928, excluding E870-E879	Accidents	1.011	1.000	1.023
V01-V99	E800-E848	Transport accidents	1.007	0.997	1.017
V01-V89	E800-E829	Land transport accidents	1.005	0.995	1.014
W00-W19	E880-E888	Falls (and fractures, cause unspecified in ICD9)	0.456	0.437	0.476
W65-W74	E910	Accidental drowning and submersion	0.977	0.904	1.057
X00-X09	E890-E899	Exposure to smoke, fire and flames	0.971	0.929	1.016
X40-X49	E850-E869	Accidental poisoning by and exposure to noxious substances	1.003	0.966	1.042
X40-X44	E850-E858	Accidental poisoning by drugs and medicaments	1.000	0.964	1.037
X41	No equivalent codes	Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified			
X42	No equivalent codes	Accidental poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified			
X44	No equivalent codes	Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances			
X59	No equivalent codes	Accidental exposure to unspecified factor			
X60-X84	E950-E959	Intentional self-harm	0.999	0.996	1.001
X85-Y09	E960-E969	Assault	0.990	0.972	1.009
Y10-Y34	E980-E989	Injury and poisoning of undetermined intent	1.014	0.999	1.029

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Males (N=116)			
A00-B99	**001-139**	**Certain infectious and parasitic diseases**	**1.056**	**1.028**	**1.084**
A00-A09	001-009	Intestinal infectious diseases	1.217	1.074	1.379
A15-A19, B90	010-018, 137	All tuberculosis (including sequelae)	1.007	0.953	1.064
A15-A16	010-012	Respiratory tuberculosis	1.048	0.983	1.117
A17-A19	013-018	Non-respiratory tuberculosis	0.725	0.544	0.967
A39	036	Meningococcal infection	1.029	0.980	1.080
A40-A41	038	Septicaemia	1.098	1.053	1.146
B15-B19	070	Viral hepatitis	1.072	0.976	1.177
B20-B24	042-044	Human immunodeficiency virus (HIV) disease	1.188	1.091	1.292
C00-D48	**140-239**	**Neoplasms**	**1.035**	**1.033**	**1.036**
C00-C97	140-208	Malignant neoplasms	1.025	1.023	1.026
C00-C14	140-149	Malignant Neoplasm of lip, oral cavity and pharynx	0.986	0.965	1.007
C15	150	Malignant Neoplasm of oesophagus	1.010	1.004	1.016
C16	151	Malignant Neoplasm of stomach	1.019	1.012	1.026
C17	152	Malignant Neoplasm small intestine	0.952	0.877	1.033
C18	153	Malignant Neoplasm of colon	1.017	1.011	1.024
C19-C21	154	Malignant Neoplasm of rectosigmoid junction, rectum, anus and anal canal	1.008	0.999	1.016
C22	155	Malignant Neoplasm of liver and intrahepatic bile ducts	0.983	0.967	1.000
C23-C24	156	Malignant Neoplasm of gallbladder and biliary tract	0.964	0.912	1.020
C25	157	Malignant Neoplasm of pancreas	1.002	0.997	1.008
C32	161	Malignant Neoplasm of larynx	1.062	1.029	1.096
C33-C34	162	Malignant Neoplasm of trachea, bronchus and lung	0.996	0.994	0.998
C43	172	Malignant melanoma of skin	0.966	0.946	0.986
C44	173	Other Malignant Neoplasm of skin	1.066	0.987	1.151
C45	No equivalent codes	Mesothelioma			
C46	No equivalent codes	Kaposi's sarcoma			
C50	174-175	Malignant Neoplasm of breast	1.108	1.027	1.195
C61	185	Malignant Neoplasm of prostate	1.038	1.032	1.044
C62	186	Malignant Neoplasm of testis	0.986	0.907	1.072
C64	189.0	Malignant Neoplasm of kidney, except renal pelvis	1.010	0.999	1.021
C67	188	Malignant Neoplasm of bladder	1.008	0.997	1.020
C69-C72	190-192	Malignant Neoplasm of eye, brain and other parts of central nervous system	1.001	0.987	1.014
C71	191	Malignant Neoplasm of brain	0.999	0.987	1.012
C81-C96	200-208	Malignant Neoplasm of lymphoid, haematopoietic and related tissue	1.053	1.045	1.062
C81	201	Hodgkin's disease	1.043	0.987	1.102
C82-C85	200, 202	Non-Hodgkin's lymphoma	1.002	0.989	1.016
C90	203	Multiple myeloma and malignant plasma cell neoplasms	1.053	1.036	1.071
C91-C95	204-208	Leukaemia	1.061	1.046	1.076
C97	No equivalent codes	Malignant Neoplasm of independent (primary) multiple sites			
D00-D48	210-239	In situ,benign neoplasms and neoplasms of uncertain and unknown behaviour	1.787	1.703	1.876
D50-D89	**280-289**	**Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism**	**0.502**	**0.461**	**0.546**
D50-D64	280-285	Anaemias	1.005	0.938	1.078

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Males (N=116)			
E00-E90	**240-279**	**Endocrine, nutritional and metabolic diseases**	**1.027**	**1.014**	**1.041**
E10-E14	250	Diabetes mellitus	1.044	1.032	1.055
F00-F99	**290-319**	**Mental and behavioural disorders**	**1.188**	**1.159**	**1.217**
F01-F03	290	Vascular and unspecified dementia	1.663	1.597	1.733
F10-F19	291-292, 303-305	Mental and behavioural disorders due to psychoactive substance use	0.977	0.949	1.006
F10	291, 303, 305.0	Mental and behavioural disorders due to use of alcohol	0.932	0.860	1.010
F11-F16, F18-F19	292, 304, 305.2-305.9	Mental and behavioural disorders due to drug use (excluding alcohol and tobacco)	0.994	0.974	1.014
G00-G99	**320-359**	**Diseases of the nervous system**	**1.415**	**1.392**	**1.439**
G00-G03	320, 322	Meningitis (excluding meningococcal)	0.980	0.913	1.051
G12.2	335.2	Motor neuron disease	1.120	1.090	1.150
G20	332.0	Parkinson's disease	1.494	1.449	1.540
G30	331.0	Alzheimer's disease	2.104	1.994	2.221
G35	340	Multiple sclerosis	1.219	1.152	1.289
H00-H59	**360-379**	**Diseases of the eye and adnexa**	**1.667**	**0.606**	**4.586**
H60-H95	**380-389**	**Diseases of the ear and mastoid process**	**0.833**	**0.583**	**1.192**
I00-I99	**390-459**	**Diseases of the circulatory system**	**1.034**	**1.032**	**1.035**
I05-I09	393-398	Chronic rheumatic heart diseases	0.868	0.819	0.920
I10-I15	401-405	Hypertensive diseases	1.010	0.996	1.025
I20-I25	410-414	Ischaemic heart diseases	1.005	1.004	1.005
I21-I22	410	Acute myocardial infarction	0.937	0.934	0.941
I26-I51	415-429	Other heart diseases	0.991	0.982	1.000
I60-I69	430-438	Cerebrovascular diseases	1.131	1.125	1.136
I60-I62	430-432	Intracranial haemorrhage	1.002	0.993	1.012
I63	433-434	Cerebral infarction	1.540	1.495	1.587
I64	436	Stroke, not specified as haemorrhage or infarction	1.057	1.050	1.064
I70	440	Atherosclerosis	1.160	1.108	1.215
I71	441	Aortic aneurysm and dissection	1.003	0.999	1.007
J00-J99	**460-519**	**Diseases of the respiratory system**	**0.789**	**0.785**	**0.793**
J10-J11	487	Influenza	0.960	0.919	1.002
J12-J18	480-486	Pneumonia	0.583	0.577	0.590
J40-J47	490-494, 496	Chronic lower respiratory diseases	1.031	1.027	1.035
J40-J44	490-492, 496	Bronchitis, emphysema and other chronic obstructive pulmonary disease	1.035	1.031	1.040
J40-J43	490-492	Bronchitis (chronic) and emphysema	0.660	0.637	0.683
J44	496	Other chronic obstructive pulmonary disease	1.101	1.094	1.108
J45-J46	493	Asthma	0.964	0.928	1.001
K00-K93	**520-579**	**Diseases of the digestive system**	**1.024**	**1.018**	**1.030**
K25-K28	531-534	Gastric, duodenal and jejunal ulcer	0.999	0.991	1.008
K25-K27	531-533	Gastric and duodenal ulcer	1.000	0.992	1.008
K40-K46	550-553	Hernia	1.037	1.003	1.072
K57	562	Diverticular disease of intestine	1.000	0.974	1.026
K70-K76	570-573	Diseases of the liver	1.063	1.050	1.075
K70, K73-K74	571	Chronic liver disease	1.002	0.988	1.016
K70	571.0-571.3	Alcoholic liver disease	1.052	1.036	1.068
L00-L99	**680-709**	**Diseases of the skin and subcutaneous tissue**	**1.003**	**0.947**	**1.062**

