

module 1

LEADING CAUSES OF DEATH

DEATH CERTIFICATES

leading causes of death

mortality data

$$\frac{\text{DEATHS}}{\text{POPULATION}} \times 100,000$$

TEEN PREGNANCY

pregnancy rate

birth rate

SMOKING AND HEALTH

population-based surveys

prevalence rate

deaths due to smoking

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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:

- 7 Define population-based data.
- 7 Explain data typically included on a death certificate, and discuss the value and limitations of those data.
- 7 Explain ICD codes.
- 7 Describe the difference between numbers of deaths (counts) and death rates.
- 7 Identify and analyze leading causes of death.
- 7 Calculate general death rates and specific types of death rates, including age-specific, cause-specific and sex-specific death rates.
- 7 Use rates to examine differences in causes of death by sex.
- 7 Analyze changes in rates over time (trends) and changes in underlying causes over time.
- 7 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)

- 7 Sex (2), Age (5a), and Birthplace (7)
- 7 Marital Status (10)
- 7 Residence (13 a-f)
- 7 Hispanic Origin (14) and Race (15)
- 7 Occupation (12a) and Education (16).

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Information about the cause of death includes:

- 7 Date of Death (3) and Place of Death (9a)
- 7 Immediate Cause and Underlying Cause of Death (27, Part I) and Other Significant Conditions (27, Part II)
- 7 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.

- 7 **Immediate cause of death** - the final disease or condition that resulted in death (listed on the first line of Part I).
- 7 **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).
- 7 **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).
- 7 **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

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.		Approximate Interval Between Onset and Death
IMMEDIATE CAUSE (Final disease or condition resulting in death) →	a. <u>Pneumocystis carinii pneumonia</u> DUE TO (OR AS A CONSEQUENCE OF):	2 weeks
Sequentially list conditions, if any, leading to immediate cause. Enter UNDERLYING CAUSE (Disease or injury that initiated events resulting in death) LAST	b. <u>Acquired immunodeficiency syndrome</u> DUE TO (OR AS A CONSEQUENCE OF):	17 months
	c. <u>HIV infection</u> DUE TO (OR AS A CONSEQUENCE OF):	Over 17 months
	d.	
PART II. Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.		
CAUSE OF DEATH		28a. WAS AN AUTOPSY PERFORMED? (Yes or no) No
		28b. WERE AUTOPSY FINDINGS AVAILABLE PRIOR TO COMPLETION OF CAUSE OF DEATH? (Yes or no)
29. MANNER OF DEATH <input checked="" type="checkbox"/> Natural <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Accident <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be Determined <input type="checkbox"/> Homicide	30a. DATE OF INJURY (Month, Day, Year) 30b. TIME OF INJURY M	30c. INJURY AT WORK? (Yes or no) 30d. DESCRIBE HOW INJURY OCCURRED
30e. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify)		30f. LOCATION (Street and Number or Rural Route Number, City or Town, State)

¹ US Department of Health and Human Services. Physicians' Handbook on Medical Certification of Death. Hyattsville, MD: National Center for Health Statistics, Public Health Service, US Department of Health and Human Services, Reprinted from 1987.

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What are ICD codes?

The International Classification of Diseases (ICD), published by the World Health Organization (WHO),² 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:

- 7 Each-Cause List (a listing of all valid causes based on the ICD).
- 7 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).
- 7 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.).
- 7 List of 61 Selected Causes of Infant Death (designed especially for presentation of causes relevant to infant deaths under 1 year of age).
- 7 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).

² World Health Organization. Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death, based on the recommendations of the Ninth Revision Conference, 1975. Geneva: World Health Organization, 1977.

**Table 1
ICD Chapters Used in Coding Causes of Death**

Chapters Based on Diseases	
I.	Infectious and Parasitic Diseases (001.0-139.8)
II.	Neoplasms (140.0-239.9)
III.	Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders (240.0-279.9)
IV.	Diseases of Blood and Blood-Forming Organs (280-289.9)
V.	Mental Disorders (290.0-319)
VI.	Diseases of the Nervous System and Sense Organs (320.0-389.9)
VII.	Diseases of the Circulatory System (390-459.9)
VIII.	Diseases of the Respiratory System (460-519.9)
IX.	Diseases of the Digestive System (520.0-579.9)
X.	Diseases of the Genitourinary System (580.0-629.9)
XI.	Complications of Pregnancy, Childbirth and the Puerperium (630-676.9)
XII.	Diseases of the Skin and Subcutaneous Tissue (680.0-709.9)
XIII.	Diseases of the Musculoskeletal System and Connective Tissue (710.0-739.9)
XIV.	Congenital Anomalies (740.0-759.9)
XV.	Certain Conditions Originating in the Perinatal Period (760.0-779.9)
XVI.	Symptoms, Signs and Ill-Defined Conditions (780.0-799.9)
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 or Purposely Inflicted (E980-E989)
	Injury Resulting from Operations of War (E990-E999)

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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 2
Death Certificate Information**

Questions	Robert Wilson	Harold Barstow	Sharon Black
What was the decedent's: a. Age b. Place of death c. Marital status d. Occupation e. Education			
What was the immediate cause of death?			
What was the intermediate cause of death, if any?			
What was the underlying cause of death?			
Were there any other contributing causes of death?			
What was the manner of death?			
What additional information is provided under " Describe how injury occurred "?			

