leading causes of death
mortality data
DEATH CERTIFICATES
DEATHS
POPULATION
x 100,000
TEEN PREGNANCY
prevalence rate
birth rate
population-based surveys
SMOKING AND HEALTH
deaths due to smoking
SMOKING AND HEALTH
PREGNANCY
INTRODUCTION

What is covered in Module 1?

Module 1 introduces you to the concept of quantitative data and its value for public health. The module describes the major types of data available for analysis, then focuses specifically on one type: data on deaths (or mortality data). You will explore where these data originate, how they are coded, and how they can be used to answer important questions.

What will you learn?

At the end of Module 1, you will be able to:

- Define population-based data.
- Explain data typically included on a death certificate, and discuss the value and limitations of those data.
- Explain ICD codes.
- Describe the difference between numbers of deaths (counts) and death rates.
- Identify and analyze leading causes of death.
- Calculate general death rates and specific types of death rates, including age-specific, cause-specific and sex-specific death rates.
- Use rates to examine differences in causes of death by sex.
- Analyze changes in rates over time (trends) and changes in underlying causes over time.
- Determine effective ways to present data.

Before you read any further, view Act 1 of the videotape.
Section I. MORTALITY DATA

What is the primary source of death (mortality) data?

Death, or mortality, is one of the primary measures of a population’s health. Death certificates are completed for every death in the United States. State laws require that a death certificate be completed for every death occurring within the state. In all states, funeral directors are legally responsible for filing a completed death certificate. A physician or medical examiner/coroner is required to pronounce the death and to complete the section of the death certificate concerning the causes of death.

Death certificates for all deaths occurring in a state are submitted to and maintained by the state’s vital registrar. The National Center for Health Statistics compiles the data from each state for each calendar year into a national data file for all deaths occurring in the United States. In cases in which a resident of one state dies in another state, the death certificate is filed in the state where the death occurred (place of occurrence) and a copy is usually sent to the state where the individual resided (place of residence). Individually, death certificates are permanent records of the fact of death and are used in settling estates. Grouped together, data reported on individual death certificates are valuable for medical and public health purposes.

Data have been collected on death certificates since the early 1900’s; however, not all states participated until 1933. Figure 1 shows a U.S. Standard Certificate of Death. This certificate is revised roughly every 10 years to address changing data and legal requirements. The Standard Certificate may be modified somewhat by each state’s vital statistics office to meet that state’s unique needs or legal mandates.

What data are on a typical death certificate?

The death certificate is a rich source of data; it contains information about the characteristics of the decedent, the circumstances of death (time, date, and place), and specifics about the causes of death.

Information about the decedent includes: (numbers in parentheses refer to the item numbers on the U.S. Standard Certificate, Figure 1)

- Sex (2), Age (5a), and Birthplace (7)
- Marital Status (10)
- Residence (13 a-f)
- Hispanic Origin (14) and Race (15)
- Occupation (12a) and Education (16).
Information about the cause of death includes:

- Date of Death (3) and Place of Death (9a)
- Immediate Cause and Underlying Cause of Death (27, Part I) and Other Significant Conditions (27, Part II)
- Manner of Death (29) and additional details for deaths due to accidents, suicide, or homicide (30 a-f).

How is cause of death determined?

The death certificate is designed so that physicians or medical examiners/coroners will provide a fairly simple sequence of medical conditions resulting in death. While the data files maintain information on all reported conditions, mortality statistics generally use one condition from a death certificate. This condition is known as the **underlying cause of death**. Because it identifies the initiating cause of death, the underlying cause is most useful to public health officials in developing measures to prevent the onset of the chain of events leading to death.

Each cause of death reported in Part I of Item 27 (Figure 1) is either an immediate, intermediate, or underlying cause of death (terms indicating the condition’s place in the sequence resulting in death), while those causes of death reported in Part II of Item 27 are contributory causes of death.

- **Immediate cause of death** - the final disease or condition that resulted in death (listed on the first line of Part I).

- **Underlying cause of death** - the disease or injury which initiated the chain of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury (listed on the last line used in Part I).

- **Intermediate cause of death** - disease or condition that falls in the sequence between the Underlying and Immediate cause of death (listed between the first line of Part I and the last line used in Part I).

- **Other significant conditions** - disease or condition that contributed to death but did not result in the underlying cause of death (listed in Part II).

At the state vital statistics office, information from death certificates is entered into electronic records. All of the diseases and conditions reported on the death certificate are translated from text into medical codes using the International Classification of Diseases. The rules for selecting an underlying cause of death are applied to all of the coded conditions on each certificate. Usually the underlying cause of death is the condition on the lowest line used in Part I. In some cases, however, the interpretations of individual physicians are overruled by the International Classification of Diseases (ICD), which is discussed later in this module.
An illustration of this coding might be helpful. Suppose that a 34-year-old male had been admitted to the hospital with severe shortness of breath. He had a 9-month history of unintentional weight loss, night sweats, and diarrhea. Although his medical history did not include any condition that would cause immunodeficiency, his Elisa test and confirmatory Western Blot test for human immunodeficiency virus (HIV) were positive. T-lymphocyte tests indicated a low T helper-suppressor ratio. A positive lung biopsy for Pneumocystis carinii pneumonia (PCP) indicated a diagnosis of acquired immunodeficiency syndrome (AIDS). The patient’s pneumonia responded to pentamidine therapy, and he was discharged. He had two subsequent admissions for PCP. Seventeen months after he was first discovered to be HIV positive, the patient again developed PCP but did not respond to therapy. He died 2 weeks later.

The death certificate for this individual would resemble Figure 2. The immediate cause of death, as recorded on the death certificate, would be Pneumocystis carinii pneumonia. The sequence of underlying causes would be acquired immunodeficiency syndrome and HIV infection, respectively.¹

Figure 2
What are ICD codes?

The International Classification of Diseases (ICD), published by the World Health Organization (WHO), establishes a structure for translating the entries on the death certificate into a statistical classification. It is revised periodically. From 1979 to 1998, death certificates were coded according to the International Classification of Diseases – Ninth Revision (ICD-9). Beginning in 1999, death certificates are being coded according to the Tenth Revision (ICD-10).

Rules for selecting the underlying cause of death are included in the ICD as a means of standardizing classification, particularly for cases in which the sequence of causes is not straightforward. This helps to assure comparability and uniformity in mortality statistics throughout the U.S. and among all countries of the world. WHO also makes recommendations about how mortality data should be tabulated.

The National Center for Health Statistics publishes five lists of causes using ICD codes:

- Each-Cause List (a listing of all valid causes based on the ICD).
- List of 282 Selected Causes of Death (includes all of the causes of death required to be consistent with the tabulation requirements for mortality specified in the ICD-9).
- List of 72 Selected Causes of Death (designed especially for presentation of health problems considered to be of greatest public health interest in the U.S.).
- List of 61 Selected Causes of Infant Death (designed especially for presentation of causes relevant to infant deaths under 1 year of age).
- List of 34 Selected Causes of Death (summary of the 72 cause list used for presentation of detailed geographic data).

