4.3 Health Status of the U.S.: Indicators and Trends of Health and Disease

This section identifies key indicators of health outcomes (mortality and disease) in the U.S. and describes trends for these outcomes. These outcomes are featured in this report because they are important measures of the health of people in the U.S., and/or because environmental exposure does or may play a role in contributing to the outcome.

The case study on air pollution, presented earlier in Section 4.1, provides an example of how health outcome data can be used to elucidate the linkage between pollution exposure and health outcomes. In this case study, a comparison between mortality rates and air monitoring data revealed an association between deaths and peak air pollutant concentrations.

Mortality

Overall mortality is a key measure of health in a population. There were more than 2,391,399 deaths in the U.S. in 1999 (Anderson, 2001), a number much larger than the 1,989,841 recorded in 1980. The increase in the number of deaths reflects the increase in the size and the aging of the U.S. population. The age-adjusted death rate for all causes has declined steadily since 1950, from 1,446 per 100,000 people to 876 in 1998. The age-adjusted death rates are higher for men than for women, a relationship that has not changed over the years. Heart disease, cancer, and stroke are the three leading causes of death, accounting for about 60 percent of all deaths.

This section presents trends in life expectancy and in mortality due to cancer, cardiovascular disease, chronic obstructive pulmonary disease, and asthma. It also presents trends in mortality for children, including infant mortality and mortality due to cancer, asthma, and birth defects.

Unless otherwise noted, the death statistics are based on the underlying cause of death and are compiled from death certificates. The underlying cause of death is the disease or injury that is judged to have initiated the events that led to death. The mortality rate is the proportion of the population that dies of a disease. The rate is usually calculated for a calendar year, is often expressed per 100,000 population, and is called the crude death rate.

Morbidity

Morbidity is another measure of health for a population. Morbidity data are often described by using the incidence and prevalence of a disease or condition:

- **Incidence** refers to the number of new cases of a disease or condition in a given time period in a specified population.
- **Prevalence** refers to the total number of persons with a given disease or condition in a specified population in a particular time period.

This section provides information on trends for several diseases, including cancer, cardiovascular disease, asthma, and gastrointestinal illness. It also examines trends in children's environmentally related diseases, including cancer and asthma as well as low birthweight and the incidence of birth defects.

Comparison Across Time, Populations, and Geographic Areas

Incidence, prevalence, and mortality statistics may be used to compare the rates of disease at two or more points in time or across different populations or between different geographic areas. These comparisons are particularly useful to determine whether the populations differ by some factor (often called a risk factor) that is known or suspected of affecting the risk of developing the disease or condition. For example, different populations that are compared can be countries, workers in factories, or states.

In general, disease incidence, prevalence, and mortality increase with age. For this reason, when comparing different populations, the data must often be adjusted to account for the age differences between the populations. The adjusted data, called "age-adjusted rates," are used when appropriate in this chapter.

Perceived Well-Being

Another measure of health, perceived well-being, is discussed briefly here, but is not covered by an indicator. The reporting of health as excellent, very good, good, fair, or poor captures both the physical health of the individual and the emotional aspects of well-being (Kramarow, et al., 1999). In 1999, approximately 90 percent of the population of the U.S. reported that they were in good, very good, or excellent health (Eberhardt, et al., 2001), a slight increase from 89.6 percent in 1991. As might be expected, the percentage of people reporting good-to-excellent health decreases with age. While 95 percent of those 18 to 44 years of age reported good-to-excellent health, only 77 percent of persons 65 years of age and older reported that they were in good-to-excellent health. Also, non-Hispanic African Americans and Hispanics of all ages reported worse health than non-Hispanic Whites (Eberhardt, et al., 2001).

This section addresses five questions:

- What are the trends for life expectancy? (Section 4.3.1)
- What are the trends for cancer, cardiovascular disease, chronic obstructive pulmonary disease, and asthma? (Section 4.3.2)
- What are the trends for gastrointestinal illness? (Section 4.3.3)
- What are the trends for children's environmental health issues? (4.3.4)
- What are the trends for emerging health effects? (Section 4.3.5)

4.3.1 What are the trends for life expectancy?

Life expectancy is the average number of years at birth that a group of infants would live if throughout life they experienced the age-specific death rates present at birth.