Figure 3

**U.S. STANDARD
CERTIFICATE OF DEATH**

LOCAL FILE NUMBER _____ STATE FILE NUMBER _____

1. DECEDENT'S NAME (First, Middle, Last) Robert Louis Wilson		2. SEX M	3. DATE OF DEATH (Month, Day, Year) Jan. 11, 1997
4. SOCIAL SECURITY NUMBER 151-40-4331	5a. AGE—Last Birthday (Years) 16	5b. UNDER 1 YEAR Months: _____ Days: _____	5c. UNDER 1 DAY Hours: _____ Minutes: _____
6. DATE OF BIRTH (Month, Day, Year) Feb. 19, 1980		7. BIRTHPLACE (City and State or Foreign Country) San Antonio, TX	
8. WAS DECEDENT EVER IN U.S. ARMED FORCES? (Yes or no) No		9a. PLACE OF DEATH (Check only one; see instructions on other side) HOSPITAL: <input type="checkbox"/> Inpatient <input type="checkbox"/> ER/Outpatient <input checked="" type="checkbox"/> DOA OTHER: <input type="checkbox"/> Nursing Home <input type="checkbox"/> Residence <input type="checkbox"/> Other (Specify) _____	
9b. FACILITY NAME (If not institution, give street and number) St. Joseph's Hospital		9c. CITY, TOWN, OR LOCATION OF DEATH Maplewood	9d. COUNTY OF DEATH Sears
10. MARITAL STATUS—Married, Never Married, Widowed, Divorced (Specify) Never Married	11. SURVIVING SPOUSE (If wife, give maiden name)	12a. DECEDENT'S USUAL OCCUPATION (Give kind of work done during most of working life. Do not use retired.) Student	12b. KIND OF BUSINESS/INDUSTRY High School
13a. RESIDENCE—STATE MD	13b. COUNTY Sears	13c. CITY, TOWN, OR LOCATION Maplewood	13d. STREET AND NUMBER 1256 Harvard Street
13e. INSIDE CITY LIMITS? (Yes or no) Yes	13f. ZIP CODE 19068	14. WAS DECEDENT OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.) <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Specify: _____	15. RACE—American Indian, Black, White, etc. (Specify) White
16. DECEDENT'S EDUCATION (Specify only highest grade completed) 10		17. FATHER'S NAME (First, Middle, Last) Ronald Lee Wilson	
18. MOTHER'S NAME (First, Middle, Maiden Surname) 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 19068		20a. METHOD OF DISPOSITION <input checked="" type="checkbox"/> Burial <input type="checkbox"/> Cremation <input type="checkbox"/> Removal from State <input type="checkbox"/> Donation <input type="checkbox"/> Other (Specify) _____	
20b. PLACE OF DISPOSITION (Name of cemetery, crematory, or other place) Evergreen Cemetery		20c. LOCATION—City or Town, State Vincetown, MD 18825	
21a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH <i>Vincent Ronald</i>		21b. LICENSE NUMBER (of Licensee) FN10787	22. NAME AND ADDRESS OF FACILITY Rinaldi Funeral Home First Street, Vincetown, MD
23a. To the best of my knowledge, death occurred at the time, date, and place stated. Signature and Title: _____		23b. LICENSE NUMBER	23c. DATE SIGNED (Month, Day, Year)
24. TIME OF DEATH 11:40 pm		25. DATE PRONOUNCED DEAD (Month, Day, Year)	
26. WAS CASE REFERRED TO MEDICAL EXAMINER/CORONER? (Yes or no) 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) → Cerebral Hemorrhage		Approximate Interval Between Onset and Death 30 min.	
DUE TO (OR AS A CONSEQUENCE OF): Fractured Skull		30 min.	
DUE TO (OR AS A CONSEQUENCE OF): Automobile Accident		30 min.	
DUE TO (OR AS A CONSEQUENCE OF):			
PART II. Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.		28a. WAS AN AUTOPSY PERFORMED? (Yes or no) Yes	
		28b. WERE AUTOPSY FINDINGS AVAILABLE PRIOR TO COMPLETION OF CAUSE OF DEATH? (Yes or no) Yes	
29. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Pending Investigation <input checked="" type="checkbox"/> Accident <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be Determined <input type="checkbox"/> Homicide	30a. DATE OF INJURY (Month, Day, Year) Jan. 11, 1997	30b. TIME OF INJURY 11:10 pm	30c. INJURY AT WORK? (Yes or no) No
30d. DESCRIBE HOW INJURY OCCURRED Driver in auto-auto collision		30e. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify) City Street	
30f. LOCATION (Street and Number or Rural Route Number, City or Town, State) Eleventh and Ash Streets, Maplewood, MD		31a. CERTIFIER (Check only one) <input type="checkbox"/> CERTIFYING PHYSICIAN (Physician certifying cause of death when another physician has pronounced death and completed Item 23) To the best of my knowledge, death occurred due to the cause(s) and manner as stated. <input type="checkbox"/> PRONOUNCING AND CERTIFYING PHYSICIAN (Physician both pronouncing death and certifying to cause of death) To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner as stated. <input checked="" type="checkbox"/> MEDICAL EXAMINER/CORONER On the basis of examination and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner as stated.	
31b. SIGNATURE AND TITLE OF CERTIFIER <i>Melvin Hightower, M.D. Deputy M.E.</i>		31c. LICENSE NUMBER ME87560	31d. 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 410 High St. Vincetown, 18823 MD		33. REGISTRAR'S SIGNATURE <i>Kenneth A. Zappel</i>	
34. DATE FILED (Month, Day, Year) January 15, 1997			

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Figure 4

**U.S. STANDARD
CERTIFICATE OF DEATH**

LOCAL FILE NUMBER _____ STATE FILE NUMBER _____

1. DECEDENT'S NAME (First, Middle, Last) Harold Douglas Barstow

2. SEX M **3. DATE OF DEATH (Month, Day, Year)** Jan. 18, 1997

4. SOCIAL SECURITY NUMBER 238-37-5661 **5a. AGE—Last Birthday (Years)** 15 **5b. UNDER 1 YEAR** Months _____ Days _____ **5c. UNDER 1 DAY** Hours _____ Minutes _____ **6. DATE OF BIRTH (Month, Day, Year)** Jan. 17, 1982 **7. BIRTHPLACE (City and State or Foreign Country)** Florence, MD

8. WAS DECEDENT EVER IN U.S. ARMED FORCES? (Yes or no) No **9a. PLACE OF DEATH (Check only one; see instructions on other side)**
HOSPITAL: Inpatient ER/Outpatient DOA **OTHER:** Nursing Home Residence Other (Specify) _____