Table 1 summarizes the ICD chapters that are used to code underlying causes of death. The first sixteen chapters are based on diseases. The Supplementary Classification for External Causes of Injuries and Poisoning captures the kind of injury event that caused the death and whether it was an accident, homicide, or suicide. For example, E918 is “caught accidentally in or between objects.” These supplementary codes are referred to as “E-codes” because each code is preceded by the letter “E,” which denotes an external cause (and not a disease).

The ICD contains an additional chapter, Chapter XVII, which includes codes to describe the kind of injury sustained (e.g., fracture of vault of skull). Chapter XVII codes are not used to code underlying cause of death. Instead, they can be used in the full data record that reflects all conditions contributing to death. When combined with the E-codes, they give a more complete picture of what event caused the death (the E-code) and how that event physically affected the person (the Chapter XVII code).

---

Table 1  
ICD Chapters Used in Coding Causes of Death

<table>
<thead>
<tr>
<th>Chapters Based on Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Infectious and Parasitic Diseases (001.0-139.8)</td>
</tr>
<tr>
<td>II. Neoplasms (140.0-239.9)</td>
</tr>
<tr>
<td>III. Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders (240.0-279.9)</td>
</tr>
<tr>
<td>IV. Diseases of Blood and Blood-Forming Organs (280-289.9)</td>
</tr>
<tr>
<td>V. Mental Disorders (290.0-319)</td>
</tr>
<tr>
<td>VI. Diseases of the Nervous System and Sense Organs (320.0-389.9)</td>
</tr>
<tr>
<td>VII. Diseases of the Circulatory System (390-459.9)</td>
</tr>
<tr>
<td>VIII. Diseases of the Respiratory System (460-519.9)</td>
</tr>
<tr>
<td>IX. Diseases of the Digestive System (520.0-579.9)</td>
</tr>
<tr>
<td>X. Diseases of the Genitourinary System (580.0-629.9)</td>
</tr>
<tr>
<td>XI. Complications of Pregnancy, Childbirth and the Puerperium (630-676.9)</td>
</tr>
<tr>
<td>XII. Diseases of the Skin and Subcutaneous Tissue (680.0-709.9)</td>
</tr>
<tr>
<td>XIII. Diseases of the Musculoskeletal System and Connective Tissue (710.0-739.9)</td>
</tr>
<tr>
<td>XIV. Congenital Anomalies (740.0-759.9)</td>
</tr>
<tr>
<td>XV. Certain Conditions Originating in the Perinatal Period (760.0-779.9)</td>
</tr>
<tr>
<td>XVI. Symptoms, Signs and Ill-Defined Conditions (780.0-799.9)</td>
</tr>
</tbody>
</table>

Supplementary Classification of External Causes of Injury and Poisoning

Transport Accidents (E800-E848)  
Accidental Poisoning by Drugs, Medicaments and Biologicals (E850-E858)  
Accidental Poisoning by Other Solid and Liquid Substances, Gases and Vapours (E860-E869)  
Misadventures to Patients During Surgical and Medical Care (E870-E876)  
Surgical and Medical Procedures as the Cause of Abnormal Reaction of Patient or Later Complication, Without Mention of Misadventure at the Time of Procedure (E878-E879)  
Accidental Falls (E880-E888)  
Accidents Caused by Fire and Flames (E890-E899)  
Accidents Due to Natural and Environmental Factors (E900-E909)  
Accidents Caused by Submersion, Suffocation and Foreign Bodies (E910-E915)  
Other Accidents (E916-E928)  
Late Effects of Accidental Injury (E929)  
Drugs, Medicaments and Biological Substances Causing Adverse Effects in Therapeutic Use (E930-E949)  
Suicide and Selfinflicted Injury (E950-E959)  
Homicide and Injury PURPOSELY Inflicted by Other Persons (E960-E969)  
Legal Intervention (E970-E978)  
Injury Undetermined Whether Accidentally of Purposely Inflicted (E980-E989)  
Injury Resulting from Operations of War (E990-E999)
How accurate are death certificate data?

The medical certification of cause of death can be made only by a qualified person, usually a physician, a medical examiner, or a coroner. The reliability and accuracy of cause-of-death statistics are, to a large extent, determined by the information available to the certifier, the certifier’s ability to interpret the information, and the care with which he or she completed the certificate.

Typically, the information about the decedent’s characteristics are fairly accurate. Details about his or her occupation and industry are often not complete, either because such information was not provided or changed over time, or because the decedent was retired. In some cases, very little information is available about decedents.

Where are data on causes of death published?

Traditionally, mortality statistics have been published in state vital statistics reports, as well as in publications from the National Center for Health Statistics. Annually, the National Center for Health Statistics publishes the Final Report of Mortality Statistics, which includes information about the leading causes of death for the U.S. and comparable numbers and rates for these causes in the 50 States, the District of Columbia, Puerto Rico, Virgin Islands, and Guam.

A number of states publish reports on causes of death, including leading causes by age and sex. CDC WONDER, a data access and communication system maintained by the Centers for Disease Control and Prevention, provides access to national mortality data through the Internet. You can use this system to extract information about numbers and rates of death for selected geographic areas. The quality of these data may vary from state to state. Using the data is often the best way to discover problems with completeness and reliability.
Exercise 1: Information from Death Certificates

Instructions: This exercise will help you become more familiar with the types of information included on a typical death certificate. Assume that you, like Helen, are faced with the task of preparing a presentation on adolescent deaths in your State. The three completed death certificates which Marsha shared with Helen are on Figures 3-5. Examine them closely, then use them to answer the questions below.

1. Complete the table below using the data on the three death certificates.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Robert Wilson</th>
<th>Harold Barstow</th>
<th>Sharon Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>What was the decedent’s:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Place of death</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What was the immediate cause of death?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What was the intermediate cause of death, if any?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What was the underlying cause of death?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were there any other contributing causes of death?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What was the manner of death?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What additional information is provided under “Describe how injury occurred”?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. In what ways are the data on these death certificates similar? How are they different?

3. How does this death certificate form differ from the form used in your state or locality?

Before you read any further, be sure to view Act 2 of the videotape.
Module 1. Leading Causes of Death

October 1999

Figure 3

Robert Louis Wilson

17. FATHER’S NAME (First, Middle, Last)
Ronald Lee Wilson

18. MOTHER’S NAME (First, Middle, Maiden or Married)
Estelle Molino

19a. INFORMANT’S NAME (Type/Print)
Ronald Wilson

19b. MAILING ADDRESS (Street and Number or Rural Route Number, City or Town, State, Zip Code)
1256 Harvard Street, Maplewood, MD 19689

20a. METHOD OF DISPOSITION
Buried

20b. PLACE OF DISPOSITION (Name of cemetery, cemetery, or other place)
Evergreen Cemetery

21a. SIGNATURE OF FUNERAL SERVICE LICENSE OR PERSON ACTING AS SUCH

21b. LICENSE NUMBER (If Licensed)

22a. NAME AND ADDRESS OF FOCUS
Rinaldi Funeral Home

22c. DATE SIGNED (Month, Day, Year)

23a. METHOD OF DEATH
Cerebral Hemorrhage

23b. TO THE BEST OF MY KNOWLEDGE, DEATH OCCURRED AT THE TIME, DATE, AND PLACE STATED
Yes

24. TIME OF DEATH
11:40 pm

25. DATE PRONOUNCED DEAD (Month, Day, Year)

26. WAS CASE REFERRED TO MEDICAL EXAMINER/CORONER?
Yes

27. PART I: Enter the diseases, injuries, or complications that caused the death. Do not enter the mode of dying, such as cardiac or respiratory arrest, shock, or heart failure. List only one cause on each line.

