
APPENDIX D: TECHNICAL NOTES

Cause of death classification

The death statistics presented in this report were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify causes of death by the current Manual of International Statistical Classification of Diseases, Injuries, and Causes of Death, Ninth Revision (ICD-9) for years prior to 1999 and the Tenth Revision (ICD-10) in 1999 and after. In addition to WHO regulations, cause of death data are coded by procedures outlined in annual issues of the National Center for Health Statistics (NCHS) Instruction Manual.

Each death certificate received by the state must have all listed causes of death converted to ICD-9 or ICD-10 codes. Colorado death records for years prior to 1993 were coded manually by a coding expert within the Health Statistics and Vital Records Division. Beginning in 1993, causes of death were converted to ICD-9 codes via Super-MICAR, an automated, cause of death processing system developed by NCHS.

Underlying cause of death classification

As described above in “Cause of Death Classification,” all causes of death listed on a death certificate must be coded. The underlying cause of death is defined by WHO as the disease or injury that initiated the sequence of events leading directly to the death, or the circumstance of the accident or violence that caused the injury. The underlying cause of an injury death would be coded as the mechanism that caused the injury (e.g., a motor vehicle traffic event) rather than the injuries that resulted.

When more than one death cause is listed on the death certificate, the underlying cause is determined by rules that take into account the sequence of conditions on the certificate and provisions of the ICD-9 and ICD-10. To select the underlying cause of death, the Automated Classification of Medical Entities (ACME) system is used. All cause of death codes (ACME codes) serve as inputs to the computer software that employs WHO rules to select the underlying cause of death.

Multiple causes for injury hospitalizations

Some records in the hospital discharge data set have been assigned more than one ICD-9-CM external cause of injury code (E-code). Hospitalizations with more than one E-code may be counted in more than one injury mechanism category.

Race/ethnicity

On death certificates, race/ethnicity often must be determined by funeral directors by observation rather than by interviewing the next of kin. This may result in misreporting or underreporting of ethnic or minority deaths. Race/ethnicity information frequently is missing from the hospital discharge data. For this reason, injury hospitalization rates by race/ethnicity are not presented in this report.

Population data

The population data used in this report were provided by the Demography Section of the Colorado Division of Local Government, formerly the Demographic Section of the Colorado Department of Local Affairs. Readers with questions regarding population data may contact the state demography office directly at 303-866-4147, or review the website at www.dola.colorado.gov/demog/.

Residence and occurrence data

Residence data, unless otherwise noted, are for events that happened to individuals who were reported as being residents of Colorado. Interstate agreements allow for the exchange of information on deaths to Colorado residents that occurred in other states. Tables with residence data will be designated “Colorado Residents” in the title.

Occurrence data, unless otherwise noted, are for events that took place in Colorado regardless of residence. Tables with occurrence data will be designated “Colorado Occurrences” in the title.

All the rates presented in the report are based on deaths and hospitalizations of Colorado residents. The injury mechanisms that result in a high proportion of hospitalizations for non-residents are noted in each chapter.

Small numbers

Many Colorado counties have small populations and therefore fewer injury events. Interpretation of statistics in such areas may be difficult, since analysis of year-to-year changes or comparisons with other areas is hampered by a tendency for rates and percentages to fluctuate.

Combining multiple years of data and/or using annual average data provides a more reliable indicator of what is “true” for an area. Combining county data into regional data for places with small numbers of events and small populations is another way of improving the general usefulness of data. Both annual average statistics and multi-county data are included in this report for selected events.

Because all Colorado death records are confidential, the Colorado Department of Public Health and Environment has a policy of not reporting categories with fewer than three deaths. Categories with fewer than three deaths are noted in Appendix A and throughout the report with the symbol “*”.

Confidence Intervals

Confidence intervals are statistics used to describe the possible margin of error in a reported rate. As discussed above, the number of events, and therefore the rate, can vary from year to year. Calculating a confidence interval provides a better indication of what the “true” rate might be. A 95 percent confidence interval indicates that the “true” rate will be a value between the lower and upper limits of the confidence interval 95 percent of the time. If the number/rate varies greatly from year to year, the confidence interval will be very large. If the number/rate is fairly stable, the confidence interval will be small.

Confidence intervals are used to determine statistical significance. For example, in Tables D25 and H18, a significant difference (sig.diff.) is noted when the confidence interval of the rate for the county or region is higher (+) or lower (-) than the confidence interval of the rate for the state.

Age-adjustment of rates

Age-adjusted death and hospitalization rates are presented in many of the tables in this report. All the adjusted rates are per 100,000 Colorado population and are adjusted to the 2000 U.S. standard population using the direct method applied to 10-year age groups. Age adjustment, using the direct method, involves the application of age-specific rates in a population of interest to a standardized age distribution in order to eliminate differences in observed rates that result from age differences in population composition. This adjustment is usually done when comparing two or more populations at one point in time or one population at two or more points in time.