9b. FACILITY NAME (If not institution, give street and number) County General **9c. CITY, TOWN, OR LOCATION OF DEATH** Florence **9d. COUNTY OF DEATH** Clarke

10. MARITAL STATUS—Married, Never Married, Widowed, Divorced (Specify) Never Married **11. SURVIVING SPOUSE (If wife, give maiden name)** _____ **12a. DECEDENT'S USUAL OCCUPATION (Give kind of work done during most of working life. Do not use retired.)** Student **12b. KIND OF BUSINESS/INDUSTRY** High School

13a. RESIDENCE—STATE MD **13b. COUNTY** Clarke **13c. CITY, TOWN, OR LOCATION** Florence **13d. STREET AND NUMBER** 3129 Discus Drive

13e. INSIDE CITY LIMITS? (Yes or no) Yes **13f. ZIP CODE** 19867 **14. WAS DECEDENT OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.)** No Yes Yes **15. RACE—American Indian, Black, White, etc. (Specify)** White **16. DECEDENT'S EDUCATION (Specify only highest grade completed)** Elementary/Secondary (0-12) 9 College (1-4 or 5+)

17. FATHER'S NAME (First, Middle, Last) Richard Douglas Barstow **18. MOTHER'S NAME (First, Middle, Maiden Surname)** Lillian Elaine Street

19a. INFORMANT'S NAME (Type/Print) Lillian Barstow **19b. MAILING ADDRESS (Street and Number or Rural Route Number, City or Town, State, Zip Code)** 3129 Discus Dr., Florence, MD 19867

20a. METHOD OF DISPOSITION Burial Cremation Removal from State Donation Other (Specify) _____ **20b. PLACE OF DISPOSITION (Name of cemetery, crematory, or other place)** Hillside Cemetery **20c. LOCATION—City or Town, State** Florence, MD

21a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH Reba McIntyre **21b. LICENSE NUMBER (of Licensee)** FN20886 **22. NAME AND ADDRESS OF FACILITY** Hillside Crematory 110 Canal Rd., Florence, MD 19868

23a. To the best of my knowledge, death occurred at the time, date, and place stated. **23b. LICENSE NUMBER** RES96997 **23c. DATE SIGNED (Month, Day, Year)** Jan. 18, 1997
Signature and Title *Lillian E. Barstow, M.D.*

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? (Yes or no)** 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)	a. Cerebral Hemorrhage	Approximate Interval Between Onset and Death
	DUE TO (OR AS A CONSEQUENCE OF):	2 hours
	Gunshot wound, head	2 hours
	DUE TO (OR AS A CONSEQUENCE OF):	
	DUE TO (OR AS A CONSEQUENCE OF):	
	DUE TO (OR AS A CONSEQUENCE OF):	

Sequentially list conditions, if any, leading to immediate cause. Enter UNDERLYING CAUSE (Disease or injury that initiated events resulting in death) LAST

PART II. Other significant conditions contributing to death but not resulting in the underlying cause given in Part I.

28a. WAS AN AUTOPSY PERFORMED? (Yes or no) Yes **28b. WERE AUTOPSY FINDINGS AVAILABLE PRIOR TO COMPLETION OF CAUSE OF DEATH? (Yes or no)** Yes

29. MANNER OF DEATH Natural Pending Investigation Suicide Accident Could not be Determined Homicide

30a. DATE OF INJURY (Month, Day, Year) Jan. 18, 1997 **30b. TIME OF INJURY** 2:00pm **30c. INJURY AT WORK? (Yes or no)** No **30d. DESCRIBE HOW INJURY OCCURRED** Bullet wound to right side of head; self-inflicted with handgun

30e. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify) At home **30f. LOCATION (Street and Number or Rural Route Number, City or Town, State)** 3129 Discus Dr., Florence, MD

31a. CERTIFIER (Check only one) CERTIFYING PHYSICIAN (Physician certifying cause of death when another physician has pronounced death and completed Item 23) PRONOUNCING AND CERTIFYING PHYSICIAN (Physician both pronouncing death and certifying to cause of death) MEDICAL EXAMINER/CORONER (On the basis of examination and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner as stated.)

31b. SIGNATURE AND TITLE OF CERTIFIER James Marvel, MD, Medical Examiner **31c. LICENSE NUMBER** ME19881 **31d. DATE SIGNED (Month, Day, Year)** Jan. 19, 1997

32. NAME AND ADDRESS OF PERSON WHO COMPLETED CAUSE OF DEATH (ITEM 27) (Type/Print) James Marvel, MD, Clarke County Court House, Florence, MD