IMMEDIATE CAUSE (Final disease or condition resulting in death)

1. Cerebral Hemorrhage
   DUE TO OR AS A CONSEQUENCE OF:
   Fractured Skull
   Due to or as a consequence of:
   Automobile Accident

28. WAS AN AUTOPSY PERFORMED?
Yes

29. MANOR OF DEATH
Natural

30a. DATE OF INJURY (Month, Day, Year)
Jan. 11, 1997

30b. TIME OF INJURY
11:10 pm

30c. INJURY AT WORK?
No

30d. DESCRIBE HOW INJURY OCCURRED
Driver in auto-auto collision

31a. CERTIFIER

31b. CERTIFYING PHYSICIAN (Physician certifying cause of death when another physician has pronounced death and completed item 23.)

31c. SIGNATURE AND TITLE (Physician certifying cause of death)

31d. LICENSE NUMBER
ME87560

31e. DATE SIGNED (Month, Day, Year)
January 12, 1997

32. NAME AND ADDRESS OF PERSON WHO COMPLETED CAUSE OF DEATH (Item 27) (Type/Print)
Melvin Hightower, MD
140 High St, Vinnetown, 18823, MD

33. REGISTER’S SIGNATURE

34. DATE FILED (Month, Day, Year)
January 15, 1997

This certificate was created for instructional purposes.
Figure 4

U.S. STANDARD
CERTIFICATE OF DEATH

LOCAL FILE NUMBER

Harold Douglas Barstow

U.S. STANDARD
CERTIFICATE OF DEATH

STATE FILE NUMBER

3a. PLACE OF DEATH (Check only one, see instructions on other side)
County General

3b. FACILITY NAME (If not institution, give street and number)
Florence

3c. CITY, TOWN, OR LOCATION OF DEATH

3d. COUNTY OF DEATH

3e. UNDER 1 YEAR
15

3f. UNDER 1 DAY

3g. AGE (Last Birthday) 

17. FATHER'S NAME (First, Middle, Last)
Richard Douglas Barstow

3h. ARMED FORCES (Yes or no)

18. MOTHER'S NAME (First, Middle, Maiden, or Surname)
Lillian Elaine Street

3i. EXEMPT

19a. INFORMANT'S NAME (Type/Phone)
Lillian Barstow

3j. OCCUPATION

19b. MAILING ADDRESS (Street and Number or Rural Route Number, City or Town, State, Zip Code)
3129 Discus Dr., Florence, MD 39337

20a. PLACE OF DISPOSITION (Name of cemetery, crematory, or other place)
Hillside Cemetery

20b. METHOD OF DISPOSITION

21a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH
Reba McIntyre

21b. LICENSE NUMBER (of Licenses)
FN20886

22. NAME AND ADDRESS OF FACILITY

23a. TO THE BEST OF MY KNOWLEDGE, DEATH OCCURRED AT THE TIME, DATE, AND PLACE STATED.
Yes

23b. LICENSE NUMBER
RES96997

23c. DATE SIGNED (Month, Day, Year)
Jan. 18, 1997

24. TIME OF DEATH
4:10 pm

25. DATE PRONOUNCED DEAD (Month, Day, Year)
Jan. 18, 1997

26. WAS CASE REFERRED TO MEDICAL EXAMINER/CORONER?

27. PART I Enter the diseases, injuries, or complications that caused the death. Do not enter the mode of dying, such as cardiac or respiratory arrest, shock, or heart failure. List only one cause on each line.

28. MANNER OF DEATH

29. DATE OF DEATH (Month, Day, Year)
Jan. 18, 1997

30a. TIME OF INJURY
2:00pm

30b. INJURY AT WORK (Yes or no)
No

30c. PLACE OF INJURY—At home, farm, street, factory, office building, etc

30d. LOCATION (Street and Number or Rural Route Number, City or Town, State)
3129 Discus Dr., Florence, MD

31. SIGNATURE AND TITLE OF CERTIFIED PHYSICIAN
James Marvel, MD, Clarke County Court House, Florence, MD

32. NAME AND ADDRESS OF PERSON WHO COMPLETED CERTIFICATE (Item 31) (Type/Phone)
James Marvel, MD, Clarke County Court House, Florence, MD

32a. CERTIFYING PHYSICIAN

33. NAME AND ADDRESS OF REGISTRAR

34. DATE FILED (Month, Day, Year)
Jan. 22, 1997

This certificate was created for instructional purposes.
Module 1. Leading Causes of Death

Figure 5

Sharon Louise Black

108 Grant St., Apt. 206, Randallstown, MD 21234

In addition to the descriptive text, the document contains a Certificate of Death for Sharon Louise Black, who passed away on February 6, 1997. The certificate includes various details such as the date of death, place of death, and cause of death, which is described in the narrative text as Pulmonary hemorrhage. The document also provides additional information about the deceased's medical history and the circumstances of the death. The certificate is signed by the attending physician, George Walker, and the registrar, Carol Fordham. The certificate is marked as being created for instructional purposes.
Section II. STANDARD MORTALITY MEASURES

What is a count?

Simple counts of health events are the most basic unit of data. These are usually tabulated within a defined geographic region (a county, a state, a nation) and time period (one year, five years). There can be counts of the number of hospital visits, the number of injuries, the number of live-born twins, the number of mothers who deliver twins (about half the number of twins), the number of deaths, the number of deaths due to AIDS, etc.

We often use counts when we are dealing with very large numbers which, in and of themselves, sound impressive (e.g., numbers of AIDS deaths). Counts are also useful when comparing numbers for the same population group.

What are leading causes of death?

Leading causes of death are diseases identified as being of public health importance based upon the burden of the disease within a population. The importance of each disease is ranked relative to other important diseases. A standard procedure for ranking leading causes of death was adopted by the National Center for Health Statistics decades ago in which eligible causes are ranked according to the number of deaths (not rates). In 1996, the National Center for Health Statistics published Leading Causes of Death by Age, Sex, Race, and Hispanic Origin: United States, 1992. Included in this report is an extensive discussion of ranking procedures.

The eligible causes include the 37 rankable causes from the List of 72 Selected Causes of Death (those causes marked by an asterisk on Figure 6), along with HIV infection (added with 1987 data) and Alzheimer’s Disease (added with 1994 data). The following categories in the List of 72 Selected Causes are excluded from ranking:

- “Major cardiovascular diseases,”
- “Symptoms, signs, and ill-defined conditions,” and
- Category titles that begin with the words “Other” and “All other.”