ICD-10 code	ICD-9 code	ICD-10 Name	ICD-10/ ICD-9 Ratio	Lower	Upper
		Males (N=116)			
M00-M99	**710-739**	**Diseases of the musculoskeletal system and connective tissue**	**1.399**	**1.344**	**1.457**
M05-M08	714	Rheumatoid arthritis and juvenile arthritis	1.674	1.497	1.871
M80-M81	733.0	Osteoporosis	1.304	1.222	1.392
N00-N99	**580-629**	**Diseases of the genitourinary system**	**0.991**	**0.979**	**1.002**
N00-N28	580-594	Diseases of kidney and ureter	1.034	1.013	1.054
N00-N15	No equivalent codes	Glomerular and renal tubulo-interstitial diseases			
N17-N19	584-586	Renal failure (without stated cause)	1.081	1.054	1.108
N40	600	Hyperplasia of prostate	0.926	0.876	0.979
P00-P96	**760-779**	**Certain conditions originating in the perinatal period**			
Q00-Q99	**740-759**	**Congenital malformations, deformations and chromosomal abnormalities**			
Q00-Q07	740-742	Congenital malformations of the nervous system			
Q20-Q28	745-747	Congenital malformations of the circulatory system			
R00-R99	**780-799**	**Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**	**1.002**	**0.996**	**1.009**
R54	797	Senility (without mention of dementia)	0.996	0.990	1.002
R95	798.0	Sudden infant death syndrome			
V01-Y89	**E800-E999**	**External causes of morbidity and mortality**	**0.999**	**0.994**	**1.003**
V01-X59	E800-E928, excluding E870-E879	Accidents	0.996	0.989	1.003
V01-V99	E800-E848	Transport accidents	0.998	0.991	1.005
V01-V89	E800-E829	Land transport accidents	1.000	0.994	1.007
W00-W19	E880-E888	Falls (and fractures, cause unspecified in ICD9)	0.718	0.694	0.744
W65-W74	E910	Accidental drowning and submersion	0.994	0.942	1.049
X00-X09	E890-E899	Exposure to smoke, fire and flames	0.968	0.934	1.003
X40-X49	E850-E869	Accidental poisoning by and exposure to noxious substances	1.009	0.987	1.031
X40-X44	E850-E858	Accidental poisoning by drugs and medicaments	1.002	0.983	1.020
X41	No equivalent codes	Accidental poisoning by and exposure to antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs, not elsewhere classified			
X42	No equivalent codes	Accidental poisoning by and exposure to narcotics and psychodysleptics (hallucinogens), not elsewhere classified			
X44	No equivalent codes	Accidental poisoning by and exposure to other and unspecified drugs, medicaments and biological substances			
X59	No equivalent codes	Accidental exposure to unspecified factor			
X60-X84	E950-E959	Intentional self-harm	1.000	0.998	1.001
X85-Y09	E960-E969	Assault	1.011	0.981	1.041
Y10-Y34	E980-E989	Injury and poisoning of undetermined intent	1.010	1.000	1.020

3. Estimated comparability ratio for 113 selected causes of death, the United States

Source: National Vital Statistics Report. Vol. 49, No.2, May 18, 2001		Estimated			
List Number	Cause of death	comparability ratio	Standard error	95% confidence limits Lower	Upper
1	Salmonella infections	0.8108	0.0644	0.6846	0.9370
2	Shigellosis and amebiasis				
3	Certain other intestinal infections				
4	Tuberculosis	0.8547	0.0172	0.8209	0.8885
5	Respiratory tuberculosis	0.9056	0.0201	0.8662	0.9450
6	Other tuberculosis	0.7031	0.0407	0.6233	0.7830
7	Whooping cough				
8	Scarlet fever and erysipelas				
9	Meningococcal infection	0.9955	0.0149	0.9663	1.0247
10	Septicemia	1.1949	0.0042	1.1867	1.2030
11	Syphilis	0.6364	0.1184	0.4043	0.8685
12	Acute poliomyelitis				
13	Arthropod-borne viral encephalitis				
14	Measles				
15	Viral hepatitis	0.8343	0.0120	0.8109	0.8578
16	Human immunodeficiency virus (HIV) disease	1.0637	0.0018	1.0601	1.0673
17	Malaria				
18	Other and unspecified infectious and parasitic diseases and their sequelae	1.0990	0.0154	1.0688	1.1291
19	Malignant neoplasms	1.0068	0.0002	1.0064	1.0072
20	Malignant neoplasms of lip, oral cavity and pharynx	0.9603	0.0040	0.9525	0.9681
21	Malignant neoplasm of esophagus	0.9965	0.0020	0.9926	1.0003
22	Malignant neoplasm of stomach	1.0063	0.0019	1.0025	1.0101
23	Malignant neoplasms of colon, rectum and anus	0.9993	0.0009	0.9975	1.0010
24	Malignant neoplasms of liver and intrahepatic bile ducts	0.9634	0.0023	0.9588	0.9679
25	Malignant neoplasm of pancreas	0.9980	0.0009	0.9963	0.9997
26	Malignant neoplasm of larynx.	1.0047	0.0053	0.9943	1.0150
27	Malignant neoplasms of trachea, bronchus and lung	0.9837	0.0005	0.9827	0.9846
28	Malignant melanoma of skin	0.9677	0.0032	0.9614	0.9741
29	Malignant neoplasm of breast	1.0056	0.0010	1.0036	1.0075
30	Malignant neoplasm of cervix uteri	0.9871	0.0034	0.9805	0.9938
31	Malignant neoplasms of corpus uteri and uterus, part unspecified	1.0260	0.0040	1.0182	1.0339
32	Malignant neoplasm of ovary	0.9954	0.0016	0.9923	0.9985
33	Malignant neoplasm of prostate	1.0134	0.0015	1.0105	1.0162
34	Malignant neoplasms of kidney and renal pelvis	1.0000	0.0022	0.9957	1.0043

List Number	Cause of death	comparability ratio	Standard error	95% confidence limits	
				Lower	Higher
35	Malignant neoplasm of bladder	0.9968	0.0026	0.9916	1.0019
36	Malignant neoplasms of meninges, brain and other parts of central nervous system	0.9691	0.0025	0.9642	0.9740
37	Malignant neoplasms of lymphoid, hematopoietic and related tissue	1.0042	0.0012	1.0019	1.0064
38	Hodgkin's disease	0.9855	0.0089	0.9680	1.0030
39	Non-Hodgkin's lymphoma	0.9781	0.0018	0.9745	0.9817
40	Leukemia	1.0119	0.0019	1.0083	1.0155
41	Multiple myeloma and immunoproliferative neoplasms	1.0383	0.0030	1.0324	1.0443
43	All other and unspecified malignant neoplasms	1.1251	0.0021	1.1210	1.1292
44	In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behavior	1.6744	0.0164	1.6422	1.7067
45	Anemias	0.9559	0.0077	0.9409	0.9710
46	Diabetes mellitus	1.0082	0.0011	1.0060	1.0103
47	Nutritional deficiencies	1.1636	0.0165	1.1312	1.1960
48	Malnutrition	0.9782	0.0151	0.9487	1.0078
49	Other nutritional deficiencies	6.2041	0.5961	5.0358	7.3724
50	Meningitis	1.0137	0.0136	0.9871	1.0403
51	Parkinson's disease	1.0012	0.0028	0.9956	1.0067
52	Alzheimer's disease	1.5536	0.0071	1.5398	1.5675
53	Major cardiovascular diseases	0.9981	0.0002	0.9977	0.9985
54	Diseases of heart	0.9858	0.0002	0.9854	0.9863
55	Acute rheumatic fever and chronic rheumatic heart diseases	0.8208	0.0089	0.8034	0.8382
56	Hypertensive heart disease	0.8028	0.0028	0.7973	0.8083
57	Hypertensive heart and renal disease	1.0705	0.0160	1.0392	1.1019
58	Ischemic heart diseases	0.9990	0.0002	0.9985	0.9994
59	Acute myocardial infarction	0.9887	0.0003	0.9880	0.9893
60	Other acute ischemic heart diseases	1.0110	0.0117	0.9880	1.0340
61	Other forms of chronic ischemic heart disease	1.0054	0.0004	1.0046	1.0062
62	Atherosclerotic cardiovascular disease, so described	1.0488	0.0016	1.0456	1.0519
63	All other forms of chronic ischemic heart disease	0.9935	0.0004	0.9927	0.9942
64	Other heart diseases	0.9716	0.0010	0.9696	0.9736
65	Acute and subacute endocarditis	0.9964	0.0137	0.9695	1.0233
66	Diseases of pericardium and acute myocarditis	1.0295	0.0160	0.9981	1.0608
67	Heart failure	1.0410	0.0013	1.0384	1.0435
68	All other forms of heart disease.	0.9373	0.0014	0.9345	0.9401
69	Essential (primary) hypertension and hypertensive renal disease	1.1192	0.0050	1.1094	1.1291
70	Cerebrovascular diseases	1.0588	0.0008	1.0572	1.0604
71	Atherosclerosis.	0.9637	0.0025	0.9588	0.9686
72	Other diseases of circulatory system	0.9456	0.0021	0.9414	0.9498
73	Aortic aneurysm and dissection.	1.0012	0.001	0.9992	1.0032

List Number	Cause of death	comparability ratio	Standard error	95% confidence limits	
				Lower	Higher
74	Other diseases of arteries, arterioles and capillaries	0.8497	0.0053	0.8394	0.8601
75	Other disorders of circulatory system	1.0293	0.0172	0.9956	1.0631
76	Influenza and pneumonia	0.6982	0.0018	0.6947	0.7016
77	Influenza	1.0088	0.0073	0.9945	1.0231
78	Pneumonia	0.6957	0.0018	0.6922	0.6992
79	Other acute lower respiratory infections	0.9746	0.0392	0.8978	1.0515
80	Acute bronchitis and bronchiolitis	0.7465	0.0264	0.6947	0.7983
81	Unspecified acute lower respiratory infection	*	*	*	*
82	Chronic lower respiratory diseases	1.0478	0.0009	1.0460	1.0496
83	Bronchitis, chronic and unspecified	0.3935	0.0107	0.3726	0.4145
84	Emphysema	0.9726	0.0031	0.9666	0.9786
85	Asthma	0.8938	0.0061	0.8819	0.9057
86	Other chronic lower respiratory diseases	1.0970	0.0014	1.0943	1.0998
87	Pneumoconioses and chemical effects	1.0178	0.0099	0.9983	1.0372
88	Pneumonitis due to solids and liquids	1.1185	0.0048	1.1092	1.1279
89	Other diseases of respiratory system	1.1673	0.0052	1.1572	1.1774
90	Peptic ulcer	0.9696	0.0045	0.9608	0.9784
91	Diseases of appendix	1.0347	0.0242	0.9873	1.0820
92	Hernia	1.0395	0.0154	1.0094	1.0696
93	Chronic liver disease and cirrhosis	1.0367	0.0027	1.0314	1.0420
94	Alcoholic liver disease	1.0183	0.0050	1.0085	1.0281
95	Other chronic liver disease and cirrhosis	1.0535	0.0041	1.0454	1.0615
96	Cholelithiasis and other disorders of gallbladder	0.9567	0.0060	0.9450	0.9685
97	Nephritis, nephrotic syndrome and nephrosis	1.2320	0.0044	1.2234	1.2407
98	Acute and rapidly progressive nephritic and nephrotic syndrome	0.6466	0.0342	0.5796	0.7136
99	Chronic glomerulonephritis, nephritis and nephropathy not specified as acute or chronic,				
	and renal sclerosis unspecified	0.3858	0.0144	0.3575	0.4141
100	Renal failure	1.2949	0.0050	1.2852	1.3047
101	Other disorders of kidney	0.9091	0.0867	0.7392	1.0790
102	Infections of kidney	1.0069	0.0144	0.9786	1.0352
103	Hyperplasia of prostate	0.9969	0.0159	0.9658	1.0280
104	Inflammatory diseases of female pelvic organs	0.9844	0.0410	0.9040	1.0648
105	Pregnancy, childbirth and the puerperium				
106	Pregnancy with abortive outcome				
107	Other complications of pregnancy, childbirth and the puerperium				
108	Certain conditions originating in the perinatal period	1.0658	0.0033	1.0593	1.0724
109	Congenital malformations, deformations and chromosomal abnormalities	0.8470	0.0055	0.8362	0.8577