33. REGISTRAR'S SIGNATURE Steve Richard **34. DATE FILED (Month, Day, Year)** Jan. 22, 1997

Figure 5

**U.S. STANDARD
CERTIFICATE OF DEATH**

TYPE/PRINT IN PERMANENT BLACK INK FOR INSTRUCTIONS SEE OTHER SIDE AND HANDBOOK

LOCAL FILE NUMBER STATE FILE NUMBER

1. DECEDENT'S NAME (First, Middle, Last) Sharon Louise Black		2. SEX F	3. DATE OF DEATH (Month, Day, Year) Feb. 6, 1997
4. SOCIAL SECURITY NUMBER 138-48-5206	5a. AGE—Last Birthday (Years) 19	5b. UNDER 1 YEAR Months: _____ Days: _____	5c. UNDER 1 DAY Hours: _____ Minutes: _____
6. DATE OF BIRTH (Month, Day, Year) Dec. 20, 1977		7. BIRTHPLACE (City and State or Foreign Country) Camden, N.J.	
8. WAS DECEDENT EVER IN U.S. ARMED FORCES? (Yes or no) No		9a. PLACE OF DEATH (Check only one; see instructions on other side) <input type="checkbox"/> HOSPITAL: <input checked="" type="checkbox"/> Inpatient <input type="checkbox"/> ER/Outpatient <input type="checkbox"/> DOA <input type="checkbox"/> OTHER: <input type="checkbox"/> Nursing Home <input type="checkbox"/> Residence <input type="checkbox"/> Other (Specify)	
9b. FACILITY NAME (If not institution, give street and number) Shore Memorial Hospital		9c. CITY, TOWN, OR LOCATION OF DEATH Eastport	9d. COUNTY OF DEATH Pitt
10. MARITAL STATUS—Married, Never Married, Widowed, Divorced (Specify) Never Married	11. SURVIVING SPOUSE (If wife, give maiden name)	12a. DECEDENT'S USUAL OCCUPATION (Give kind of work done during most of working life. Do not use retired.) Sales Clerk	12b. KIND OF BUSINESS/INDUSTRY Convenience Store
13a. RESIDENCE—STATE MD	13b. COUNTY Pitt	13c. CITY, TOWN, OR LOCATION Randallstown	13d. STREET AND NUMBER Apt 206, 108 Grant Street
13e. INSIDE CITY LIMITS? (Yes or no) Yes	13f. ZIP CODE 20381	14. WAS DECEDENT OF HISPANIC ORIGIN? (Specify No or Yes—If yes, specify Cuban, Mexican, Puerto Rican, etc.) No	15. RACE—American Indian, Black, White, etc. (Specify) Black
16. DECEDENT'S EDUCATION (Specify only highest grade completed) Elementary/Secondary (0-12) College (1-4 or 5+)		17. FATHER'S NAME (First, Middle, Last)	
18. MOTHER'S NAME (First, Middle, Maiden Surname) Sara Hope Nugent		19a. INFORMANT'S NAME (Type/Print) Shelly Harper	
19b. MAILING ADDRESS (Street and Number or Rural Route Number, City or Town, State, Zip Code) 108 Grant St., Apt. 206, Randallstown, MD 18007		20a. METHOD OF DISPOSITION <input type="checkbox"/> Burial <input type="checkbox"/> Cremation <input checked="" type="checkbox"/> Removal from State <input type="checkbox"/> Donation <input type="checkbox"/> Other (Specify)	
20b. PLACE OF DISPOSITION (Name of cemetery, crematory, or other place) Wiggins Funeral Home		20c. LOCATION—City or Town, State Camden, N.J.	
21a. SIGNATURE OF FUNERAL SERVICE LICENSEE OR PERSON ACTING AS SUCH <i>George Walker</i>		21b. LICENSE NUMBER (of Licensee) FN 08777	22. NAME AND ADDRESS OF FACILITY Hines Funeral Home 6400 8th Street, Eastport, MD 17525
23a. To the best of my knowledge, death occurred at the time, date, and place stated. Signature and Title <i>Hazel O. Watkins, M.D.</i>		23b. LICENSE NUMBER RES 96401	23c. DATE SIGNED (Month, Day, Year) Feb. 6, 1997
24. TIME OF DEATH 6:40am		25. DATE PRONOUNCED DEAD (Month, Day, Year) Feb. 6, 1997	
26. WAS CASE REFERRED TO MEDICAL EXAMINER/CORONER? (Yes or no) 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) Pulmonary hemorrhage		Approximate Interval Between Onset and Death 15 hrs	
a. DUE TO (OR AS A CONSEQUENCE OF): Stab wound of lung		15 hrs	
b. DUE TO (OR AS A CONSEQUENCE OF):			
c. DUE TO (OR AS A CONSEQUENCE OF):			
d. DUE TO (OR AS A CONSEQUENCE OF):			
PART II. Other significant conditions contributing to death but not resulting in the underlying cause given in Part I. Several stab wounds of abdomen		28a. WAS AN AUTOPSY PERFORMED? (Yes or no) Yes	28b. WERE AUTOPSY FINDINGS AVAILABLE PRIOR TO COMPLETION OF CAUSE OF DEATH? (Yes or no) Yes
29. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Accident <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be Determined <input checked="" type="checkbox"/> Homicide	30a. DATE OF INJURY (Month, Day, Year) Feb. 5, 1997	30b. TIME OF INJURY 3:35pm	30c. INJURY AT WORK? (Yes or no) No
30d. DESCRIBE HOW INJURY OCCURRED Stabbed by a sharp instrument		30e. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify) Alley	
30f. LOCATION (Street and Number or Rural Route Number, City or Town, State) 331- 333 Euclid, Eastport, MD 17526		31a. CERTIFIER (Check only one) <input type="checkbox"/> CERTIFYING PHYSICIAN (Physician certifying cause of death when another physician has pronounced death and completed Item 23) To the best of my knowledge, death occurred due to the cause(s) and manner as stated. <input type="checkbox"/> PRONOUNCING AND CERTIFYING PHYSICIAN (Physician both pronouncing death and certifying to cause of death) To the best of my knowledge, death occurred at the time, date, and place, and due to the cause(s) and manner as stated. <input checked="" type="checkbox"/> MEDICAL EXAMINER/CORONER On the basis of examination and/or investigation, in my opinion, death occurred at the time, date, and place, and due to the cause(s) and manner as stated.	
31b. SIGNATURE AND TITLE OF CERTIFIER <i>Otis Brown, M.D. M.E.</i>		31c. LICENSE NUMBER ME 15083	31d. DATE SIGNED (Month, Day, Year) Feb. 7, 1997
32. NAME AND ADDRESS OF PERSON WHO COMPLETED CAUSE OF DEATH (ITEM 27) (Type/Print) Otis Brown, MD 6500 Rouse Blvd., Eastport, MD 17525			
33. REGISTRAR'S SIGNATURE <i>Carol Friedman</i>			34. DATE FILED (Month, Day, Year) Feb. 8, 1997

DEPARTMENT OF HEALTH AND HUMAN SERVICES — NATIONAL CENTER FOR HEALTH STATISTICS — 1989 REVISION

NAME OF DECEDENT: For use by physician or institution

SEE INSTRUCTIONS ON OTHER SIDE

SEE DEFINITION ON OTHER SIDE

PRONOUNCING PHYSICIAN ONLY

ITEMS 24-26 MUST BE COMPLETED BY PERSON WHO PRONOUNCES DEATH

SEE INSTRUCTIONS ON OTHER SIDE

CAUSE OF DEATH

SEE DEFINITION ON OTHER SIDE

CERTIFIER

REGISTRAR

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*.³ 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:

- 7 "Major cardiovascular diseases,"
- 7 "Symptoms, signs, and ill-defined conditions," and
- 7 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.