When a title representing a subtotal is ranked, its component parts are not ranked. In the case of “Major cardiovascular diseases,” some of its major components are eligible to be ranked rather than the subtotal. These major components are: Diseases of heart, Hypertension with or without renal disease, Cerebrovascular disease, and Atherosclerosis.

---

**Figure 6. List of 72 Selected Causes of Death: United States, Ninth Revision ICD, 1975**

1* Shigellosis and amebiasis .......................... 004–006
2 Certain other intestinal infectious .......... 007–009
* Tuberculosis ........................................ 010–018
3 Tuberculosis of respiratory system ........ 010–012
4 Other tuberculosis .................................. 013–018
5* Whooping cough .................................. 033
6* Streptococcal sore throat, scarlatina, and erysipelas 034–035
7* Meningococcal infection ........................ 036
9* Acute poliomyelitis .............................. 045
10* Measles ........................................ 055
11* Viral hepatitis .................................. 070
12* Syphilis ......................................... 090–097
13 All other infectious and parasitic diseases . 001–003, 005,020–032,037,039–041,*042–044, 046–054,056–066,071–088,098–139
* Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues .......... 140–208
14 Malignant neoplasms of lip, oral cavity, and pharynx .................. 140–149
15 Malignant neoplasms of digestive organs and peritoneum ........... 150–159
16 Malignant neoplasms of respiratory and intrathoracic organs .......... 160–165
17 Malignant neoplasm of breast .................. 174–175
18 Malignant neoplasms of genital organs ...... 179–187
19 Malignant neoplasms of urinary organs ...... 188–189
20 Malignant neoplasms of all other and unspecified sites ............. 170–173,190–199
21 Leukemia ......................................... 204–208
22 Other malignant neoplasms of lymphatic and hematopoietic tissues ........... 200–203
23* Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature .......... 210–239
24* Diabetes mellitus ................................. 250
25* Nutritional deficiencies .......................... 260–269
26* Anemias 290–285
27* Meningitis ....................................... 320–322
Major cardiovascular diseases .................. 390–448
* Diseases of heart .................................. 390–398,402,404–429
28 Rheumatic fever and rheumatic heart disease 390–398
29 Hypertensive heart disease .................... 402
30 Hypertensive heart and renal disease .... 404
31 Ischemic heart disease ......................... 410–414
* Acute myocardial infarction .................. 410
32 Other acute and subacute forms of ischemic heart disease ........ 411
33 Angina pectoris .................................. 413
34 Old myocardial infarction and other forms of chronic ischemic heart disease ........ 412–414
35 Other diseases of endocardium .................. 424
36 All other forms of heart disease .......... 415–423,425–429
37* Hypertension with or without renal disease .... 401,403
* Cerebrovascular diseases 430–438
38 Intracerebral and other intracranial hemorrhage 431–432
39 Cerebral thrombosis and unspecified occlusion of cerebral arteries 434.0,434.9
40 Cerebral embolism ................................ 434.1
41 All other and late effects of cerebrovascular diseases .......... 430,433,435–438
42* Atherosclerosis .................................. 440
43 Other diseases of arteries, arterioles, and capillaries ............. 441–448
44* Acute bronchitis and bronchiolitis .......... 446
45 Pneumonia ........................................ 480–487
46 Influenza ......................................... 480–486
46* Influenza ........................................ 487
* Chronic obstructive pulmonary diseases and allied conditions .......... 490–496
47 Bronchitis, chronic and unspecified .......... 490–491
48 Emphysema ....................................... 492
49 Asthma ........................................... 493
50 Other chronic obstructive pulmonary diseases and allied conditions .......... 494–496
51* Ulcer of stomach and duodenum .......... 531–533
52* Appendicitis ....................................... 540–543
53* Hernia of abdominal cavity and intestinal obstruction without mention of hernia .......... 550–553,560
54* Chronic liver disease and cirrhosis .......... 571
55* Cholelithiasis and other disorders of gallbladder ...... 574–575
* Nephritis, nephrotic syndrome, and nephrosis .......... 580–589
56 Acute glomerulonephritis and nephrotic syndrome .......... 580–581
57 Chronic glomerulonephritis, nephritis and nephropathy, not specified as acute or chronic, and renal sclerosis, unspecified .......... 582–583,587
58 Renal failure, disorders resulting from impaired renal function, and small kidney of unknown cause .......... 584–586,588–589
59* Infections of kidney ......................... 590
60* Hyperplasia of prostate ......................... 600
* Complications of pregnancy, childbirth, and the puerperium ........ 630–676
61 Pregnancy with abortive outcome .......... 630–638
62 Other complications of pregnancy, childbirth, and the puerperium .......... 640–676
63* Congenital anomalies ......................... 740–759
* Certain conditions originating in the perinatal period .......... 760–779
64 Birth trauma, intrauterine hypoxia, birth asphyxia, and respiratory distress syndrome ........ 767–769
65 Other conditions originating in the perinatal period .......... 760–766,770–779
66 Symptoms, signs, and ill-defined conditions .......... 780–799
67 All other diseases ............................... 800–889
* Accidents and adverse effects .......... E800–E807
68 Motor vehicle accidents .......... E810–E825
69 All other accidents and adverse effects .......... E800–E807,E826–E949
70* Suicide .......................................... E950–E959
71* Homicide and legal intervention .......... E960–E978
72 All other external causes ........................ E980–E999

NOTE: The 37 causes designated by the asterisk can be ranked to determine leading causes of death for specified population groups. Since the development of the list of 72 selected causes of death above, two additional causes of death have been added to the list of rankable causes. HIV Infection (ICD-9 Nos. *042-*044) and Alzheimer’s disease (ICD-9 No. 331.0) are now considered rankable causes. (The asterisks appearing before the ICD-9 codes for HIV signify that these codes were added to ICD-9 after it was developed.)
The rationale for excluding “Symptoms, signs, and ill-defined conditions” and titles beginning with “Other” and “All other” is that these are not specific conditions that lend themselves to public health intervention.

**Counts** or numbers of deaths are used to identify leading causes of death. The leading cause of death is the cause with the greatest number of deaths. In 1995, heart disease was thus the leading cause of death in the U.S. (accounting for 737,563 deaths), followed by cancer (538,455 deaths).

Leading causes often vary by age and sex. Thus, when trying to identify targeted public health interventions, it is often appropriate to analyze leading cause by age and sex separately. The National Center for Health Statistics uses seven age groups in its analysis of *Leading Causes of Death by Age, Sex, Race, and Hispanic Origin: United States, 1992.* They are:

- C Less than 1 year
- C 1-4 years
- C 5-14 years
- C 15-24 years
- C 25-44 years
- C 45-64 years
- C 65 years and over.