In this report, age-adjusted rates are calculated by the direct method as follows:

$$\sum_{i=1}^n r_i \times (p_i/P)$$

where r_i = the age-specific rates for the population of interest

p_i = the standard population in age group i

$P = \sum_{i=1}^n p_i$ for the age groups that comprise the age range of the rate being adjusted

n = the total number of age groups over the age range of the age-adjusted rate

Age-adjustment by the direct method requires the use of a standard age distribution. All the rates in the report are age-adjusted to the 2000 U.S. standard population.¹

United States Standard Year 2000 population: Numbers and proportions (weights)

Age	Population	Proportion Distribution (weights)	Standard million
Total	274,634,000	1.000000	1,000,000
Under 1 year	3,795,000	0.013818	13,818
1-4 years	15,192,000	0.055317	55,317
5-14 years	39,977,000	0.145565	145,565
15-24 years	38,077,000	0.138646	138,646
25-34 years	37,233,000	0.135573	135,573
35-44 years	44,659,000	0.162613	162,613
45-54 years	37,030,000	0.134834	134,834
55-64 years	23,961,000	0.087247	87,247
65-74 years	18,136,000	0.066037	66,037
75-84 years	12,315,000	0.044842	44,842
85 years and older	4,259,000	0.015508	15,508

1. Anderson R.N., Rosenberg, H.M. (1998). *Age Standardization of Death Rates: Implementation of the Year 2000 Standard*. National Vital Statistics Reports 47 (3). Hyattsville, MD: National Center for Health Statistics.

Calculating Years of Potential Life Lost

Years of potential life lost (YPLL) is a measure of premature mortality. In this report, YPLL is presented in two different ways: (1) YPLL before age 65, and (2) YPLL using the life expectancy method. YPLL before age 65 is calculated from the difference between 65 and the age at death. For example, the death of a person 40 years old contributes 25 years of life lost before age 65. YPLL using the life expectancy method is calculated for each death from the expected years of life remaining for a person at a particular age, and is based on the age-specific death rates for a given population (gender, racial/ethnic group, etc.) in a particular year.

For both methods, YPLL is calculated by summing the years of life lost for all deaths over all ages.

Age-adjusted rates for YPLL are per 100,000 population and are adjusted to the 2000 U.S. standard population using the direct method applied to 10-year age groups.

Data quality

Data generally are presented as coded on death certificates and on electronic hospital discharge dataset records. As with all large, complex data sets, completeness and accuracy of reporting may vary. Some attempts at verification of information by review of a sample of medical records has been done, particularly with patients who sustained a traumatic brain injury; however, in most instances, the diagnoses and mechanism of injuries are analyzed as coded in the electronic data files, without independent verification.

Many tables show cases with characteristics unknown or not stated, or with mechanism of injury unspecified. Table notes and narratives explain other qualifications of the data where appropriate.

Definitions

Cause of death: All the diseases, conditions, or injuries that either resulted in or contributed to death, and/or the circumstances of the accident or violence that produced such injuries. Most standard mortality data are compiled by underlying cause of death.

E-Codes: This external cause of injury codes (E-codes) are a subset of the International Classification of Diseases, Ninth Revision, used to classify the environmental events, circumstances, and conditions that are the cause of injury, poisoning, or other adverse effects. The E-code groups used in this report are listed in Appendix F.

Epidemiology: The study of the distribution of a disease or physiological condition in human populations and of the factors that influence this distribution.

ICD-9: The International Classification of Diseases, Ninth Revision, is the system used to classify the causes of death listed on death certificates from 1979 through 1998. The Clinical Modification of this coding system (ICD-9-CM) is used to classify diagnoses on hospital discharge records.

ICD-10: The International Classification of Diseases, Tenth Revision, is the system used to classify the causes of death listed on death certificates beginning in 1999.

Intent of injury: Intentional injuries, such as homicide and suicide, involve acts in which there is intent to kill or harm. Unintentional injuries involve acts in which there is no intent to harm; these injuries are sometimes labeled as “accidental”. In some cases, the intentionality has not been determined. These injuries are categorized as “undetermined intent”.

Legal intervention: This category includes injuries that were inflicted in the course of performing legal law enforcement actions. In this report, as in National Vital Statistics Reports, injuries due to legal intervention are grouped with homicide and assault.

Mechanism of injury: The activities or circumstances that led to the hospitalization or death.

Morbidity: The state of being diseased.

Mortality: The state of being deceased (dead).

Rate: A rate is the number of events divided by the number of people in the population. This number is usually expressed in events per 100,000 population so that it is easy to compare populations of different size. For example, if there are five deaths among males ages 85 and older, and there are only 10,000 males in this population, the rate of death would be 50 per 100,000 population. If there are 20 deaths among males ages 25-34, and there are 200,000 males in this population, the rate would be 10 per 100,000. For this example, the number of deaths is higher in the younger group; however, the rate of death is higher in the older age group.

Crude death rate or hospitalization rate: The number of deaths or hospitalizations per a specified number of population (e.g., per 100,000). Crude rates are not adjusted for differences in demographic distributions among populations, such as age distributions.

Age-adjusted rate: A rate that has been standardized to the age distribution of a particular population, so that it is, in effect, independent of the age distribution of the population it represents. Age-adjusted rates are used to compare rates over time, among different geographical areas or between different race, gender or race/ethnicity groups.

Underlying cause of death: The disease or injury that initiated the chain of events leading directly to the death or the circumstances of the accident or violence that produced the fatal injury.