³ Gardner, P, Rosenberg HM, Wilson RW. Leading causes of death by age, sex, race, and hispanic origin: United States, 1992. National Center for Health Statistics. Vital Health Stat 20(29). 1996.

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

1*	Shigellosis and amebiasis	004,006	39	Cerebral thrombosis and unspecified occlusion of cerebral arteries	434,0,434.9
2	Certain other intestinal infections	007-009	40	Cerebral embolism	434.1
*	Tuberculosis	.010-018	41	All other and late effects of cerebrovascular diseases	430,433,435-438
3	Tuberculosis of respiratory system	010-012	42*	Atherosclerosis	.440
4	Other tuberculosis	013-018	43	Other diseases of arteries, arterioles, and capillaries	441-448
5*	Whooping cough	033	44*	Acute bronchitis and bronchiolitis.	466
6*	Streptococcal sore throat, scarlatina, and erysipelas	034-035	*	Pneumonia and influenza	480-487
7*	Meningococcal infection	036	45	Pneumonia	480-486
8*	Septicemia	038	46	Influenza	487
9*	Acute poliomyelitis	045	*	Chronic obstructive pulmonary diseases and allied conditions	490-496
10*	Measles	055	47	Bronchitis, chronic and unspecified	490-491
11*	Viral hepatitis	070	48	Emphysema.	.492
12*	Syphilis	090-097	49	Asthma	493
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	50	Other chronic obstructive pulmonary diseases and allied conditions	494-496
*	Malignant neoplasms, including neoplasms of lymphatic and hematopoietic tissues.	140-208	51*	Ulcer of stomach and duodenum	531-533
14	Malignant neoplasms of lip, oral cavity, and pharynx.	140-149	52*	Appendicitis	540-543
15	Malignant neoplasms of digestive organs and peritoneum	150-159	53*	Hernia of abdominal cavity and intestinal obstruction without mention of hernia	550-553,560
16	Malignant neoplasms of respiratory and intrathoracic organs	160-165	54*	Chronic liver disease and cirrhosis	571
17	Malignant neoplasm of breast	174-175	55*	Cholelithiasis and other disorders of gallbladder	574-575
18	Malignant neoplasms of genital organs	179-187	*	Nephritis, nephrotic syndrome, and nephrosis	580-589
19	Malignant neoplasms of urinary organs	188-189	56	Acute glomerulonephritis and nephrotic syndrome	580-581
20	Malignant neoplasms of all other and unspecified sites	170-173,190-199	57	Chronic glomerulonephritis, nephritis and nephropathy, not specified as acute or chronic, and renal sclerosis, unspecified	582-583,587
21	Leukemia	204-208	58	Renal failure, disorders resulting from impaired renal function, and small kidney of unknown cause	584-586,588-589
22	Other malignant neoplasms of lymphatic and hematopoietic tissues	200-203	59*	Infections of kidney	590
23*	Benign neoplasms, carcinoma in situ, and neoplasms of uncertain behavior and of unspecified nature	210-239	60*	Hyperplasia of prostate	600
24*	Diabetes mellitus	250	*	Complications of pregnancy, childbirth, and the puerperium	630-676
25*	Nutritional deficiencies	260-269	61	Pregnancy with abortive outcome	630-638
26*	Anemias	280-285	62	Other complications of pregnancy, childbirth, and the puerperium	640-676
27*	Meningitis	320-322	63*	Congenital anomalies	740-759
	Major cardiovascular diseases	390-448	*	Certain conditions originating in the perinatal period	760-779
*	Diseases of heart	390-398,402,404-429	64	Birth trauma, intrauterine hypoxia, birth asphyxia, and respiratory distress syndrome	767-769
28	Rheumatic fever and rheumatic heart disease	390-398	65	Other conditions originating in the perinatal period	760-766,770-779
29	Hypertensive heart disease.	402	66	Symptoms, signs, and ill-defined conditions	780-799
30	Hypertensive heart and renal disease.	404	67	All other diseases	.Residual
	Ischemic heart disease.	410-414	*	Accidents and adverse effects	E800-E949
31	Acute myocardial infarction	410	68	Motor vehicle accidents	E810-E825
32	Other acute and subacute forms of ischemic heart disease	411	69	All other accidents and adverse effects	E800-E807,E826-E949
33	Angina pectoris	413	70*	Suicide	E950-E959
34	Old myocardial infarction and other forms of chronic ischemic heart disease	412,414	71*	Homicide and legal intervention	E960-E978
35	Other diseases of endocardium	424	72	All other external causes	E980-E999
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			

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*.⁴ They are:

- 7 Less than 1 year
- 7 1-4 years
- 7 5-14 years
- 7 15-24 years
- 7 25-44 years
- 7 45-64 years
- 7 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:

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

⁴ Gardner, P, Rosenberg HM, Wilson RW. Leading causes of death by age, sex, race, and hispanic origin: United States, 1992. National Center for Health Statistics. Vital Health Stat 20(29). 1996.

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:

- 7 The counts in the numerator and denominator should cover the same time period.
- 7 The persons who experienced the events in the numerator should all be included in the denominator.
- 7 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.

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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:

$$\frac{\text{Number of deaths from homicide in Illinois, 1990-1994}}{\text{Population in Illinois, 1990-1994}} \times 100,000$$

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:

$$\frac{\text{Number of deaths from homicide among 65-80 year old females in Illinois, 1990-1994}}{\text{Number of 65-80 year old females in Illinois, 1990-1994}} \times 100,000$$

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:

$$X \div Y \quad \text{or} \quad \frac{X}{Y}$$

where:

X = death rate in one population

Y = 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:

$$141.8 \div 258.3 = 0.55$$

This means that the death rate for younger males is 0.55 times that for older males, or roughly ½ 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:

$$258.3 \div 141.8 = 1.8$$

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?