List Number	Cause of death	Comparability ratio	Standard error	95% confidence limits	
				Lower	Higher
110	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified				
111	All other diseases (Residual)	0.8996	0.0015	0.8968	0.9025
112	Accidents (unintentional injuries)	1.0305	0.0014	1.0278	1.0333
113	Transport accidents	0.9978	0.0006	0.9966	0.9990
114	Motor vehicle accidents	0.8527	0.0027	0.8473	0.8581
115	Other land transport accidents	.	.	*	*
116	Water, air and space, and other and unspecified transport accidents and their sequelae				
117	Non-transport accidents	1.0763	0.0035	1.0696	1.0831
118	Falls	0.8409	0.0049	0.8313	0.8505
119	Accidental discharge of firearms	1.0579	0.0127	1.0331	1.0828
120	Accidental drowning and submersion	0.9965	0.0127	0.9716	1.0213
121	Accidental exposure to smoke, fire and flames	0.9743	0.0089	0.9568	0.9918
122	Accidental poisoning and exposure to noxious substances	*	*	*	*
123	Other and unspecified non-transport accidents and their sequelae	1.4188	0.0123	1.3947	1.4428
124	Intentional self-harm (suicide)	0.9962	0.0005	0.9952	0.9972
125	Intentional self-harm (suicide) by discharge of firearms	0.9982	0.0007	0.9968	0.9996
126	Intentional self-harm (suicide) by other and unspecified means and their sequelae	0.9896	0.0023	0.9850	0.9942
127	Assault (homicide)	0.9983	0.0006	0.9972	0.9994
128	Assault (homicide) by discharge of firearms	0.9969	0.0008	0.9953	0.9985
129	Assault (homicide) by other and unspecified means and their sequelae	1.0017	0.0024	0.9969	1.0064
130	Legal intervention				
131	Events of undetermined intent				
132	Discharge of firearms, undetermined intent				
133	Other and unspecified events of undetermined intent and their sequelae				
134	Operations of war and their sequelae				
135	Complications of medical and surgical care				

Appendix D. ICD-10/ICD-9 Comparable Cause-of-Death Groups between Statistics Canada and Alberta Public Health Surveillance and Environmental Health Grouping (HSG)

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
1	**002**	**Chapter I. Certain infectious and parasitic diseases**	**A00-B99**	**001-139**
2		Salmonella infections	A01-A02	002-003
3		Shigellosis and amebiasis	A03, A06	004, 006
4		Certain other intestinal infections	A04, A07-A09	007-009
5	003	Tuberculosis	A15-A19	010-018
6		Respiratory tuberculosis	A15-A16	010-012
7		Other tuberculosis	A17-A19	013-018
8		Whooping cough	A37	33
10	004	Meningococcal infection	A39	36
11	005	Septicemia	A40-A41	38
12		Syphilis	A50-A53	090-097
13		Acute poliomyelitis	A80	45
15		Measles	B05	55
16	006	Viral hepatitis	B15-B19	70
17	007	Human immunodeficiency virus (HIV) disease	B20-B24	042-044
18		Malaria	B50-B54	84
19		Other and unspecified infectious and parasitic diseases and their sequelae	A00, A05, A20-A36, A42-A44, A48-A49, A54-A79, A81-A82, A85.0-A85.1, A85.8, A86-B04, B06-B09, B25-B49, B55-B99	001, 005, 020-032, 034-0340, 037, 039-041, 046-054, 056-061, 065-066, 071-083, 085-088, 098-134, 136-139, 771.3
20	**009**	**Chapter II. Neoplasms**	**C00-D48**	**140-239**
21	010	Malignant neoplasms	C00-C97	140-208
22		Malignant neoplasms of lip, oral cavity and pharynx	C00-C14	140-149
23	011	Malignant neoplasm of esophagus	C15	150
24	012	Malignant neoplasm of stomach	C16	151
25	013	Malignant neoplasms of colon, rectum and anus	C18-C21	153-154
26	014	Malignant neoplasms of liver and intrahepatic bile ducts	C22	155
27	015	Malignant neoplasm of pancreas	C25	157
28		Malignant neoplasm of larynx	C32	161
29	016	Malignant neoplasms of trachea, bronchus and lung	C33-C34	162
30	017	Malignant melanoma of skin	C43	172
31	018	Malignant neoplasm of breast	C50	174-175
32	019	Malignant neoplasm of cervix uteri	C53	180
33		Malignant neoplasms of corpus uteri and uterus, part unspecified	C54-C55	179, 182

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
34	020	Malignant neoplasm of ovary	C56	183
35	021	Malignant neoplasm of prostate	C61	185
36	022	Malignant neoplasms of kidney and renal pelvis	C64-C65	189.0-189.1
37	023	Malignant neoplasm of bladder	C67	188
38	024	Malignant neoplasms of meninges, brain and other parts of central nervous system	C70-C72	191-192
39	025	Malignant neoplasms of lymphoid, hematopoietic and related tissue"	C81-C96	200-208
40		Hodgkin's disease	C81	201
41	026	Non-Hodgkin's lymphoma	C82-C85	200, 202
42	028	Leukemia	C91-C95	204-208
43	027	Multiple myeloma and immunoproliferative neoplasms	C88, C90	203
44		Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue	C96	---
45		All other and unspecified malignant neoplasms	C17, C23-C24, C26-C31, C37-C41, C44-C49, C51-C52, C57-C60, C62-C63, C66, C68-C69, C73-C80, C97	152, 156, 158-160, 163-171, 173, 176, 181, 183.2-184, 186-187, 189.2-190, 193-199
46	030	In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behaviour	D00-D48	210-239
47	**031**	**Chapter III. Diseases of the blood and blood forming organs and certain disorders involving the immune mechanism**	**D50-D89**	**280-289**
48	032	Anemias	D50-D64	280-285
49	**034**	**Chapter IV. Endocrine, nutritional and metabolic diseases**	**E00-E90**	**240-279**
50	035	Diabetes mellitus	E10-E14	250
51	036	Nutritional deficiencies	E40-E64	260-269
52	037	Malnutrition	E40-E46	260-263
53		Other nutritional deficiencies	E50-E64	264-269
54	**039**	**Chapter V. Mental and behavioural disorders**	**F00-F99**	**290-319**
55	**044**	**Chapters VI-VIII. Diseases of the nervous system and the sense organs**	**G00-H95**	**320-389**
56		Meningitis	G00, G03	320, 322
57	047	Parkinson's disease	G20-G21	332
58	048	Alzheimer's disease	G30	331
59	**052**	**Chapter IX. Diseases of the circulatory system**	**I00-I99**	**390-459**
60	053	Major cardiovascular diseases	I00-I78	390-434, 436-448
61	061	Diseases of heart	I00-I09, I11, I13, I20-I51	390-398, 402, 404, 410-429
62		Acute rheumatic fever and chronic rheumatic heart diseases	I00-I09	390-398

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
63	055	Hypertensive heart disease	I11	402
64		Hypertensive heart and renal disease	I13	404
65		Ischemic heart diseases	I20-I25	410-414
66	056	Ischemic heart diseases	I20-I25	410-414, 429.2 (Alt)
67	057	Acute myocardial infarction	I21-I22	410
68		Other acute ischemic heart diseases	I24	411
69	058	Other forms of chronic ischemic heart disease	I20, I25	412-414, 429.2
70	059	Atherosclerotic cardiovascular disease, so described	I25.0	429.2
71		All other forms of chronic ischemic heart disease	I20, I25.1-I25.9	412-414
72		Other heart diseases	I26-I51	415-429.1, 429.3-429.9
73		Acute and subacute endocarditis	I33	421
74		Diseases of pericardium and acute myocarditis	I30-I31, I40	420, 422-423
75	060	Heart failure	I50	428
76		All other forms of heart disease	I26-I28, I34-I38, I42-I49, I51	415-417, 424-427, 429.0-429.1, 429.3-429.9
77		Essential (primary) hypertension and hypertensive renal disease	I10, I12	401, 403
78		Cerebrovascular diseases	I60-I69	430-438
79	062	Cerebrovascular diseases	I60-I69	430-434, 436-438 (Alt)
80	067	Atherosclerosis	I70	440
81		Other diseases of circulatory system	I71-I78	441-448
82	068	Aortic aneurysm and dissection	I71	441
83		Other diseases of arteries, arterioles and capillaries	I72-I78	442-448
84	069	Other disorders of circulatory system	I80-I99	451-459
85	**070**	**Chapter X. Diseases of the respiratory system**	**J00-J99**	**460-519**
86	071	Influenza and pneumonia	J10-J18	480-487
87	072	Influenza	J10-J11	487
88	073	Pneumonia	J12-J18	480-486
89		Other acute lower respiratory infections	J20-J22	466
90		Acute bronchitis and bronchiolitis	J20-J21	466
91		Unspecified acute lower respiratory infection	J22	---
92	074	Chronic lower respiratory diseases	J40-J47	490-494, 496
93		Bronchitis, chronic and unspecified	J40-J42	490-491
94	075	Emphysema	J43	492
95	076	Asthma	J45-J46	493
96		Other chronic lower respiratory diseases	J44, J47	494, 496
97		Pneumoconioses and chemical effects	J60-J66, J68	500-506
98	077	Pneumonitis due to solids and liquids	J69	507
99		Other diseases of respiratory system	J00-J06, J30-J39, J67, J70-J98	034.0, 460-465, 470-478, 495, 508-519