Indicator: Life expectancy - Category I

The primary source for data on life expectancy in the U.S. is the National Center for Health Statistics (NCHS). Through its National Vital Statistics System, the NCHS has collected and published data on births, deaths, marriages, and divorces in the U.S. since 1933. U.S. data are for the 50 states and the District of Columbia, unless otherwise specified. Virtually all births and deaths are registered. U.S. Standard Certificates of Live Birth and Death are revised periodically, usually every 10 to 15 years. New versions of the U.S. Standard Certificates of Live Birth and Death are planned for 2003. Most state certificates conform closely in content and arrangement to the standard certificate recommended by NCHS, and all certificates contain a minimum data set specified by NCHS. At the time of birth, the mother provides demographic information on the birth certificate, such as race and ethnicity. Medical and health information is based on hospital records. Demographic information on the death certificate is provided by the funeral director based on information supplied by an informant. A physician, medical examiner, or coroner provides medical certification of cause of death.

What the Data Show

Throughout the 20th century there has been a general improvement in life expectancy at birth in the U.S. (Hoyert, et al., 2001). In 2000, life expectancy at birth reached a record high of 76.9 years, based on preliminary data. In 1999, life expectancy was 76.7 years (Pastor, et al., 2002). This follows 5 consecutive years of improvement and a general upward trend in life expectancy throughout the 20th century.

The gap in life expectancy between males and females widened from 2.0 years to 7.8 years between 1900 and the late 1970s. Now this gap is narrowing, and in 2000 the difference in life expectancy between the sexes was 5.4 years. This improvement was primarily due to a greater reduction in mortality for males from heart disease, cancer, suicide, and homicide. Between 1970 and 1999, life expectancy at birth in the U.S. increased from 67.1 to 73.9 years for males and from 74.7 to 79.4 years for females (Pastor, et al., 2002; Mannino and Smith, 2001).

In 1999, life expectancy at birth for the African American population reached a record high of 71.4 years. In 2000, the difference in life expectancy between the African American and White populations was 5.6 years, based on preliminary data. Based on 1999 data, White females continue to have the highest life expectancy (79.9 years), followed by African American females (74.7 years), White males (74.6 years), and African American males (67.8 years). The narrowing of the gap in life expectancy between Whites and African Americans was largely due to a greater reduction in mortality for African Americans due to homicide, cancer, stroke, and HIV-related disease.

Data Source

National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-25, for information.)

4.3.2 What are the trends for cancer, cardiovascular disease, chronic obstructive pulmonary disease, and asthma?

Several chronic diseases that are important indicators of health are presented in this section. Cardiovascular disease, cancer, and stroke are the three leading causes of death in the U.S., accounting for 60.3 percent of all deaths (Anderson, 2001). Chronic obstructive pulmonary disease, a category of diseases that restrict airflow through parts of the respiratory system, was the fourth leading cause of death in the U.S. in 1999 (Hoyert, et al., 2001). Asthma, a chronic condition characterized by inflammation of the airways and lungs, affected more than 10 million people in the U.S. in 1999 (Mannino, et al., 2002).

Indicators

Cancer mortality - Category 1
Cancer incidence - Category 2

The term "cancer" is used to characterize diseases in which abnormal cells divide without control. A cancerous cell loses its ability to regulate its own growth, control cell division, and communicate with other cells. Cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body (NCI, 2003).

What the Data Show

In the U.S., 549,838 people died of cancer in 1999. The death rate was 201.6 per 100,000 people. Cancer accounted for 23 percent of all deaths (Anderson, 2001). Between 1990 and 1998, the age-adjusted death rates for all types of cancer for all persons declined from 173.3 to 161.5 per 100,000 people. The death rate for cancer is highest for non-Hispanic Whites (232.8 per 100,000 people). The death rate for cancer for non-Hispanic African Americans is 185.6 per 100,000 and for Hispanics is 64.6 per 100,000 (Hoyert, et al., 2001). Death rates for different types of cancer show differences across age, gender, and ethnic lines.