- § 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.
- § 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.
- § Be sure to indicate what scale was used — usually results are per 1,000 or per 100,000.

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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

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

Cause	Males		Females	
	Deaths	Rate	Deaths	Rate
Suicide (E950-E959)	297		32	
Unintentional injuries (E800-E949)	416		161	
Cancer (140-208)	34		22	
Heart disease (390-398, 402, 404-429)	18		8	
Homicide (E960-E978)	49		16	
Note: Deaths are 5-year totals				

Population	5-year Total
Male	765,720
Female	792,650
Total	1,559,370

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?

***Before you go any further,
be sure to view Act 3 of the videotape.***

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:

$$525 \div 2,625 = 0.20$$

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

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

Methods	1992-1996	
	Number	%
Poison solid/liquid (E950)	24	
Poison - gas domestic (E951)	0	
Poison - other gas/vapor (E952)	20	
Hanging/strangulation/suffocation (E953)	56	
Submersion (drowning) (E954)	0	
Firearms/explosives (E955)	220	
Cutting/piercing (956)	2	
Jumping (E957)	3	
Other/unspecified (E958)	4	
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

Type	1992-1996	
	Number	%
Handgun (E955.0)	110	
Shotgun (E955.1)	33	
Hunting rifle (E955.2)	44	
Military firearms (E955.3)	0	
Other unspecified firearm (E955.4)	33	
Explosives (E955.5)	0	
Unspecified (E955.9)	0	
Total	220	100

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:

- 7 deciding which results are most important to present; and
- 7 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:

- § What are the leading causes of death?
- § Do the causes differ by age group? By sex? By race or ethnic group?
- § Are there any significant trends over time?
- § 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:

- § Develop clear messages.
- § 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:

- 7 Are as simple as possible.
- 7 Are self-explanatory.
- 7 Use a clear and concise title.
- 7 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).
- 7 show totals for rows and columns.
- 7 Explain any codes, abbreviations, or symbols in a footnote.
- 7 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:

- 7 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.
- 7 Position the bars either vertically or horizontally as you prefer.
- 7 Make all the bars the same width.
- 7 Make the length of bars proportional to the frequency of the event.
- 7 Leave a space between adjacent bars, to make the bar chart easier to read.
- 7 Code different variables by differences in bar color, shading, cross-hatching, etc., and include a legend that interprets your code.

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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.

Figure 8

Leading causes of death: Ages 15-24, 1992-96	
<i>Cause of death</i>	<i>Number of deaths*</i>
Unintentional injuries	577
Suicide	329
Homicide	65
Cancer	56
Heart disease	26