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
100	**079**	**Chapter XI. Diseases of the digestive system**	**K00-K93**	**520-579**
101		Peptic ulcer	K25-K28	531-534
102		Diseases of appendix	K35-K38	540-543
103		Hernia	K40-K46	550-553
104	083	Chronic liver disease and cirrhosis	K70, K73-K74	571
105	084	Alcoholic liver disease	K70	571.0-571.3
106		Other chronic liver disease and cirrhosis	K73-K74	571.4-571.9
107		Cholelithiasis and other disorders of gallbladder	K80-K82	574-575
108	**086**	**Chapter XII. Diseases of the skin and subcutaneous tissue**	**L00-L99**	**680-709**
109	**087**	**Chapter XIII. Diseases of the musculoskeletal system and connective system**	**M00-M99**	**710-739**
110	**088**	**Chapter XIV. Diseases of the genitourinary system**	**N00-N99**	**580-629**
111	089	Nephritis, nephrotic syndrome and nephrosis	N00-N07, N17-N19, N25-N27	580-589
112		Acute and rapidly progressive nephritic and nephrotic syndrome	N00-N01, N04	580-581
113		Chronic glomerulonephritis, nephritis and nephropathy not specified as acute or chronic, and renal sclerosis unspecified	N02-N03, N05-N07, N26	582-583, 587
114	090	Renal failure	N17-N19	584-586
115		Other disorders of kidney	N25, N27	588-589
116		Infections of kidney	N10-N12, N13.6, N15.1	590
117		Hyperplasia of prostate	N40	600
118		Inflammatory diseases of female pelvic organs	N70-N76	614-616
119	**092**	**Chapter XV. Pregnancy, childbirth and the puerperium**	**O00-O99**	**630-676**
120		Pregnancy with abortive outcome	O00-O07	630-639
121		Other complications of pregnancy, childbirth and the puerperium	O10-O99	640-676
122	**093**	**Chapter XVI. Certain conditions originating in the perinatal period**	**P00-P96**	**760-771.2, 771.4-779**
123	**094**	**Chapter XVII. Congenital malformations, deformations and chromosomal abnormalities**	**Q00-Q99**	**740-759**
124	**097**	**Chapter XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified**	**R00-R99**	**780-799**
125	099	Sudden infant death syndrome	R95	798

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
126		Other symptoms, signs and abnormal clinical and laboratory findings	R00-R94, R96-R99	780-797, 798.1-799
127		All other diseases	Residual	Residual
128	**101**	**Chapter XX. External causes of morbidity and mortality**	**V01-Y98**	**E800-E999**
129	102	Accidents (unintentional injuries)	V01-X59, Y85-Y86	E800-E869, E880-E929
130	103	Transport accidents	V01-V99, Y85	E800-E848, E929.0, E929.1
131	105	Motor vehicle accidents	V02-V04, V09.0, V09.2, V12-V14, V19.0-V19.2, V19.4-V19.6, V20-V79, V80.3-V80.5, V81.0-V81.1, V82.0-V82.1, V83-V86, V87.0-V87.8, V88.0-V88.8, V89.0, V89.2	E810-E825
132		Other land transport accidents	V01, V05-V06, V09.1, V09.3-V09.9, V10-V11, V15-V18, V19.3, V19.8-V19.9, V80.0-V80.2, V80.6-V80.9, V81.2-V81.9, V82.2-V82.9, V87.9, V88.9, V89.1, V89.3, V89.9	E800-E807, E826-E829
133		Water, air and space, and other and unspecified transport accidents and their sequelae	V90-V99, Y85	E830-E848, E929.0, E929.1
134		Nontransport accidents	W00-X59, Y86	E850-E869, E880-E928, E929.2-E929.9
135	106	Falls	W00-W19	E880-E888
136		Accidental discharge of firearms	W32-W34	E922
137	108	Accidental drowning and submersion	W65-W74	E910
138	109	Accidental exposure to smoke, fire and flames	X00-X09	E890-E899
139	110	Accidental poisoning and exposure to noxious substances	X40-X49	E850-E869, E924.1
140		Other and unspecified nontransport accidents and their sequelae	W20-W31, W35-W64, W75-W99, X10-X39, X50-X59, Y86	E900-E909, E911-E921, E923-E924.0, E924.8-E928, E929.2-E929.9
141	114	Intentional self-harm (suicide)	X60-X84, Y87.0	E950-E959
142	117	Intentional self-harm (suicide) by discharge of firearms	X72-X74	E955.0-E955.4
143		Intentional self-harm (suicide) by other and unspecified means and their sequelae	X60-X71, X75-X84, Y87.0	E950-E954, E955.5-E959
144	118	Assault (homicide)	X85-Y09, Y87.1	E960-E969
145		Assault (homicide) by discharge of firearms	X93-X95	E965.0-E965.4
146		Assault (homicide) by other and unspecified means and their sequelae	X85-X92, X96-Y09, Y87.1	E960-E964, E965.5-E969
147		Legal intervention	Y35, Y89.0	E970-E978

Stats Can Group No.	Alberta HSG No.	Description	ICD-10 Code	ICD-9 Code
148		Events of undetermined intent	Y10-Y34, Y87.2, Y89.9	E980-E989
149		Discharge of firearms, undetermined intent	Y22-Y24	E985.0-E985.4
150		Other and unspecified events of undetermined intent and their sequelae	Y10-Y21, Y25-Y34, Y87.2, Y89.9	E980-E984, E985.5-E989
151		Operations of war and their sequelae	Y36, Y89.1	E990-E999
152	119	Complications of medical and surgical care	Y40-Y84, Y88	E870-E879, E930-E949

Appendix E. SAS Codes for Grouping and Counting the Number of Death, HSG, Alberta

```
/*************************************************************************/
/* SAS Program for Grouping and Counting Number of Death of 120 Causes  */
/*************************************************************************/
/* Developed on July 2005 and Modified on Nov 30, 2005                   */
/*************************************************************************/
```