Over the past century, the age-adjusted incidence rate for all cancers for all persons decreased from 400.3 per 100,000 people to 395.3. Age-adjusted incidence rates have not declined uniformly over all types of cancer. For example, the incidence of lung cancer for men was 69.8 per 100,000 in 1998, a decline from 81.8 in 1990 and from 76.2 in 1975. For women, the 1998 age-adjusted lung cancer incidence rate of 43.4 per 100,000 people was an increase from 41.6 in 1990 and was nearly 2 times the 1975 rate of 21.5 (Ries, et al., 2001).

Exhibit 4-14 shows the estimated percent change in death and incidence rates according to the type of cancer for men and women of all races, between 1973 and 1998. Notable is the 150.6 percent increase in lung cancer deaths for females between 1973 and 1998. Despite the progress in reducing the number of new cases of some types of cancer, the incidence rates for all types of cancers combined increased 22.4 percent (Ries, et al., 2001).

Data Sources

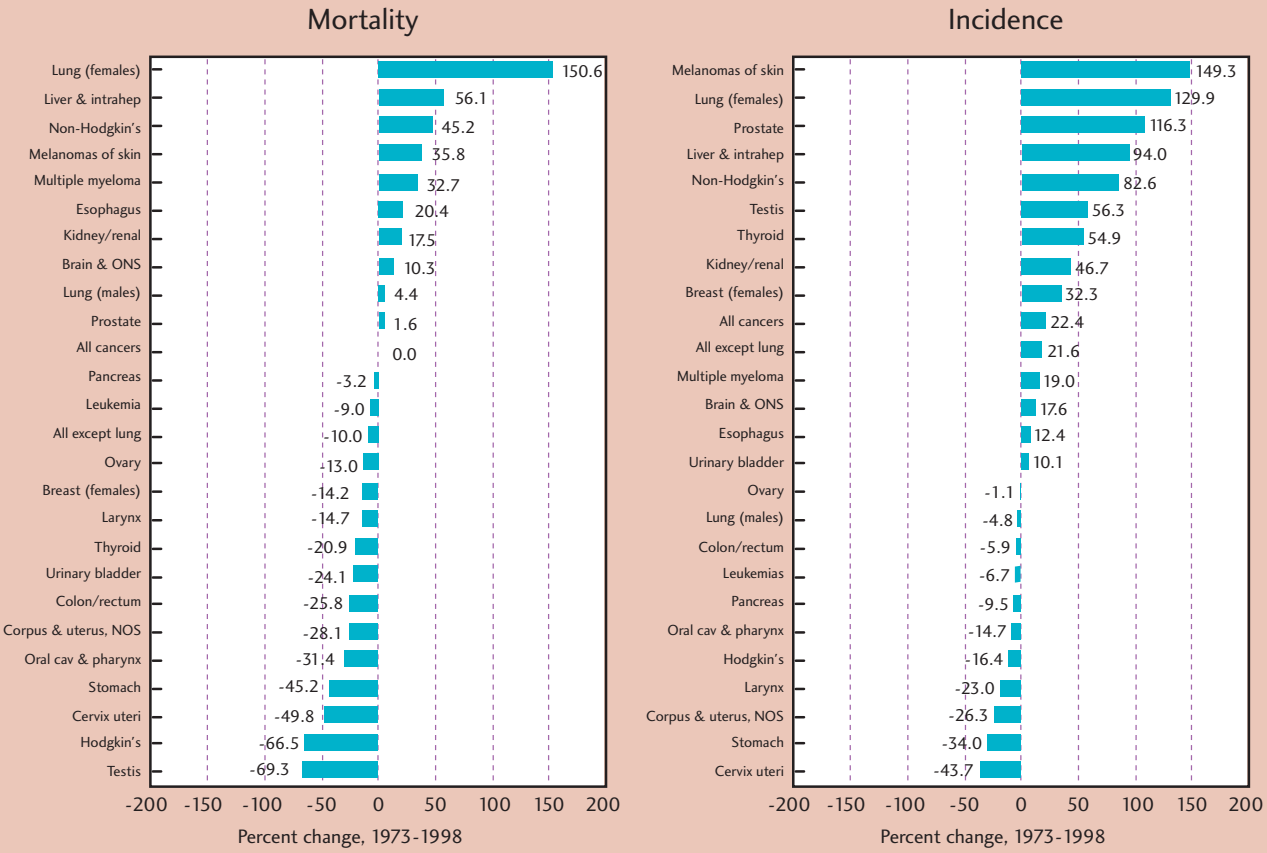
Mortality: National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-25 for more information.)