**When should counts be used?**

While counts can be used to identify the leading causes of death in a single population, their value is limited. Counts do not help you compare the risk of death in one population with the risk in another population. For example, suppose you are interested in knowing whether males or females are more likely to die of cancer, or if your state has a greater homicide problem than nearby states in your region. In order to answer these questions, you need rates.

**What is a rate?**

A **rate** is the most common way to measure the occurrence of an event in a population. The general formula for a rate is as follows:

\[
Rate = \frac{\text{Number of events occurring during a given time period}}{\text{Population at risk during the same time period}} \times 100
\]

---

The number of events on top is known as the **numerator**; the population at risk on the bottom is referred to as the **denominator**. A percentage is the most common example of a rate. If 50 women smoke in a high school class of 100 women, then 50% of the women smoke.

Three consistent characteristics of a rate are as follows:

- **C** The counts in the numerator and denominator should cover the same time period.
- **C** The persons who experienced the events in the numerator should all be included in the denominator.
- **C** The persons in the denominator should be at “risk” for the event in the numerator. In other words, it should be possible for them to experience the event.

**What is a death rate?**

A **death rate** is a measure of the occurrence of death in a defined population during a specified time interval. The general formula for a death rate is as follows:

\[
\text{Death rate} = \frac{\text{Number of deaths during a given time period}}{\text{Number of people in the population in which the deaths occurred}} \times 1,000
\]

The **numerator** is the number of deaths that occurred during a certain time interval — usually 1 year. The **denominator** is the total number of people in the population at risk for the same period of time. The denominator is usually based on the Census, which is conducted in the U.S. every 10 years, or on population estimates for years in between census years that are available from your state health department. We multiply by 1,000 to get a number that is easier to discuss and manipulate. The rate is expressed in terms of deaths per 1,000 population.

When rates are calculated for infants, the number of live births is used as the denominator. Rates based on the number of live births are referred to as mortality rates (i.e., infant mortality rates, neonatal mortality rates, and postneonatal mortality rates).

\[
\text{Infant mortality rate} = \frac{\text{Number of deaths under one year of age during a given time period}}{\text{Number of live births during the same period}} \times 1,000
\]

**What are some specific types of death rates?**

The death rate discussed above is often called the **crude death rate**. It measures the frequency of deaths from all causes in an entire population.
Example: Crude Death Rate

The crude death rate for the United States in 1990 would be:

\[
\frac{\text{Number of deaths in the U.S. in 1990}}{\text{U.S. population in 1990}} \times 1,000
\]

Often we want to know more about who is affected by a disease, for example, whether younger or older people are most affected or which specific diseases are causing the most deaths. For this, we need a few special types of death rates.

**Age-specific death rate**

Definition: The death rate for a particular age group.

Formula: \[
\frac{\text{Number of deaths in the age group during a given time period}}{\text{Population in that age group during the time period}} \times 1,000
\]

Example: Age-specific Death Rate

The death rate for older adults, age 65-80, in Illinois in 1983 would be:

\[
\frac{\text{Number of deaths among 65-80 year olds in Illinois in 1983}}{\text{Number of 65-80 year olds in Illinois, 1983}} \times 1,000
\]

**Sex-specific death rate**

Definition: The death rate for a particular sex, either males or females.

Formula: \[
\frac{\text{Number of deaths among males (or females) during a given time period}}{\text{Population of males (or females) during the time period}} \times 1,000
\]

Example: Sex-specific Death Rate

The death rate for females in Illinois in 1991 would be:

\[
\frac{\text{Number of deaths among females in Illinois in 1991}}{\text{Number of females in Illinois, 1991}} \times 1,000
\]
Cause-specific death rate

Definition: The death rate from a specific cause for a population. The sum of all cause-specific mortality rates for a population equals the total mortality rate for that population.

Formula: \( \frac{\text{Number of deaths from a specific cause during a given time period}}{\text{Population during the time period}} \times 100,000 \)

Crude death rates and death rates by age, race, and sex (as defined above) are usually expressed per 1,000 persons in the population. When calculating cause-specific mortality rates, however, the fraction is usually multiplied by 100,000 (rather than 1,000). This is because the numbers of deaths for specific causes can be relatively small. Cause-specific rates for infants may be expressed either way — as per 1,000 or per 100,000 live births.

Example: Cause-specific Death Rate

The death rate from homicides in Illinois, 1990-1994 would be:

<table>
<thead>
<tr>
<th>( \frac{\text{Number of deaths from homicide in Illinois, 1990-1994}}{\text{Population in Illinois, 1990-1994}} \times 100,000 )</th>
</tr>
</thead>
</table>

Age-sex-cause-specific death rates are calculated by including an age-sex-specific population in the denominator and deaths due to a certain cause to persons in that age- and sex-specific group in the numerator.

Example: Age-sex-cause-specific Death Rate

The death rate from homicides for 65-80 year old females in Illinois, 1990-1994 would be:

<table>
<thead>
<tr>
<th>( \frac{\text{Number of deaths from homicide among 65-80 year old females in Illinois, 1990-1994}}{\text{Number of 65-80 year old females in Illinois, 1990-1994}} \times 100,000 )</th>
</tr>
</thead>
</table>
What happens when the numbers are small?

Occasionally, your numerators will be so small that the resulting rates become unstable or unreliable. In such cases, you may consider combining data for more than one age group or year. In the videotape, for example, the age group 15-24 was used in Helen’s analysis because there were relatively few deaths in the strictly defined teenage age group of 15-19 year olds. In addition, because there were only about 250 deaths among 15-24 year olds each year, the numbers of deaths were combined over 5 years.

One rule of thumb is to have at least 20 deaths in each cause category that you are analyzing.

How are rates used to make comparisons?

The real value of death (mortality) rates is that they enable us to compare the risk of death between different causes, different age/sex groups, different time periods, etc.

Quite often, these comparisons are expressed in terms of a rate ratio. The formula for calculating a rate ratio is as follows:

\[
\frac{X}{Y} \quad \text{or} \quad \frac{X}{Y}
\]

where:

\[
X = \text{death rate in one population}
\]
\[
Y = \text{death rate in another population}
\]

You can use this formula to compare death rates between males and females, age groups, various causes, and different time periods. The group to which the comparison is being made is always in the denominator.
Example: Comparing Death Rates

Suppose that in 1993 the overall death rate for males, ages 15-24 years, had been 141.8 per 100,000. Further suppose that the death rate for males, ages 25-44, that same year had been 258.3 per 100,000. Then the ratio of the death rate for younger males to the death rate for older males would be:

\[
\frac{141.8}{258.3} = 0.55
\]

This means that the death rate for younger males is 0.55 times that for older males, or roughly \( \frac{1}{2} \) the rate for older males. Expressed in common language, the death rate for younger males is half the death rate for older males. In this case, the older group is the group to which the comparison is being made.

What if we reversed the example and wanted to compare the rate for older males to the rate for younger males? Here, the younger group would be in the denominator and our ratio would be:

\[
\frac{258.3}{141.8} = 1.8
\]

We would then conclude that the risk of death for males ages 25-44 is 1.8 times (or nearly double) that for males ages 15-24.