Grouping Causes of Death: HSG 120 Tabulation List for Mortality

```
/*************************************************************************/
/*    SAS codes: HSG_MulGroup.sas                                        */
/*************************************************************************/
/*     1.1 Load Macro to Code HSG 120 Groups by ICD-10 and ICD-9         */
/*************************************************************************/

%MACRO GROUP1(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'A00' <=substr(&V1,1,3)<= 'B99' THEN '002'
    WHEN year>=2000 AND 'C00' <=substr(&V1,1,3)<= 'D48' THEN '009'
    WHEN year>=2000 AND 'D50' <=substr(&V1,1,3)<= 'D89' THEN '031'
    WHEN year>=2000 AND 'E00' <=substr(&V1,1,3)<= 'E90' THEN '034'
    WHEN year>=2000 AND 'F00' <=substr(&V1,1,3)<= 'F99' THEN '039'
    WHEN year>=2000 AND 'G00' <=substr(&V1,1,3)<= 'G99' THEN '045'
    WHEN year>=2000 AND 'H00' <=substr(&V1,1,3)<= 'H59' THEN '050'
    WHEN year>=2000 AND 'H60' <=substr(&V1,1,3)<= 'H95' THEN '051'
    WHEN year>=2000 AND 'I00' <=substr(&V1,1,3)<= 'I99' THEN '052'
    WHEN year>=2000 AND 'J00' <=substr(&V1,1,3)<= 'J99' THEN '070'
    WHEN year>=2000 AND 'K00' <=substr(&V1,1,3)<= 'K93' THEN '079'
    WHEN year>=2000 AND 'L00' <=substr(&V1,1,3)<= 'L99' THEN '086'
    WHEN year>=2000 AND 'M00' <=substr(&V1,1,3)<= 'M99' THEN '087'
    WHEN year>=2000 AND 'N00' <=substr(&V1,1,3)<= 'N99' THEN '088'
    WHEN year>=2000 AND 'O00' <=substr(&V1,1,3)<= 'O99' THEN '092'
    WHEN year>=2000 AND 'P00' <=substr(&V1,1,3)<= 'P96' THEN '093'
    WHEN year>=2000 AND 'Q00' <=substr(&V1,1,3)<= 'Q99' THEN '094'
    WHEN year>=2000 AND 'R00' <=substr(&V1,1,3)<= 'R99' THEN '097'
    WHEN year>=2000 AND 'V01' <=substr(&V1,1,3)<= 'Y98' THEN '101'

    WHEN year<=1999 AND '001' <=substr(&V1,1,3)<= '139' THEN '002'
    WHEN year<=1999 AND '140' <=substr(&V1,1,3)<= '239' THEN '009'
    WHEN year<=1999 AND '280' <=substr(&V1,1,3)<= '289' THEN '031'
    WHEN year<=1999 AND '240' <=substr(&V1,1,3)<= '279' THEN '034'
    WHEN year<=1999 AND '290' <=substr(&V1,1,3)<= '319' THEN '039'
    WHEN year<=1999 AND '320' <=substr(&V1,1,3)<= '359' THEN '045'
    WHEN year<=1999 AND '360' <=substr(&V1,1,3)<= '379' THEN '050'
    WHEN year<=1999 AND '380' <=substr(&V1,1,3)<= '389' THEN '051'
    WHEN year<=1999 AND '390' <=substr(&V1,1,3)<= '459' THEN '052'
    WHEN year<=1999 AND '460' <=substr(&V1,1,3)<= '519' THEN '070'
    WHEN year<=1999 AND '520' <=substr(&V1,1,3)<= '579' THEN '079'
    WHEN year<=1999 AND '680' <=substr(&V1,1,3)<= '709' THEN '086'
    WHEN year<=1999 AND '710' <=substr(&V1,1,3)<= '739' THEN '087'
```

```
    WHEN year<=1999 AND '580' <=substr(&V1,1,3)<= '629' THEN '088'
    WHEN year<=1999 AND '630' <=substr(&V1,1,3)<= '676' THEN '092'
    WHEN year<=1999 AND '760 '<=substr(&V1,1,3)<= '779' THEN '093'
    WHEN year<=1999 AND '740' <=substr(&V1,1,3)<= '759' THEN '094'
    WHEN year<=1999 AND '780' <=substr(&V1,1,3)<= '799' THEN '097'
    WHEN year<=1999 AND '800' <=substr(&V1,1,3)<= '999' THEN '101'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;
%MEND;


%MACRO GROUP2(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'A15' <=substr(&V1,1,3)<= 'A19' THEN '003'
    WHEN year>=2000 AND 'A39' <=substr(&V1,1,3)<= 'A39' THEN '004'
    WHEN year>=2000 AND 'A40' <=substr(&V1,1,3)<= 'A41' THEN '005'
    WHEN year>=2000 AND 'B15' <=substr(&V1,1,3)<= 'B19' THEN '006'
    WHEN year>=2000 AND 'B20' <=substr(&V1,1,3)<= 'B24' THEN '007'
    WHEN year>=2000 AND 'A00' <=substr(&V1,1,3)<= 'A14' THEN '008'
    WHEN year>=2000 AND 'A20' <=substr(&V1,1,3)<= 'A38' THEN '008'
    WHEN year>=2000 AND 'A42' <=substr(&V1,1,3)<= 'B09' THEN '008'
    WHEN year>=2000 AND 'B25' <=substr(&V1,1,3)<= 'B99' THEN '008'
    WHEN year>=2000 AND 'C00' <=substr(&V1,1,3)<= 'C97' THEN '010'
    WHEN year>=2000 AND 'D00' <=substr(&V1,1,3)<= 'D48' THEN '030'
    WHEN year>=2000 AND 'D50' <=substr(&V1,1,3)<= 'D64' THEN '032'
    WHEN year>=2000 AND 'D65' <=substr(&V1,1,3)<= 'D89' THEN '033'
    WHEN year>=2000 AND 'E10' <=substr(&V1,1,3)<= 'E14' THEN '035'
    WHEN year>=2000 AND 'E40' <=substr(&V1,1,3)<= 'E64' THEN '036'
    WHEN year>=2000 AND 'E00' <=substr(&V1,1,3)<= 'E07' THEN '038'
    WHEN year>=2000 AND 'E15' <=substr(&V1,1,3)<= 'E35' THEN '038'
    WHEN year>=2000 AND 'E65' <=substr(&V1,1,3)<= 'E90' THEN '038'
    WHEN year>=2000 AND 'F01' <=substr(&V1,1,3)<= 'F03' THEN '040'
    WHEN year>=2000 AND 'F10' <=substr(&V1,1,3)<= 'F19' THEN '041'
    WHEN year>=2000 AND 'F04' <=substr(&V1,1,3)<= 'F09' THEN '043'
    WHEN year>=2000 AND 'F20' <=substr(&V1,1,3)<= 'F99' THEN '043'
    WHEN year>=2000 AND 'G122'<=substr(&V1,1,4)<= 'G122' THEN '046'
    WHEN year>=2000 AND 'G20' <=substr(&V1,1,3)<= 'G21' THEN '047'
    WHEN year>=2000 AND 'G30' <=substr(&V1,1,3)<= 'G30' THEN '048'
    WHEN year>=2000 AND 'G00 '<=substr(&V1,1,4)<= 'G121' THEN '049'
    WHEN year>=2000 AND 'G000'<=substr(&V1,1,4)<= 'G121' THEN '049'
    WHEN year>=2000 AND 'G128'<=substr(&V1,1,4)<= 'G129' THEN '049'
    WHEN year>=2000 AND 'G13' <=substr(&V1,1,3)<= 'G13' THEN '049'
    WHEN year>=2000 AND 'G22' <=substr(&V1,1,3)<= 'G26' THEN '049'
    WHEN year>=2000 AND 'G31' <=substr(&V1,1,3)<= 'G99' THEN '049'
    WHEN year>=2000 AND 'I00' <=substr(&V1,1,3)<= 'I78' THEN '053'
    WHEN year>=2000 AND 'I80' <=substr(&V1,1,3)<= 'I99' THEN '069'
    WHEN year>=2000 AND 'J10' <=substr(&V1,1,3)<= 'J18' THEN '071'
    WHEN year>=2000 AND 'J40' <=substr(&V1,1,3)<= 'J47' THEN '074'
    WHEN year>=2000 AND 'J69' <=substr(&V1,1,3)<= 'J69' THEN '077'
    WHEN year>=2000 AND 'J00' <=substr(&V1,1,3)<= 'J06' THEN '078'
    WHEN year>=2000 AND 'J20' <=substr(&V1,1,3)<= 'J39' THEN '078'
```

```
WHEN year>=2000 AND 'J60' <=substr(&V1,1,3)<= 'J68' THEN '078'
WHEN year>=2000 AND 'J70' <=substr(&V1,1,3)<= 'J99' THEN '078'
WHEN year>=2000 AND 'K55' <=substr(&V1,1,3)<= 'K67' THEN '080'
WHEN year>=2000 AND 'K70' <=substr(&V1,1,3)<= 'K76' THEN '082'
WHEN year>=2000 AND 'K00' <=substr(&V1,1,3)<= 'K52' THEN '085'
WHEN year>=2000 AND 'K77' <=substr(&V1,1,3)<= 'K77' THEN '085'
WHEN year>=2000 AND 'K80' <=substr(&V1,1,3)<= 'K93' THEN '085'
WHEN year>=2000 AND 'N00' <=substr(&V1,1,3)<= 'N07' THEN '089'
WHEN year>=2000 AND 'N17' <=substr(&V1,1,3)<= 'N19' THEN '089'
WHEN year>=2000 AND 'N25' <=substr(&V1,1,3)<= 'N27' THEN '089'
WHEN year>=2000 AND 'N08' <=substr(&V1,1,3)<= 'N16' THEN '091'
WHEN year>=2000 AND 'N20' <=substr(&V1,1,3)<= 'N23' THEN '091'
WHEN year>=2000 AND 'N28' <=substr(&V1,1,3)<= 'N99' THEN '091'
WHEN year>=2000 AND 'Q20' <=substr(&V1,1,3)<= 'Q28' THEN '095'
WHEN year>=2000 AND 'Q00' <=substr(&V1,1,3)<= 'Q18' THEN '096'
WHEN year>=2000 AND 'Q30' <=substr(&V1,1,3)<= 'Q99' THEN '096'
WHEN year>=2000 AND 'R54' <=substr(&V1,1,3)<= 'R54' THEN '098'
WHEN year>=2000 AND 'R95' <=substr(&V1,1,3)<= 'R95' THEN '099'
WHEN year>=2000 AND 'R00' <=substr(&V1,1,3)<= 'R53' THEN '100'
WHEN year>=2000 AND 'R55' <=substr(&V1,1,3)<= 'R94' THEN '100'
WHEN year>=2000 AND 'R96' <=substr(&V1,1,3)<= 'R99' THEN '100'
WHEN year>=2000 AND 'V01' <=substr(&V1,1,3)<= 'X59' THEN '102'
WHEN year>=2000 AND 'Y85' <=substr(&V1,1,3)<= 'Y86' THEN '102'
WHEN year>=2000 AND 'X60' <=substr(&V1,1,3)<= 'X84' THEN '114'
WHEN year>=2000 AND 'Y870'<=substr(&V1,1,4)<= 'Y870' THEN '114'
WHEN year>=2000 AND 'X85' <=substr(&V1,1,3)<= 'Y09' THEN '118'
WHEN year>=2000 AND 'Y871'<=substr(&V1,1,4)<= 'Y871' THEN '118'
WHEN year>=2000 AND 'Y40' <=substr(&V1,1,3)<= 'Y84' THEN '119'
WHEN year>=2000 AND 'Y88' <=substr(&V1,1,3)<= 'Y88' THEN '119'
WHEN year>=2000 AND 'Y30' <=substr(&V1,1,3)<= 'Y36' THEN '120'
WHEN year>=2000 AND 'Y872'<=substr(&V1,1,4)<= 'Y872' THEN '120'
WHEN year>=2000 AND 'Y89' <=substr(&V1,1,3)<= 'Y98' THEN '120'

WHEN year<=1999 AND '010' <=substr(&V1,1,3)<= '018' THEN '003'
WHEN year<=1999 AND '036' <=substr(&V1,1,3)<= '036' THEN '004'
WHEN year<=1999 AND '038' <=substr(&V1,1,3)<= '038' THEN '005'
WHEN year<=1999 AND '070' <=substr(&V1,1,3)<= '070' THEN '006'
WHEN year<=1999 AND '042' <=substr(&V1,1,3)<= '044' THEN '007'
WHEN year<=1999 AND '001' <=substr(&V1,1,3)<= '009' THEN '008'
WHEN year<=1999 AND '020' <=substr(&V1,1,3)<= '035' THEN '008'
WHEN year<=1999 AND '037' <=substr(&V1,1,3)<= '037' THEN '008'
WHEN year<=1999 AND '039' <=substr(&V1,1,3)<= '041' THEN '008'
WHEN year<=1999 AND '045' <=substr(&V1,1,3)<= '066' THEN '008'
WHEN year<=1999 AND '071' <=substr(&V1,1,3)<= '139' THEN '008'
WHEN year<=1999 AND '140' <=substr(&V1,1,3)<= '208' THEN '010'
WHEN year<=1999 AND '210' <=substr(&V1,1,3)<= '239' THEN '030'
WHEN year<=1999 AND '280' <=substr(&V1,1,3)<= '285' THEN '032'
WHEN year<=1999 AND '286' <=substr(&V1,1,3)<= '289' THEN '033'
WHEN year<=1999 AND '250' <=substr(&V1,1,3)<= '250' THEN '035'
WHEN year<=1999 AND '260' <=substr(&V1,1,3)<= '269' THEN '036'
WHEN year<=1999 AND '240' <=substr(&V1,1,3)<= '246' THEN '038'
WHEN year<=1999 AND '251' <=substr(&V1,1,3)<= '259' THEN '038'
WHEN year<=1999 AND '270' <=substr(&V1,1,3)<= '279' THEN '038'
WHEN year<=1999 AND '290' <=substr(&V1,1,3)<= '290' THEN '040'
WHEN year<=1999 AND '291' <=substr(&V1,1,3)<= '292' THEN '041'
WHEN year<=1999 AND '303' <=substr(&V1,1,3)<= '305' THEN '041'
WHEN year<=1999 AND '293' <=substr(&V1,1,3)<= '302' THEN '043'
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    WHEN year<=1999 AND '306' <=substr(&V1,1,3)<= '319' THEN '043'
    WHEN year<=1999 AND '3352'<=substr(&V1,1,4)<= '3352' THEN '046'
    WHEN year<=1999 AND '332' <=substr(&V1,1,3)<= '332' THEN '047'
    WHEN year<=1999 AND '3310'<=substr(&V1,1,4)<= '3310' THEN '048'
    WHEN year<=1999 AND '320' <=substr(&V1,1,3)<= '330' THEN '049'
    WHEN year<=1999 AND '3311'<=substr(&V1,1,4)<= '3319' THEN '049'
    WHEN year<=1999 AND '333' <=substr(&V1,1,3)<= '359' THEN '049'
    WHEN year<=1999 AND '390' <=substr(&V1,1,3)<= '434' THEN '053'
    WHEN year<=1999 AND '436' <=substr(&V1,1,3)<= '448' THEN '053'
    WHEN year<=1999 AND '435' <=substr(&V1,1,3)<= '435' THEN '069'
    WHEN year<=1999 AND '451' <=substr(&V1,1,3)<= '459' THEN '069'
    WHEN year<=1999 AND '480' <=substr(&V1,1,3)<= '487' THEN '071'
    WHEN year<=1999 AND '490' <=substr(&V1,1,3)<= '494' THEN '074'
    WHEN year<=1999 AND '496' <=substr(&V1,1,3)<= '496' THEN '074'
    WHEN year<=1999 AND '507' <=substr(&V1,1,3)<= '507' THEN '077'
    WHEN year<=1999 AND '460' <=substr(&V1,1,3)<= '478' THEN '078'
    WHEN year<=1999 AND '495' <=substr(&V1,1,3)<= '495' THEN '078'
    WHEN year<=1999 AND '500' <=substr(&V1,1,3)<= '506' THEN '078'
    WHEN year<=1999 AND '508' <=substr(&V1,1,3)<= '519' THEN '078'
    WHEN year<=1999 AND '560' <=substr(&V1,1,3)<= '569' THEN '080'
    WHEN year<=1999 AND '570' <=substr(&V1,1,3)<= '573' THEN '082'
    WHEN year<=1999 AND '520' <=substr(&V1,1,3)<= '558' THEN '085'
    WHEN year<=1999 AND '574' <=substr(&V1,1,3)<= '579' THEN '085'
    WHEN year<=1999 AND '580' <=substr(&V1,1,3)<= '589' THEN '089'
    WHEN year<=1999 AND '590' <=substr(&V1,1,3)<= '629' THEN '091'
    WHEN year<=1999 AND '745' <=substr(&V1,1,3)<= '747' THEN '095'
    WHEN year<=1999 AND '740' <=substr(&V1,1,3)<= '744' THEN '096'
    WHEN year<=1999 AND '748' <=substr(&V1,1,3)<= '759' THEN '096'
    WHEN year<=1999 AND '797' <=substr(&V1,1,3)<= '797' THEN '098'
    WHEN year<=1999 AND '7980'<=substr(&V1,1,4)<= '7980' THEN '099'
    WHEN year<=1999 AND '780' <=substr(&V1,1,3)<= '796' THEN '100'
    WHEN year<=1999 AND '798 '<=substr(&V1,1,4)<= '798 ' THEN '100'
    WHEN year<=1999 AND '7981'<=substr(&V1,1,4)<= '7989' THEN '100'
    WHEN year<=1999 AND '799 '<=substr(&V1,1,3)<= '799 ' THEN '100'
    WHEN year<=1999 AND '800' <=substr(&V1,1,3)<= '869' THEN '102'
    WHEN year<=1999 AND '880' <=substr(&V1,1,3)<= '929' THEN '102'
    WHEN year<=1999 AND '950' <=substr(&V1,1,3)<= '959' THEN '114'
    WHEN year<=1999 AND '960' <=substr(&V1,1,3)<= '969' THEN '118'
    WHEN year<=1999 AND '870' <=substr(&V1,1,3)<= '879' THEN '119'
    WHEN year<=1999 AND '930' <=substr(&V1,1,3)<= '949' THEN '119'
    WHEN year<=1999 AND '970' <=substr(&V1,1,3)<= '999' THEN '120'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;

%MEND;


%MACRO GROUP3(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'C15' <=substr(&V1,1,3)<= 'C15' THEN '011'
    WHEN year>=2000 AND 'C16' <=substr(&V1,1,3)<= 'C16' THEN '012'
```