Incidence: National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-25 for more information.)

Indicators

Cancer mortality - Category 1 (continued)
Cancer incidence - Category 2 (continued)

Exhibit 4-14: Trends in United States cancer mortality rates and Surveillance, Epidemiology and End Results (SEER) incidence (annual percentage change 1973-1998)



NOS = Not otherwise specified
ONS = Other nervous system

Source: Ries, L.A.G., et al. *Surveillance, Epidemiology and End Results (SEER) Cancer Statistics Review, 1973-1998*. 2001.

Indicators

Cardiovascular disease mortality - Category I
Cardiovascular disease prevalence - Category I

The broad category of cardiovascular disease (CVD) includes any disease involving the heart and blood vessels. Coronary heart disease (CHD) and cerebrovascular disease, commonly known as stroke, are the major cardiovascular diseases.

What the Data Show

Because there are several conditions included in the cardiovascular disease category, it is not surprising that the National Heart, Lung, and Blood Institute (NHLBI) estimates that approximately 59.7 million people in the U.S. have some form of CVD (NHLBI, 2000). An estimated 12.2 million people have coronary heart disease and 4.4 million have had a stroke.

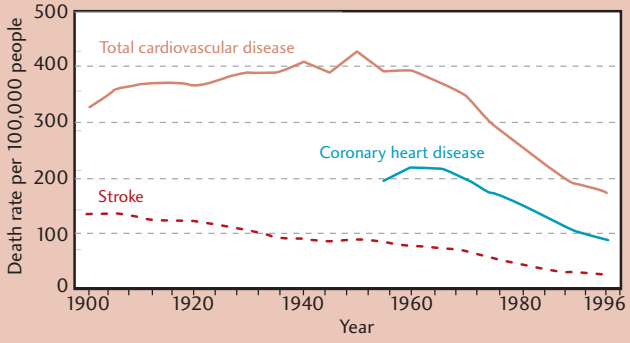
CVD is the leading cause of death for both men and women in the U.S. (AHA, 2001). The age-adjusted death rate for CVD reached a peak in 1950. Between 1950 and 1999, the age-adjusted death rate for CVD declined 60 percent (Exhibit 4-15) (CDC, 1999a). The percentage of all deaths due to CVD increases with age, from 19 percent at 35 to 44 years of age, to 53 percent for people 85 years and older.

The prevalence of cardiovascular disease varies depending upon the age and sex of the individual (Exhibit 4-16). CVD is more prevalent in men than in women until 65 years of age, when the prevalence among women equals that in men. After age 74 years, the prevalence is greater in women than in men. The age-adjusted prevalence of CVD in adults for non-Hispanic Whites is 30.0 percent for men and 23.8 percent for women; for non-Hispanic African Americans it is 40.5 percent for men and 39.6 percent for women.

The death rate for CHD was 195.6 per 100,000 people in 1999 (AHA, 2001). The death rates were lower for White men (249.4 per 100,000 people) than for African American men (272.6) and higher for African American women (192.5) than for White women (152.5) (AHA, 2001).

After age 45, the prevalence of CHD is lower for women than for men at all ages and increases with age for both men and women, peaking after 75 years of age (Exhibit 4-17). The age-adjusted prevalence for CHD for non-Hispanic Whites is 6.9 percent for men and 5.4 percent for women. For non-Hispanic African Americans, the prevalence is 7.1 percent for men and 9.0 percent for women (AHA, 2001).

Exhibit 4-15: Death rates for total cardiovascular disease, coronary heart disease, and stroke, by year, United States, 1900-1996

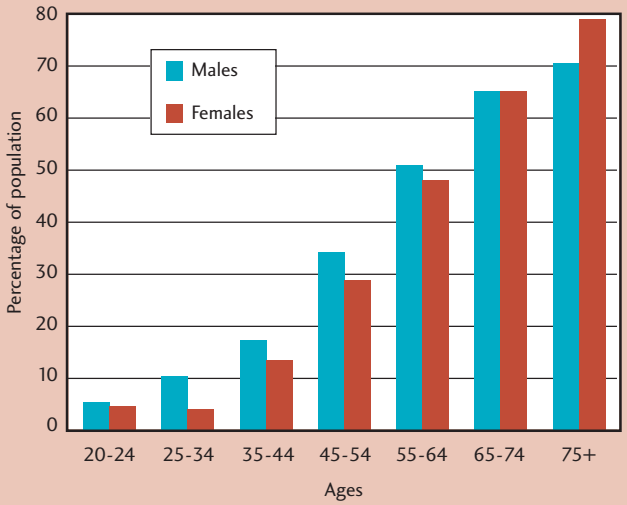


Notes: Rates are per 100,00 people, age adjusted to the 1940 U.S. population.