What are some common mistakes in calculating rates?

1. When calculating a rate, always use the same time period in the numerator and denominator. When the numerator includes deaths for more than one year, the denominator must include the population for the same years. If the deaths in the numerator are added together for 5 years, the population in the denominator must also be added together for the same 5 years.

2. Be sure to use the same population, age group, and/or sex in both the numerator and denominator. When calculating cause-specific rates, the denominator should include the entire population while the numerator should include only deaths due to one specific cause.

3. Be sure to indicate what scale was used — usually results are per 1,000 or per 100,000.
Exercise 2: Determining Leading Causes of Death

Instructions: This exercise will give you some practice working with data on the leading causes of death, just as Helen is doing. Table 3 presents the leading causes for the adolescent population in Helen’s State, during the 5-year period 1992-1996. Use the data on Table 3 to answer the questions below.

Table 3
Selected Causes of Death, Helen’s State, 1992-96
Age 15-24

<table>
<thead>
<tr>
<th>Cause</th>
<th>Deaths</th>
<th>Rank</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suicide (E950-E959)</td>
<td>329</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unintentional injuries (E800-E949)</td>
<td>577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer (140-208)</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Disease (390-398, 402, 404-429)</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homicide (E960-E978)</td>
<td>65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congenital Anomalies (740-759)</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV infection (*042-*044)</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Deaths are 5-year totals

1. What were the 5 leading causes of death for adolescents 15-24 years of age in Helen’s State during the time period 1992-1996? In the rank column, label each cause from 1 to 5, with 1 being the leading cause of death.

2. Based on population estimates, Helen’s State had 1,559,370 residents in the 15-24 age group for the 5-year period, 1992-1996. Using this figure, calculate the age-cause-specific death (mortality) rates for each of the top 5 causes identified in Question 1 and record them on Table 3. Show your answers rounded to two decimal places.
3. What are the 5 leading causes of death based on age-cause-specific mortality rates?

4. Are your answers to Questions 1 and 3 the same or different? Why?
Exercise 3: Determining Sex Differences

*Instructions:* In this exercise, you will join Helen in examining differences in death rates between males and females. To help you, we have provided data on selected causes of death by sex in Helen’s State (Table 4). Use these data to answer the questions below.

### Table 4
Selected Causes of Death, Helen’s State, 1992-96
Age 15-24, by Sex

<table>
<thead>
<tr>
<th>Cause</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths</td>
<td>Rate</td>
<td>Deaths</td>
<td>Rate</td>
<td></td>
</tr>
<tr>
<td>Suicide (E950-E959)</td>
<td>297</td>
<td></td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unintentional injuries (E800-E949)</td>
<td>416</td>
<td></td>
<td>161</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer (140-208)</td>
<td>34</td>
<td></td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart disease (390-398, 402, 404-429)</td>
<td>18</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homicide (E960-E978)</td>
<td>49</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Deaths are 5-year totals

<table>
<thead>
<tr>
<th>Population</th>
<th>5-year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>765,720</td>
</tr>
<tr>
<td>Female</td>
<td>792,650</td>
</tr>
<tr>
<td>Total</td>
<td>1,559,370</td>
</tr>
</tbody>
</table>

1. Calculate the age-sex-cause-specific death rates for each cause of death and for both sex groups. Show your answers rounded to two decimal places. Record your answers in Table 4.
2. Is the leading cause of death the same for males and females?

3. Rank the causes of death separately for males and females. Do the causes rank in the same order?

4. Is the suicide rate greater for males or females? What is the ratio of the suicide rate for males to the suicide rate for females? How could you express this ratio in common language?

5. What is the ratio of the homicide rate for females to the homicide rate for males? How could you express this ratio in common language?
Section III. UNDERSTANDING AND PRESENTING DATA

What additional analyses can be done?

In addition to examining differences in leading causes by sex, you might also be interested in changes in leading causes over time. Comparisons with other states or the nation as a whole might also be useful.

Specific data to explain why the leading causes exist can be particularly valuable in shaping public health policies and programs. In the videotape, Jim wanted to tell the Board of Health how young people were killing themselves or being killed. As you know, specific ICD codes are employed for ranking causes of death due to Suicide and Homicide (see Figure 6). Most of these ICD codes include subcategories that provide additional detail on the way in which the suicides or homicides were committed. The complete list of subcategories and ICD codes for Suicide and Homicide is shown in Figure 7.

Another source of additional information on cause of death is the “Manner of Death” section (Item 29) of the Death Certificate. This section is used when the ICD codes are initially assigned to underlying causes of death, and is particularly important for deaths that were not due to natural causes. You may wish to refresh your memory about how this section is used by reviewing the U.S. Standard Certificate of Death (Figure 1) and/or the completed sample certificates (Figures 3-5).

How are percents helpful?

It is common practice to use a percent (%) to describe the proportion of deaths due to a specific cause (that is, those deaths assigned a specific ICD code). The formula for calculating this percent is:

\[
\frac{\text{Number of deaths from a specific cause during a given time period}}{\text{Number of deaths due to all causes during the time period}} \times 100
\]

Example: Using Percents

Suppose that in a certain population from 1992 to 1996, the number of deaths from suicide was 525, and the total number of deaths was 2,625. The percent of deaths due to suicide would be calculated using the formula:

\[
\frac{525}{2,625} = 0.20
\]

This means that 20% of the deaths from 1992 to 1996 were due to suicide.
Figure 7
Detailed ICD Codes for Suicide and Homicide

**Suicide (E950-E959)**

Suicide by solid or liquid substances (E950)
- Analgesics, antipyretics, and antirheumatics (E950.0)
- Barbiturates (E950.1)
- Other sedatives and hypnotics (E950.2)
- Tranquilizers and other psychotropic agents (E950.3)
- Other specified drugs and medicaments (E950.4)
- Unspecified drug or medicament (950.5)
- Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilizers (950.6)
- Corrosive and caustic substances (950.7)
- Arsenic and its compounds (950.8)
- Other and unspecified solid and liquid substances (950.9)

Suicide by gases in domestic use (E951)
- Gas distributed by pipeline (E951.0)
- Liquefied petroleum gas distributed in mobile containers (E951.1)
- Other utility gas (E951.8)

Suicide by other gases and vapors (E952)
- Motor vehicle exhaust gas (E952.0)
- Other carbon monoxide (E952.1)
- Other specified gases and vapors (E952.8)
- Unspecified gases and vapors (952.9)

Suicide by hanging, strangulation, and suffocation (E953)
- Hanging (E953.0)
- Suffocation by plastic bag (E953.1)
- Other specified means (E953.8)
- Unspecified means (E953.9)

Suicide by submersion (drowning) (E954)

Suicide by firearms and explosives (E955)
- Handgun (E955.0)
- Shotgun (E955.1)
- Hunting rifle (E955.2)
- Military firearms (E955.3)
- Other and unspecified firearms (E955.4)
- Explosives (E955.5)
- Unspecified (E955.9)