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WHEN year>=2000 AND 'C18' <=substr(&V1,1,3)<= 'C21' THEN '013'
WHEN year>=2000 AND 'C22' <=substr(&V1,1,3)<= 'C22' THEN '014'
WHEN year>=2000 AND 'C25' <=substr(&V1,1,3)<= 'C25' THEN '015'
WHEN year>=2000 AND 'C33' <=substr(&V1,1,3)<= 'C34' THEN '016'
WHEN year>=2000 AND 'C43' <=substr(&V1,1,3)<= 'C43' THEN '017'
WHEN year>=2000 AND 'C50' <=substr(&V1,1,3)<= 'C50' THEN '018'
WHEN year>=2000 AND 'C53' <=substr(&V1,1,3)<= 'C53' THEN '019'
WHEN year>=2000 AND 'C56' <=substr(&V1,1,3)<= 'C56' THEN '020'
WHEN year>=2000 AND 'C61' <=substr(&V1,1,3)<= 'C61' THEN '021'
WHEN year>=2000 AND 'C64' <=substr(&V1,1,3)<= 'C65' THEN '022'
WHEN year>=2000 AND 'C67' <=substr(&V1,1,3)<= 'C67' THEN '023'
WHEN year>=2000 AND 'C70' <=substr(&V1,1,3)<= 'C72' THEN '024'
WHEN year>=2000 AND 'C81' <=substr(&V1,1,3)<= 'C96' THEN '025'
WHEN year>=2000 AND 'C00' <=substr(&V1,1,3)<= 'C14' THEN '029'
WHEN year>=2000 AND 'C17' <=substr(&V1,1,3)<= 'C17' THEN '029'
WHEN year>=2000 AND 'C17' <=substr(&V1,1,3)<= 'C17' THEN '029'
WHEN year>=2000 AND 'C23' <=substr(&V1,1,3)<= 'C24' THEN '029'
WHEN year>=2000 AND 'C26' <=substr(&V1,1,3)<= 'C32' THEN '029'
WHEN year>=2000 AND 'C37' <=substr(&V1,1,3)<= 'C41' THEN '029'
WHEN year>=2000 AND 'C44' <=substr(&V1,1,3)<= 'C49' THEN '029'
WHEN year>=2000 AND 'C51' <=substr(&V1,1,3)<= 'C52' THEN '029'
WHEN year>=2000 AND 'C54' <=substr(&V1,1,3)<= 'C55' THEN '029'
WHEN year>=2000 AND 'C57' <=substr(&V1,1,3)<= 'C60' THEN '029'
WHEN year>=2000 AND 'C62' <=substr(&V1,1,3)<= 'C63' THEN '029'
WHEN year>=2000 AND 'C66' <=substr(&V1,1,3)<= 'C66' THEN '029'
WHEN year>=2000 AND 'C68' <=substr(&V1,1,3)<= 'C69' THEN '029'
WHEN year>=2000 AND 'C73' <=substr(&V1,1,3)<= 'C80' THEN '029'
WHEN year>=2000 AND 'C97' <=substr(&V1,1,3)<= 'C97' THEN '029'
WHEN year>=2000 AND 'E40' <=substr(&V1,1,3)<= 'E46' THEN '037'
WHEN year>=2000 AND 'F10' <=substr(&V1,1,3)<= 'F10' THEN '042'
WHEN year>=2000 AND 'I10' <=substr(&V1,1,3)<= 'I15' THEN '054'
WHEN year>=2000 AND 'J10' <=substr(&V1,1,3)<= 'J11' THEN '072'
WHEN year>=2000 AND 'J12' <=substr(&V1,1,3)<= 'J18' THEN '073'
WHEN year>=2000 AND 'J43' <=substr(&V1,1,3)<= 'J43' THEN '075'
WHEN year>=2000 AND 'J45' <=substr(&V1,1,3)<= 'J46' THEN '076'
WHEN year>=2000 AND 'K57' <=substr(&V1,1,3)<= 'K57' THEN '081'
WHEN year>=2000 AND 'K70' <=substr(&V1,1,3)<= 'K70' THEN '083'
WHEN year>=2000 AND 'K73' <=substr(&V1,1,3)<= 'K74' THEN '083'
WHEN year>=2000 AND 'N17' <=substr(&V1,1,3)<= 'N19' THEN '090'
WHEN year>=2000 AND 'W65' <=substr(&V1,1,3)<= 'W74' THEN '108'
WHEN year>=2000 AND 'X67' <=substr(&V1,1,3)<= 'X67' THEN '115'
WHEN year>=2000 AND 'X70' <=substr(&V1,1,3)<= 'X70' THEN '116'
WHEN year>=2000 AND 'X72' <=substr(&V1,1,3)<= 'X74' THEN '117'