Diseases are classified according to International Classification of Diseases (ICD) codes in use when the deaths were reported.

Source: CDC. *Decline in Deaths from Heart Disease and Stroke, United States, 1900-1999*. 1999.

Exhibit 4-16: Prevalence of cardiovascular diseases among adults by age and sex, United States, 1988-1994



Source: American Heart Association. 2001 Heart and Stroke Statistical Update. 2001. Data from NHANES III, 1988-1994, the CDC, National Center for Health Statistics, and the American Heart Association.

Indicators

Cardiovascular disease mortality - Category 1 (continued)
Cardiovascular disease prevalence - Category 1 (continued)

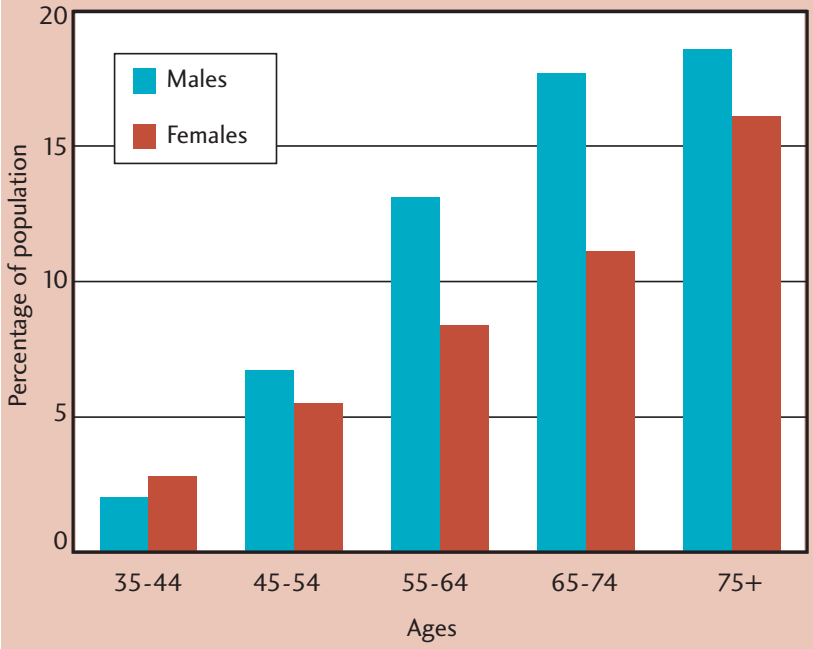
Stroke ranks as the third leading cause of death in the U.S. Stroke accounted for 7.0 percent of total deaths. The death rate for stroke was 61.4 deaths per 100,000 people. The age-adjusted prevalence of stroke is higher for men than for women at all ages. In 1999, there were 167,366 deaths (102,881 were females) attributed to stroke (Anderson, 2001). Death rates for stroke were highest among non-Hispanic Whites (70.8 per 100,000 people), followed by non-Hispanic African Americans (56.6) and Hispanics (18.8).

Data Sources

Mortality: National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-26 for more information.)

Prevalence: NHANES III (1988-1994), National Center for Health Statistics. (See Appendix B, page B-26, for more information.)

Exhibit 4-17: Prevalence of coronary heart disease by age and sex, United States, 1988-1994



Source: American Heart Association. 2001 *Heart and Stroke Statistical Update.* 2001. Data from NHANES III, 1988-1994, the CDC, National Center for Health Statistics, and the American Heart Association.

Indicator: Chronic obstructive pulmonary disease mortality - Category I

Chronic obstructive pulmonary disease (COPD), sometimes referred to as chronic lung disease, is a disease that damages lung tissue or restricts airflow through the bronchioles and bronchi (ALA, 2001). Chronic bronchitis and emphysema are the most frequently occurring COPDs.