Suicide by cutting and piercing instruments (E956)

Suicide by jumping from high place (E957)
- Residential premises (E957.0)
- Other manmade structures (E957.1)
- Natural sites (E957.2)
- Unspecified (E957.9)

Suicide by other and unspecified means (E958)
- Jumping or lying before moving objective (E958.0)
- Burns, fire (E958.1)
- Scald (E958.2)
- Extremes of cold (E958.3)
- Electrocution (E958.4)
- Crashing of motor vehicle (E958.5)
- Crashing of aircraft (E958.6)
- Caustic substances, except poisoning (E958.7)
- Other specified means (E958.8)
- Unspecified means (E958.9)

Late effects of self-inflicted injury (E959)

**Homicide (E960-E969)**

Fight, brawl, rape (E960)
- Unarmed fight or brawl (E960.0)
- Rape (E960.1)

Assault by corrosive or caustic substance, except poisoning (E961)

Assault by poisoning (E962)
- Drugs and medicaments (E962.0)
- Other solid and liquid substances (E962.1)
- Other gases and vapors (E962.2)
- Unspecified poisoning (E962.9)

Assault by hanging and strangulation (E963)

Assault by submersion (drowning) (E964)

Assault by firearms and explosives (E965)
- Handgun (E965.0)
- Shotgun (E965.1)
- Hunting rifle (E965.2)
- Military firearms (E965.3)
- Other and unspecified firearms (E965.4)
- Antipersonnel bomb (E965.5)
- Petrol bomb (E965.6)
- Letter bomb (E965.7)
- Other specified explosive (E965.8)
- Unspecified explosive (E965.9)

Assault by cutting and piercing instrument (E966)

Child battering and other maltreatment (E967)
- By parent (E967.0)
- By other specified person (E967.1)
- By unspecified person (E967.9)

Assault by other and unspecified means (E968)
- Fire (E968.0)
- Pushing from high place (E968.1)
- Striking by blunt or thrown object (E968.2)
- Hot liquid (E968.3)
- Criminal neglect (E968.4)
- Other specified means (E968.8)
- Unspecified means (E968.9)

Late effects of injury purposely inflicted by other person (E969)
Exercise 4: Comparing Rates Over Time

Instructions: In this exercise, you will help Helen determine if any changes have occurred over the past 10 years in adolescent suicide rates in her state. Table 5 presents data for your use in answering the questions in this exercise.

Table 5
Selected Causes of Death in Helen’s State, 1987-91
Age 15-24, by Sex

<table>
<thead>
<tr>
<th>Cause</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths</td>
<td>Rate</td>
<td>Deaths</td>
<td>Rate</td>
</tr>
<tr>
<td>Suicide (E950-E959)</td>
<td>195</td>
<td>26.35</td>
<td>39</td>
<td>5.21</td>
</tr>
<tr>
<td>Unintentional injuries (E800-E949)</td>
<td>446</td>
<td>60.27</td>
<td>168</td>
<td>22.45</td>
</tr>
<tr>
<td>Cancer (140-208)</td>
<td>34</td>
<td>4.59</td>
<td>27</td>
<td>3.60</td>
</tr>
<tr>
<td>Heart Disease (390-398, 402, 404-429)</td>
<td>16</td>
<td>2.16</td>
<td>16</td>
<td>2.13</td>
</tr>
<tr>
<td>Homicide (E960-E978)</td>
<td>38</td>
<td>5.13</td>
<td>20</td>
<td>2.67</td>
</tr>
</tbody>
</table>

Note: Deaths are 5-year totals

1. What were the three leading causes of death for males 15-24 years of age during the time period 1987-1991? What were the three leading causes for females?

2. Have the three leading causes of death for male adolescents changed over the past 10 years? For females? If so, how? [Note: You will need your answers to Exercise 3 for this question.]
3. For which of the five leading causes did the risk of death for 15-24 year olds decrease between 1987-91 and 1992-96?
   a. Males:
   b. Females:

4. For which of the five leading causes did the risk of death increase for 15-24 year olds between 1987-91 and 1992-96?
   a. Males:
   b. Females:

5. Calculate the following ratios, showing your answers rounded to two decimal places.
   a. Ratio of the male homicide rate in 1987-91 to the rate in 1992-96:
   b. Ratio of the male suicide rate in 1987-1991 to the rate in 1992-96:
   c. Ratio of male to female homicide rates in 1992-96:
   d. Ratio of male to female suicide rates in 1992-96:
Exercise 5: Analyzing Causes of Death

Instructions: Now let’s look at the detailed causes of death, particularly for suicides among adolescents, to see what we can learn from available data.

Table 6
Methods of Suicide, Helen’s State, 1992-96
Age 15-24

<table>
<thead>
<tr>
<th>Methods</th>
<th>1992-1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Poison solid/liquid (E950)</td>
<td>24</td>
</tr>
<tr>
<td>Poison - gas domestic (E951)</td>
<td>0</td>
</tr>
<tr>
<td>Poison - other gas/vapor (E952)</td>
<td>20</td>
</tr>
<tr>
<td>Hanging/strangulation/suffocation (E953)</td>
<td>56</td>
</tr>
<tr>
<td>Submersion (drowning) (E954)</td>
<td>0</td>
</tr>
<tr>
<td>Firearms/explosives (E955)</td>
<td>220</td>
</tr>
<tr>
<td>Cutting/piercing (956)</td>
<td>2</td>
</tr>
<tr>
<td>Jumping (E957)</td>
<td>3</td>
</tr>
<tr>
<td>Other/unspecified (E958)</td>
<td>4</td>
</tr>
</tbody>
</table>
| Total                                        | 329       | 100

1. Calculate the percentage of suicides due to each type of method. Record your answers in Table 6. Show your work rounded to one decimal place.

2. Which two methods of suicide were used most often in 1992-96?
Exercise 6: More Analysis

Instructions: Since the overwhelming majority of suicides in Helen’s State were caused by firearms and explosives (Table 6), the next step for Helen (and you) is to look at the types of firearms and explosives being used. Suicides due to “Firearms and explosives (E955)” can be further broken down according to the ICD codes in Figure 7. Table 7 provides the data for these codes in 1992-1996.

Table 7
Types of Firearms and Explosives Used for Suicide, Helen’s State, 1992-96
Age 15-24

<table>
<thead>
<tr>
<th>Type</th>
<th>1992-1996</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Handgun (E955.0)</td>
<td>110</td>
</tr>
<tr>
<td>Shotgun (E955.1)</td>
<td>33</td>
</tr>
<tr>
<td>Hunting rifle (E955.2)</td>
<td>44</td>
</tr>
<tr>
<td>Military firearms (E955.3)</td>
<td>0</td>
</tr>
<tr>
<td>Other unspecified firearm (E955.4)</td>
<td>33</td>
</tr>
<tr>
<td>Explosives (E955.5)</td>
<td>0</td>
</tr>
<tr>
<td>Unspecified (E955.9)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>220</strong></td>
</tr>
</tbody>
</table>

1. Complete Table 7 by calculating the percent of suicides caused by each of the various types of firearms and explosives. Show your work rounded to one decimal place.