WHEN year<=1999 AND '150' <=substr(&V1,1,3)<= '150' THEN '011'
WHEN year<=1999 AND '151' <=substr(&V1,1,3)<= '151' THEN '012'
WHEN year<=1999 AND '153' <=substr(&V1,1,3)<= '154' THEN '013'
WHEN year<=1999 AND '155' <=substr(&V1,1,3)<= '155' THEN '014'
WHEN year<=1999 AND '157' <=substr(&V1,1,3)<= '157' THEN '015'
WHEN year<=1999 AND '162' <=substr(&V1,1,3)<= '162' THEN '016'
WHEN year<=1999 AND '172' <=substr(&V1,1,3)<= '172' THEN '017'
WHEN year<=1999 AND '174' <=substr(&V1,1,3)<= '175' THEN '018'
WHEN year<=1999 AND '180' <=substr(&V1,1,3)<= '180' THEN '019'
WHEN year<=1999 AND '1830'<=substr(&V1,1,4)<= '1830' THEN '020'
WHEN year<=1999 AND '185' <=substr(&V1,1,3)<= '185' THEN '021'
WHEN year<=1999 AND '1890'<=substr(&V1,1,4)<= '1891' THEN '022'
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    WHEN year<=1999 AND '188' <=substr(&V1,1,3)<= '188' THEN '023'
    WHEN year<=1999 AND '191' <=substr(&V1,1,3)<= '192' THEN '024'
    WHEN year<=1999 AND '200' <=substr(&V1,1,3)<= '208' THEN '025'
    WHEN year<=1999 AND '140' <=substr(&V1,1,3)<= '149' THEN '029'
    WHEN year<=1999 AND '152' <=substr(&V1,1,3)<= '152' THEN '029'
    WHEN year<=1999 AND '156' <=substr(&V1,1,3)<= '156' THEN '029'
    WHEN year<=1999 AND '158' <=substr(&V1,1,3)<= '161' THEN '029'
    WHEN year<=1999 AND '163' <=substr(&V1,1,3)<= '171' THEN '029'
    WHEN year<=1999 AND '173' <=substr(&V1,1,3)<= '173' THEN '029'
    WHEN year<=1999 AND '176' <=substr(&V1,1,3)<= '179' THEN '029'
    WHEN year<=1999 AND '181' <=substr(&V1,1,3)<= '182' THEN '029'
    WHEN year<=1999 AND '1832'<=substr(&V1,1,4)<= '1839' THEN '029'
    WHEN year<=1999 AND '184' <=substr(&V1,1,3)<= '184' THEN '029'
    WHEN year<=1999 AND '186' <=substr(&V1,1,3)<= '187' THEN '029'
    WHEN year<=1999 AND '1892'<=substr(&V1,1,4)<= '1899' THEN '029'
    WHEN year<=1999 AND '190' <=substr(&V1,1,3)<= '190' THEN '029'
    WHEN year<=1999 AND '193' <=substr(&V1,1,3)<= '199' THEN '029'
    WHEN year<=1999 AND '260' <=substr(&V1,1,3)<= '263' THEN '037'
    WHEN year<=1999 AND '291' <=substr(&V1,1,3)<= '291' THEN '042'
    WHEN year<=1999 AND '303' <=substr(&V1,1,3)<= '303' THEN '042'
    WHEN year<=1999 AND '3050'<=substr(&V1,1,4)<= '3050' THEN '042'
    WHEN year<=1999 AND '401' <=substr(&V1,1,3)<= '405' THEN '054'
    WHEN year<=1999 AND '487' <=substr(&V1,1,3)<= '487' THEN '072'
    WHEN year<=1999 AND '480' <=substr(&V1,1,3)<= '486' THEN '073'
    WHEN year<=1999 AND '492' <=substr(&V1,1,3)<= '492' THEN '075'
    WHEN year<=1999 AND '493' <=substr(&V1,1,3)<= '493' THEN '076'
    WHEN year<=1999 AND '562' <=substr(&V1,1,3)<= '562' THEN '081'
    WHEN year<=1999 AND '571' <=substr(&V1,1,3)<= '571' THEN '083'
    WHEN year<=1999 AND '584' <=substr(&V1,1,3)<= '586' THEN '090'
    WHEN year<=1999 AND '910' <=substr(&V1,1,3)<= '910' THEN '108'
    WHEN year<=1999 AND '952' <=substr(&V1,1,3)<= '952' THEN '115'
    WHEN year<=1999 AND '953' <=substr(&V1,1,3)<= '953' THEN '116'
    WHEN year<=1999 AND '9550'<=substr(&V1,1,4)<= '9554' THEN '117'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;
%MEND;



%MACRO GROUP4(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'C82' <=substr(&V1,1,3)<= 'C85' THEN '026'
    WHEN year>=2000 AND 'C88' <=substr(&V1,1,3)<= 'C88' THEN '027'
    WHEN year>=2000 AND 'C90' <=substr(&V1,1,3)<= 'C90' THEN '027'
    WHEN year>=2000 AND 'C91' <=substr(&V1,1,3)<= 'C95' THEN '028'
    WHEN year>=2000 AND 'I20' <=substr(&V1,1,3)<= 'I25' THEN '056'
    WHEN year>=2000 AND 'I50' <=substr(&V1,1,3)<= 'I50' THEN '060'
    WHEN year>=2000 AND 'I60' <=substr(&V1,1,3)<= 'I69' THEN '062'
    WHEN year>=2000 AND 'I70' <=substr(&V1,1,3)<= 'I78' THEN '066'
    WHEN year>=2000 AND 'K70' <=substr(&V1,1,3)<= 'K70' THEN '084'
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    WHEN year>=2000 AND 'V01' <=substr(&V1,1,3)<= 'V89' THEN '104'
    WHEN year>=2000 AND 'W00' <=substr(&V1,1,3)<= 'W19' THEN '107'
    WHEN year>=2000 AND 'X00' <=substr(&V1,1,3)<= 'X09' THEN '109'
    WHEN year>=2000 AND 'X40' <=substr(&V1,1,3)<= 'X49' THEN '110'
    WHEN year>=2000 AND 'X59' <=substr(&V1,1,3)<= 'X59' THEN '112'
    WHEN year>=2000 AND 'W20' <=substr(&V1,1,3)<= 'W64' THEN '113'
    WHEN year>=2000 AND 'W75' <=substr(&V1,1,3)<= 'W99' THEN '113'
    WHEN year>=2000 AND 'X10' <=substr(&V1,1,3)<= 'X39' THEN '113'
    WHEN year>=2000 AND 'X50' <=substr(&V1,1,3)<= 'X58' THEN '113'
    WHEN year>=2000 AND 'Y86' <=substr(&V1,1,3)<= 'Y86' THEN '113'

    WHEN year<=1999 AND '200' <=substr(&V1,1,3)<= '200' THEN '026'
    WHEN year<=1999 AND '202' <=substr(&V1,1,3)<= '202' THEN '026'
    WHEN year<=1999 AND '203' <=substr(&V1,1,3)<= '203' THEN '027'
    WHEN year<=1999 AND '204' <=substr(&V1,1,3)<= '208' THEN '028'
    WHEN year<=1999 AND '410' <=substr(&V1,1,3)<= '414' THEN '056'
    WHEN year<=1999 AND '4292'<=substr(&V1,1,4)<= '4292' THEN '056'
    WHEN year<=1999 AND '428' <=substr(&V1,1,3)<= '428' THEN '060'
    WHEN year<=1999 AND '430' <=substr(&V1,1,3)<= '434' THEN '062'
    WHEN year<=1999 AND '436' <=substr(&V1,1,3)<= '438' THEN '062'
    WHEN year<=1999 AND '440' <=substr(&V1,1,3)<= '448' THEN '066'
    WHEN year<=1999 AND '5710'<=substr(&V1,1,4)<= '5713' THEN '084'
    WHEN year<=1999 AND '800' <=substr(&V1,1,3)<= '829' THEN '104'
    WHEN year<=1999 AND '880' <=substr(&V1,1,3)<= '886' THEN '107'
    WHEN year<=1999 AND '888' <=substr(&V1,1,3)<= '888' THEN '107'
    WHEN year<=1999 AND '890' <=substr(&V1,1,3)<= '899' THEN '109'
    WHEN year<=1999 AND '850' <=substr(&V1,1,3)<= '869' THEN '110'
    WHEN year<=1999 AND '900' <=substr(&V1,1,3)<= '909' THEN '113'
    WHEN year<=1999 AND '911' <=substr(&V1,1,3)<= '929' THEN '113'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;
%MEND;


%MACRO GROUP5(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'I11' <=substr(&V1,1,3)<= 'I11'  THEN '055'
    WHEN year>=2000 AND 'I250' <=substr(&V1,1,4)<= 'I250' THEN '059'
    WHEN year>=2000 AND 'I60' <=substr(&V1,1,3)<= 'I62'  THEN '063'
    WHEN year>=2000 AND 'I63' <=substr(&V1,1,3)<= 'I63'  THEN '064'
    WHEN year>=2000 AND 'I64' <=substr(&V1,1,3)<= 'I64'  THEN '065'
    WHEN year>=2000 AND 'I70' <=substr(&V1,1,3)<= 'I70'  THEN '067'
    WHEN year>=2000 AND 'I71' <=substr(&V1,1,3)<= 'I71'  THEN '068'
    WHEN year>=2000 AND 'V01' <=substr(&V1,1,3)<= 'V99'  THEN '103'
    WHEN year>=2000 AND 'Y85' <=substr(&V1,1,3)<= 'Y85'  THEN '103'

    WHEN year<=1999 AND '402' <=substr(&V1,1,3)<= '402' THEN '055'
    WHEN year<=1999 AND '4292'<=substr(&V1,1,4)<= '4292' THEN '059'
    WHEN year<=1999 AND '430' <=substr(&V1,1,3)<= '432' THEN '063'
    WHEN year<=1999 AND '433' <=substr(&V1,1,3)<= '434' THEN '064'
    WHEN year<=1999 AND '436' <=substr(&V1,1,3)<= '436' THEN '065'
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    WHEN year<=1999 AND '440' <=substr(&V1,1,3)<= '440' THEN '067'
    WHEN year<=1999 AND '441' <=substr(&V1,1,3)<= '441' THEN '068'
    WHEN year<=1999 AND '800' <=substr(&V1,1,3)<= '848' THEN '103'
    WHEN year<=1999 AND '9290'<=substr(&V1,1,4)<= '9290' THEN '103'
    WHEN year<=1999 AND '9291'<=substr(&V1,1,4)<= '9291' THEN '103'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;
%MEND;


%MACRO GROUP6(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'I21' <=substr(&V1,1,3)<= 'I22' THEN '057'
    WHEN year>=2000 AND 'I20' <=substr(&V1,1,3)<= 'I20' THEN '058'
    WHEN year>=2000 AND 'I25' <=substr(&V1,1,3)<= 'I25' THEN '058'
    WHEN year>=2000 AND 'V02' <=substr(&V1,1,3)<= 'V04' THEN '105'
    WHEN year>=2000 AND 'V090'<=substr(&V1,1,4)<= 'V090' THEN '105'
    WHEN year>=2000 AND 'V092'<=substr(&V1,1,4)<= 'V092' THEN '105'
    WHEN year>=2000 AND 'V12' <=substr(&V1,1,3)<= 'V14' THEN '105'
    WHEN year>=2000 AND 'V190'<=substr(&V1,1,4)<= 'V192' THEN '105'
    WHEN year>=2000 AND 'V194'<=substr(&V1,1,4)<= 'V196' THEN '105'
    WHEN year>=2000 AND 'V20' <=substr(&V1,1,3)<= 'V79' THEN '105'
    WHEN year>=2000 AND 'V803'<=substr(&V1,1,4)<= 'V805' THEN '105'
    WHEN year>=2000 AND 'V810'<=substr(&V1,1,4)<= 'V811' THEN '105'
    WHEN year>=2000 AND 'V820'<=substr(&V1,1,4)<= 'V821' THEN '105'
    WHEN year>=2000 AND 'V83' <=substr(&V1,1,3)<= 'V86' THEN '105'
    WHEN year>=2000 AND 'V870'<=substr(&V1,1,4)<= 'V878' THEN '105'
    WHEN year>=2000 AND 'V880'<=substr(&V1,1,4)<= 'V888' THEN '105'
    WHEN year>=2000 AND 'V890'<=substr(&V1,1,4)<= 'V890' THEN '105'
    WHEN year>=2000 AND 'V892'<=substr(&V1,1,4)<= 'V892' THEN '105'
    WHEN year>=2000 AND 'W00' <=substr(&V1,1,3)<= 'W19' THEN '106'
    WHEN year>=2000 AND 'X40' <=substr(&V1,1,3)<= 'X44' THEN '111'