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

Figure 9

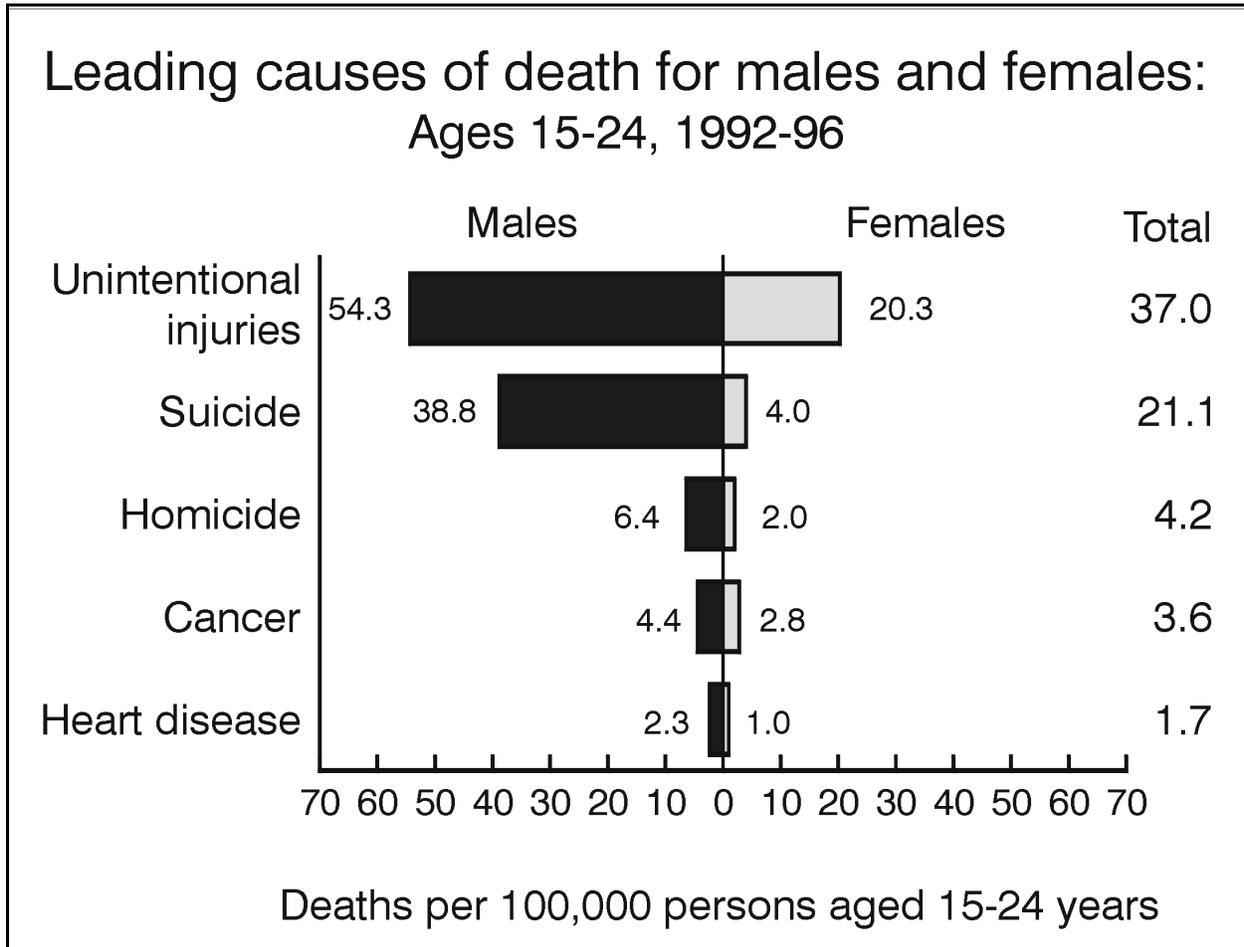


Figure 10

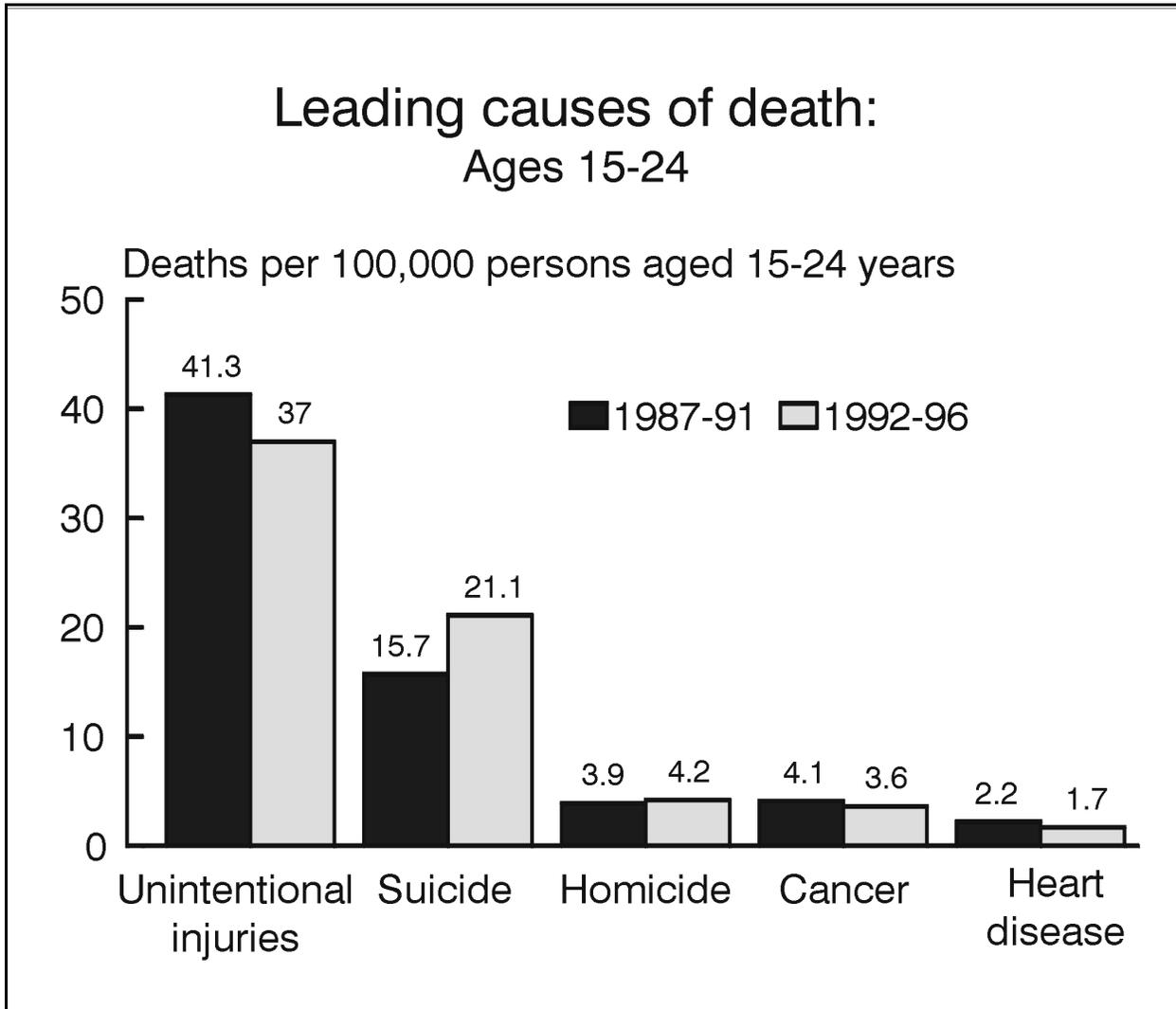