2. Which three specific types of firearms or explosives were used most often to commit suicides in 1992-96?

3. How can this information be useful for program planning?
How should these data best be presented?

Presenting data is an important part of the job for many persons in public health. Not only must you understand the data and their implications, you must also be skilled in sharing those data with others. Those “others” may include your supervisors, other public health administrators, county commissioners, members of boards of health, legislators, or even radio and television reporters. Many of these individuals may not be comfortable with data; in fact, some may suffer from “data block” and may be turned off by figures and tables.

Usually, your task will be a challenging one: to convince them of the importance of a particular health problem or to dispel myths they might have about the cause of certain health conditions. In all instances, you will be trying to “set the record straight” based on good information — frequently information based on data.

In planning your presentation, two steps are critical:

1. Deciding which results are most important to present; and
2. Choosing the most appropriate format for presenting those results.

For a presentation on the leading causes of death, the results that you present should answer the following questions:

1. What are the leading causes of death?
2. Do the causes differ by age group? By sex? By race or ethnic group?
3. Are there any significant trends over time?
4. What can be learned from comparisons with other states or with the United States as a whole?

What are some tips for presenting quantitative data?

The task of preparing a data presentation is complex and could comprise the topic of an entire course. Following a few simple rules, however, will go a long way towards an effective presentation:

1. Develop clear messages.
2. Limit your data points to those that are most important.
Display data in colorful, interesting graphics.

Make all of the graphics relate to the message.

Avoid too much data on one graph.

Intersperse data with the “human” element to personalize the statistics.

Keep the “so what?” in mind to relate all data to your main points.

**Are there any special rules for preparing tables?**

A table is a set of data arranged in rows and columns, and can be used to organize almost any quantitative information. Tables usually serve as the basis for preparing more visual displays of data, such as graphs and charts, where some of the detail may be lost.

Effective tables have the following characteristics:

- Are as simple as possible.
- Are self-explanatory.
- Use a clear and concise title.
- Have clear and concise labels for each row and column, and include the unit of measurement for the data (e.g., years, rate per 100,000).
- Show totals for rows and columns.
- Explain any codes, abbreviations, or symbols in a footnote.
- Note the source of data in a footnote (if not original data).

**What about charts?**

The simplest type of chart is a bar chart. Bars can be presented either horizontally or vertically, with the length or height of each bar proportional to the frequency of the event or to the rate.

To construct a bar chart:

- Arrange the categories that define the bars in a natural order, such as alphabetically or by increasing age, or in an order that will produce increasing or decreasing bar lengths.
- Position the bars either vertically or horizontally as you prefer.
- Make all the bars the same width.
- Make the length of bars proportional to the frequency of the event.
- Leave a space between adjacent bars, to make the bar chart easier to read.
- Code different variables by differences in bar color, shading, cross-hatching, etc., and include a legend that interprets your code.
Another common type of chart is a pie chart, so-called because it resembles a pie cut into “slices” to show the proportional contribution of each component part. Pie charts are useful for showing the component parts of a single group or variable.

Maps are a third type of chart that can help readers quickly grasp differences in rates between and among counties, states, or countries. Again, different colors or shading are often used to distinguish areas with different rates.

Figures 8-12 on the following pages were prepared using Harvard Graphics to display data on Helen’s State. They are good examples of tables, bar charts, and pie charts.
Leading causes of death:
Ages 15-24, 1992-96

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Number of deaths*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintentional injuries</td>
<td>577</td>
</tr>
<tr>
<td>Suicide</td>
<td>329</td>
</tr>
<tr>
<td>Homicide</td>
<td>65</td>
</tr>
<tr>
<td>Cancer</td>
<td>56</td>
</tr>
<tr>
<td>Heart disease</td>
<td>26</td>
</tr>
</tbody>
</table>

* Number of deaths to persons 15-24 years of age for the five years from 1992-96 for each cause of death
Figure 9

Leading causes of death for males and females:
Ages 15-24, 1992-96

<table>
<thead>
<tr>
<th>Cause</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintentional injuries</td>
<td>54.3</td>
<td>20.3</td>
<td>37.0</td>
</tr>
<tr>
<td>Suicide</td>
<td>38.8</td>
<td>4.0</td>
<td>21.1</td>
</tr>
<tr>
<td>Homicide</td>
<td>6.4</td>
<td>2.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Cancer</td>
<td>4.4</td>
<td>2.8</td>
<td>3.6</td>
</tr>
<tr>
<td>Heart disease</td>
<td>2.3</td>
<td>1.0</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Deaths per 100,000 persons aged 15-24 years
Figure 10

Leading causes of death:
Ages 15-24

Deaths per 100,000 persons aged 15-24 years

<table>
<thead>
<tr>
<th>Cause</th>
<th>1987-91</th>
<th>1992-96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unintentional injuries</td>
<td>41.3</td>
<td>37.0</td>
</tr>
<tr>
<td>Suicide</td>
<td>15.7</td>
<td>21.1</td>
</tr>
<tr>
<td>Homicide</td>
<td>3.9</td>
<td>4.2</td>
</tr>
<tr>
<td>Cancer</td>
<td>4.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Heart disease</td>
<td>2.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Deaths from suicide by method:
Ages 15-24, 1992-96

Poisoning:
Solid or liquid 7% (24)
Gases and vapors 6% (20)

Hanging and suffocation 17% (56)

All other means 3% (9)

Firearms 67% (220)

Total: 329 deaths by suicide
Deaths from homicide by method:

- Firearms 66% (43)
- Sharp instruments 23% (15)
- All other means 11% (7)

Total: 65 deaths by homicide
Exercise 7: Analyzing Past Presentations

Instructions: Answer the following questions about presentations you have made in the past.

1. Think about a good experience you have had lately in making a presentation or a good presentation that you have heard.
   
   a. What was the purpose of the presentation?
   
   b. Who was the audience?
   
   c. Why was it so good, and how did you know?
   
   d. What could you have done to make the presentation even better?

2. Now think back to one of your “worst” experiences in making presentations or one of the worst one’s you have heard - as painful as it may be!
   
   a. What was the purpose of the presentation?
   
   b. Who was the audience?
   
   c. Why was it so bad, and how did you know?
   
   d. What could you have done to improve the presentation?
Exercise 8: Planning a Presentation

Instructions: In this exercise, you will outline Helen’s presentation to the Board of Health. Use the following questions and Helen’s graphs to guide your work.

1. What is the purpose of your presentation? What do you want to accomplish?

2. What major points do you wish to make?

3. What data will help you make your major points and accomplish your purpose?

4. What method will you use for sharing those data (tables, bar charts, etc.)? Feel free to use and/or adapt Helen’s graphs to suit your needs.

5. How will you capture the Board’s attention? How will you keep their attention?

6. What types of questions do you anticipate from the Board? What will be your responses to these hypothetical questions?

Now return to the videotape to view Act 4, which concludes Module 1.