    WHEN year<=1999 AND '410' <=substr(&V1,1,3)<= '410' THEN '057'
    WHEN year<=1999 AND '412' <=substr(&V1,1,3)<= '414' THEN '058'
    WHEN year<=1999 AND '4292'<=substr(&V1,1,4)<= '4292' THEN '058'
    WHEN year<=1999 AND '810' <=substr(&V1,1,3)<= '825' THEN '105'
    WHEN year<=1999 AND '880' <=substr(&V1,1,3)<= '888' THEN '106'
    WHEN year<=1999 AND '850' <=substr(&V1,1,3)<= '858' THEN '111'

    END as &mortGrp label = "Mortality Cause List"
    FROM &srcData;
  quit;

%MEND;
```

```
%MACRO GROUP7(srcData=, destData=, v1=, mortGrp=);

  proc sql;
  CREATE table &destData as
    SELECT *,
    CASE
    WHEN year>=2000 AND 'G00' <=substr(&V1,1,3)<= 'H95' THEN '044'
    WHEN year<=1999 AND '320' <=substr(&V1,1,3)<= '389' THEN '044'
    WHEN year>=2000 AND 'I00' <=substr(&V1,1,3)<= 'I09' THEN '061'
    WHEN year>=2000 AND 'I11' <=substr(&V1,1,3)<= 'I11' THEN '061'
    WHEN year>=2000 AND 'I13' <=substr(&V1,1,3)<= 'I13' THEN '061'
    WHEN year>=2000 AND 'I20' <=substr(&V1,1,3)<= 'I51' THEN '061'
    WHEN year<=1999 AND '390' <=substr(&V1,1,3)<= '398' THEN '061'
    WHEN year<=1999 AND '402' <=substr(&V1,1,3)<= '402' THEN '061'
    WHEN year<=1999 AND '404' <=substr(&V1,1,3)<= '404' THEN '061'
    WHEN year<=1999 AND '410' <=substr(&V1,1,3)<= '429' THEN '061'

    END as &mortGrp label = "Mortality Cause List"

    FROM &srcData;
  quit;

%MEND;

%MACRO GroupA (srcData=, destData=, mortGrp =);
  data &destData;
    set &srcData;
    tp = trim (Grp1 || Grp2 || Grp3 || Grp4 || Grp5 || Grp6 || Grp7);
    if (tp = '') then &mortGrp = '999'; /* missing data on causes */
  run;
%MEND;

%MACRO mGroup(source=, dest=, varCause=);

  %Group1 (srcData=&source, destData=tp1,  v1=&varCause, mortGrp = grp1);
  %Group2 (srcData=tp1,   destData=tp2,  v1=&varCause, mortGrp = grp2);
  %Group3 (srcData=tp2,   destData=tp3,  v1=&varCause, mortGrp = grp3);
  %Group4 (srcData=tp3,   destData=tp4,  v1=&varCause, mortGrp = grp4);
  %Group5 (srcData=tp4,   destData=tp5,  v1=&varCause, mortGrp = grp5);
  %Group6 (srcData=tp5,   destData=tp6,  v1=&varCause, mortGrp = grp6);
  %Group7 (srcData=tp6,   destData=tp7,  v1=&varCause, mortGrp = grp7);
  %GroupA (srcData=tp7,   destData=&dest, mortGrp = grp8);

%MEND;

/*************************************************************************/
/*      1.2 Execute Macro to Group by ICD-10 and ICD-9                   */
/*************************************************************************/

%mGroup (source = vs_dth.deth8304, dest = tp, varCause = U_CAUSE);
```

```
/*************************************************************************/
```

Counting Number of Deaths by Year, Sex/Age Group, and Heatlh Region

```
/*************************************************************************/
/*     SAS codes: HSG_CountGrp.sas                                       */
/*************************************************************************/
/*     2.1 Load Macro for Counting                                       */
/*************************************************************************/

/* Macro to Count causes of 120 grouping  */

%MACRO countMortGrp (source=, base=);

  %flagMortGrp(srcData=&source, baseData=&base, grp= 001);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 002);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 003);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 004);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 005);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 006);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 007);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 008);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 009);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 010);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 011);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 012);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 013);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 014);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 015);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 016);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 017);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 018);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 019);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 020);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 021);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 022);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 023);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 024);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 025);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 026);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 027);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 028);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 029);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 030);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 031);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 032);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 033);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 034);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 035);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 036);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 037);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 038);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 039);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 040);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 041);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 042);
```

```
%flagMortGrp(srcData=&source, baseData=&base, grp= 043);
%flagMortGrp(srcData=&source, baseData=&base, grp= 044);
%flagMortGrp(srcData=&source, baseData=&base, grp= 045);
%flagMortGrp(srcData=&source, baseData=&base, grp= 046);
%flagMortGrp(srcData=&source, baseData=&base, grp= 047);
%flagMortGrp(srcData=&source, baseData=&base, grp= 048);
%flagMortGrp(srcData=&source, baseData=&base, grp= 049);
%flagMortGrp(srcData=&source, baseData=&base, grp= 050);
%flagMortGrp(srcData=&source, baseData=&base, grp= 051);
%flagMortGrp(srcData=&source, baseData=&base, grp= 052);
%flagMortGrp(srcData=&source, baseData=&base, grp= 053);
%flagMortGrp(srcData=&source, baseData=&base, grp= 054);
%flagMortGrp(srcData=&source, baseData=&base, grp= 055);
%flagMortGrp(srcData=&source, baseData=&base, grp= 056);
%flagMortGrp(srcData=&source, baseData=&base, grp= 057);
%flagMortGrp(srcData=&source, baseData=&base, grp= 058);
%flagMortGrp(srcData=&source, baseData=&base, grp= 059);
%flagMortGrp(srcData=&source, baseData=&base, grp= 060);
%flagMortGrp(srcData=&source, baseData=&base, grp= 061);
%flagMortGrp(srcData=&source, baseData=&base, grp= 062);
%flagMortGrp(srcData=&source, baseData=&base, grp= 063);
%flagMortGrp(srcData=&source, baseData=&base, grp= 064);
%flagMortGrp(srcData=&source, baseData=&base, grp= 065);
%flagMortGrp(srcData=&source, baseData=&base, grp= 066);
%flagMortGrp(srcData=&source, baseData=&base, grp= 067);
%flagMortGrp(srcData=&source, baseData=&base, grp= 068);
%flagMortGrp(srcData=&source, baseData=&base, grp= 069);
%flagMortGrp(srcData=&source, baseData=&base, grp= 070);
%flagMortGrp(srcData=&source, baseData=&base, grp= 071);
%flagMortGrp(srcData=&source, baseData=&base, grp= 072);
%flagMortGrp(srcData=&source, baseData=&base, grp= 073);
%flagMortGrp(srcData=&source, baseData=&base, grp= 074);
%flagMortGrp(srcData=&source, baseData=&base, grp= 075);
%flagMortGrp(srcData=&source, baseData=&base, grp= 076);
%flagMortGrp(srcData=&source, baseData=&base, grp= 077);
%flagMortGrp(srcData=&source, baseData=&base, grp= 078);
%flagMortGrp(srcData=&source, baseData=&base, grp= 079);
%flagMortGrp(srcData=&source, baseData=&base, grp= 080);
%flagMortGrp(srcData=&source, baseData=&base, grp= 081);
%flagMortGrp(srcData=&source, baseData=&base, grp= 082);
%flagMortGrp(srcData=&source, baseData=&base, grp= 083);
%flagMortGrp(srcData=&source, baseData=&base, grp= 084);
%flagMortGrp(srcData=&source, baseData=&base, grp= 085);
%flagMortGrp(srcData=&source, baseData=&base, grp= 086);
%flagMortGrp(srcData=&source, baseData=&base, grp= 087);
%flagMortGrp(srcData=&source, baseData=&base, grp= 088);
%flagMortGrp(srcData=&source, baseData=&base, grp= 089);
%flagMortGrp(srcData=&source, baseData=&base, grp= 090);
%flagMortGrp(srcData=&source, baseData=&base, grp= 091);
%flagMortGrp(srcData=&source, baseData=&base, grp= 092);
%flagMortGrp(srcData=&source, baseData=&base, grp= 093);
%flagMortGrp(srcData=&source, baseData=&base, grp= 094);
%flagMortGrp(srcData=&source, baseData=&base, grp= 095);
%flagMortGrp(srcData=&source, baseData=&base, grp= 096);
%flagMortGrp(srcData=&source, baseData=&base, grp= 097);
%flagMortGrp(srcData=&source, baseData=&base, grp= 098);
%flagMortGrp(srcData=&source, baseData=&base, grp= 099);
```

```
  %flagMortGrp(srcData=&source, baseData=&base, grp= 100);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 101);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 102);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 103);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 104);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 105);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 106);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 107);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 108);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 109);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 110);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 111);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 112);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 113);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 114);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 115);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 116);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 117);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 118);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 119);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 120);
  %flagMortGrp(srcData=&source, baseData=&base, grp= 999);

%MEND;


%MACRO flagMortGrp(srcData=, baseData=, grp=);

  data temp1;
    set &srcData;
    array grpName {8} $;

    grpName {1} = Grp1;
    grpName {2} = Grp2;
    grpName {3} = Grp3;
    grpName {4} = Grp4;
    grpName {5} = Grp5;
    grpName {6} = Grp6;
    grpName {7} = Grp7;
    grpName {8} = Grp8;


    do i = 1 to 8;
        if (grpName {i} = "&grp") then selectGrp = "&grp";
    end;
  run;

  proc sql;
    create table temp2 as
    select year, Sex, Age_yrs, AgeGrp, RES_RHA, selectGrp,
        count (*) as n
    from temp1
    group by year, Sex, Age_yrs, AgeGrp, RES_RHA, selectGrp;

  quit;
```

```
  data temp3;
    set temp2;
    where (selectGrp > '0');
  run;

  proc Append Base = &baseData DATA=temp3; run;

%MEND;

/*************************************************************************/
/*      2.2 Execute Macro to Count Each Group                            */
/*************************************************************************/

%countMortGrp(source=tp, base=Vital_cnt);
```