Figure 11

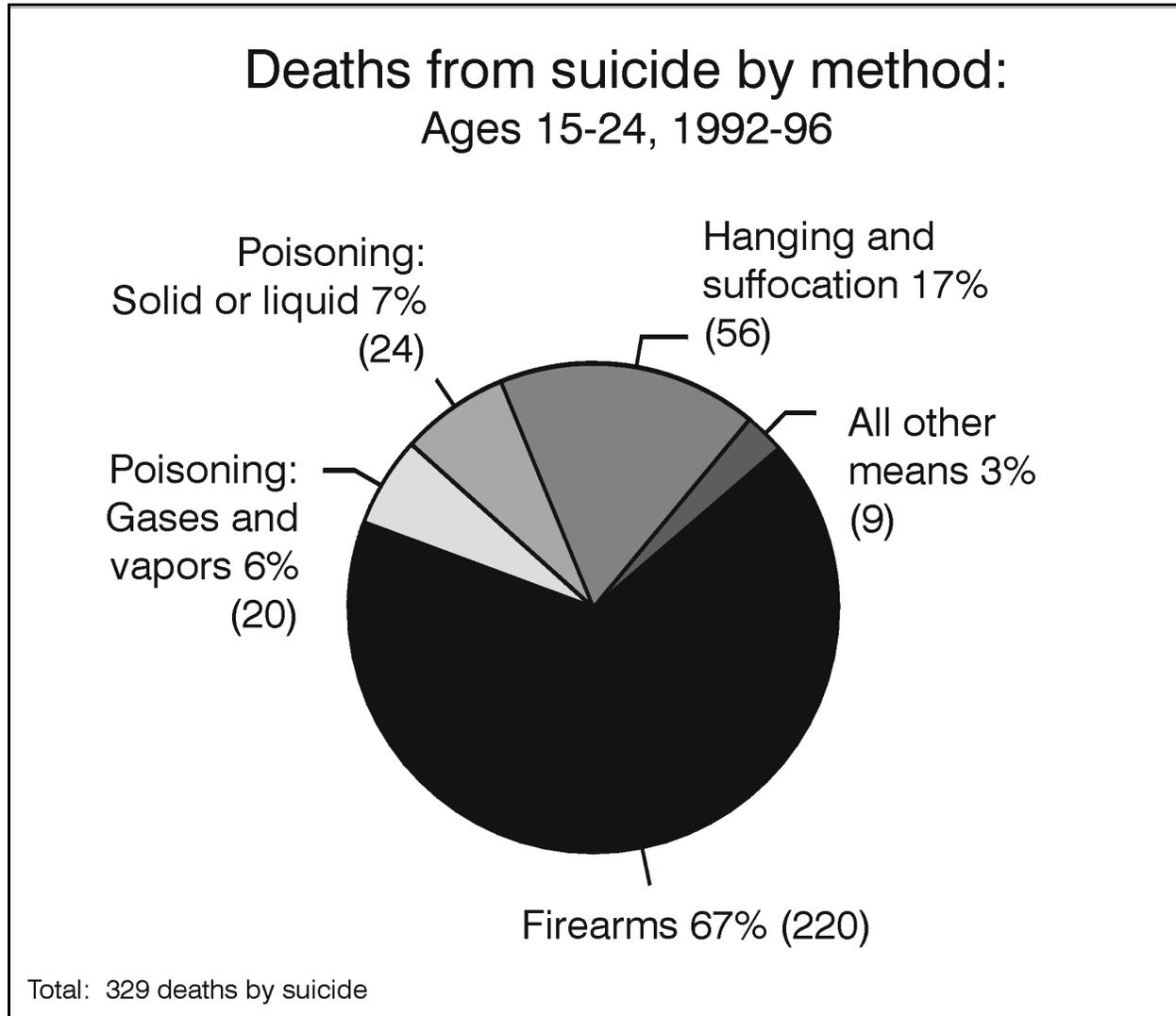
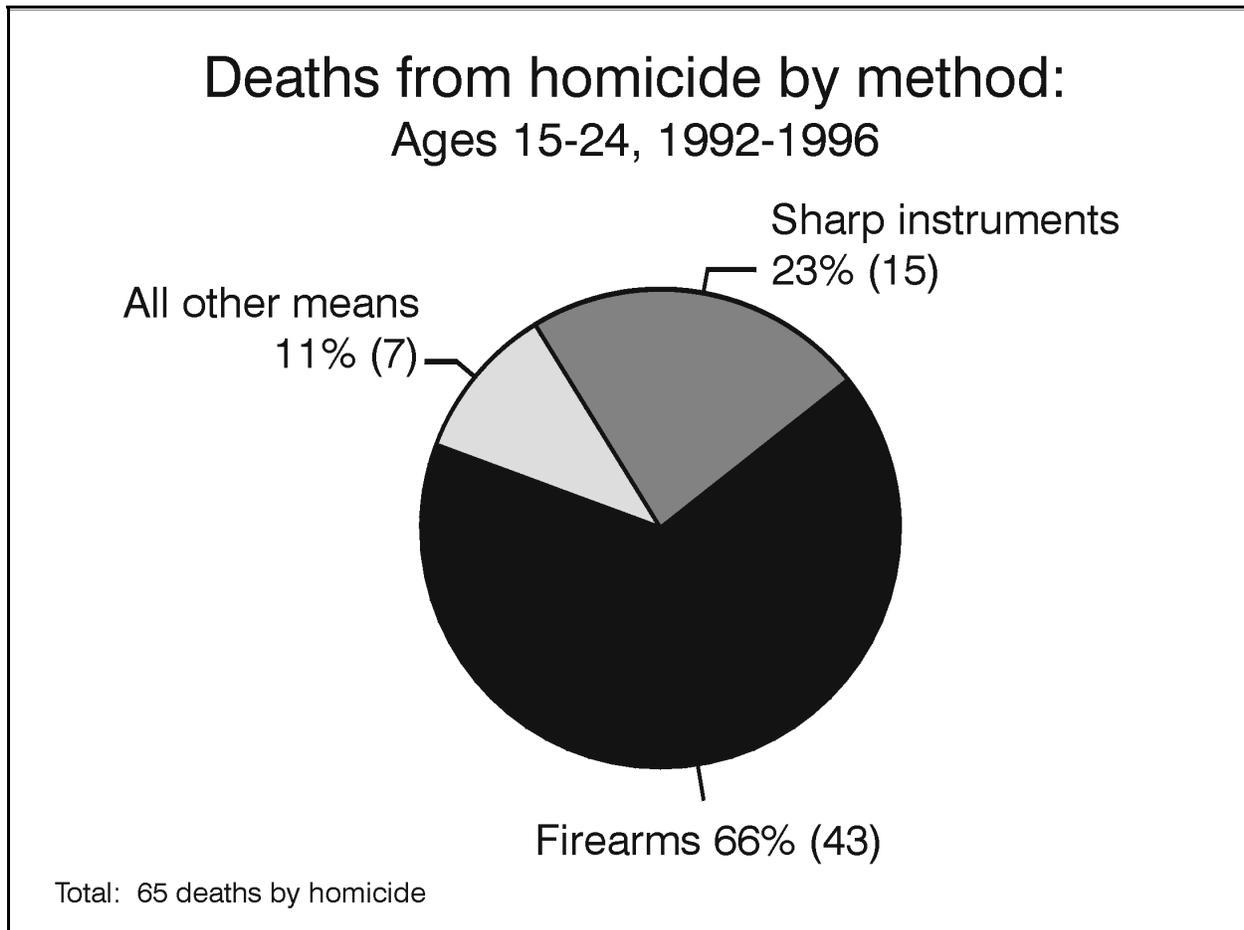


Figure 12



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.***