What the Data Show

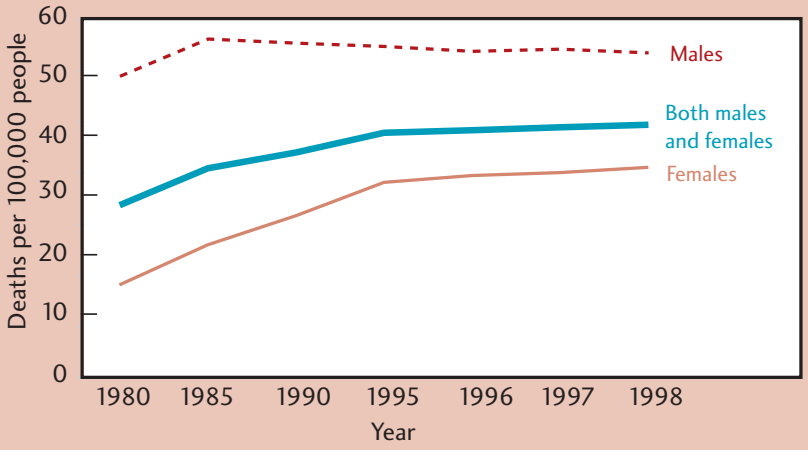
In 1999, COPD was the fourth leading cause of death, accounting for more than 124,181 deaths (5.2 percent of total deaths) (Hoyert, et al., 2001). The age-adjusted death, rate for COPD was 45.8 per 100,000 population. From 1980 to 1998, the age-adjusted death rates for COPD increased from 28.3 to 42.0 per 100,000 population for men and women of all racial and ethnic groups in the U.S. (Eberhardt, et al., 2001). For females, the age-adjusted death rates for COPD increased steadily from 1980 to 1998, from 14.9 per 100,000 population to 34.8 in 1998 (Exhibit 4-18). For males, the age-adjusted death rates rose between 1980 and 1985 from 49.9 to 56.2 per 100,000. From 1990 to 1998, the rate remained generally stable, declining slightly in 1998 to 54.0 per 100,000.

In 1998, the age-adjusted death rate for COPD was highest for White males at 55.4 per 100,000 population, followed by African American males (45.2) and Hispanic males (26.2 per 100,000 population). Among females, White females had the highest rates (36.5) followed by African American females (22.3) and Hispanic females (13.7 per 100,000 population) (Hoyert, et al., 2001).

Data Source

National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-26, for more information.)

Exhibit 4-18: Age-adjusted death rates for chronic obstructive pulmonary disease according to sex, selected years, in the United States 1980-1998



Source: Eberhardt, M.S., et al. *Health, United States, 2001 with Urban and Rural Health Chartbook.* 2001.

Indicators

Asthma mortality - Category 1
Asthma prevalence - Category 1

Asthma is a chronic respiratory disease characterized by inflammation of the airways and lungs. During an asthma attack the airways that carry air to the lungs are constricted, and as a result less air is able to flow in and out of the lungs (NCHS, 2001). Asthma attacks can cause a multitude of symptoms ranging in severity from mild to life-threatening. These symptoms include wheezing, breathlessness, chest tightness, and coughing (NCHS, 2001).

What the Data Show

In 1999, 4,657 people died from asthma. The age-adjusted death rate was 17.2 per 1,000,000 population. Exhibit 4-19 shows the trends in age-adjusted death rates with asthma as the underlying cause of death.

In 1999, approximately 10.5 million people in the U.S. reported that they had an asthma attack or episode in the preceding 12 months (Mannino, et al., 2002). This included approximately 7.3 million people over 14 years of age. The 1999 age-adjusted prevalence of asthma for people of all ages was 38.4 per 100,000 population in 1999 (Exhibit 4-20). That same year, the prevalence of asthma in adults was highest (42.2 per 100,000) for people 15 to 34 years of age, and lowest (22.1 per 100,000) for those 65 years of age and older. African Americans were more likely to report an asthma episode or attack than other race/ethnic groups, and females were more likely than males to have had an asthma episode or attack. Since 1997, the age-adjusted prevalence of asthma has decreased slightly from 40.7 per 100,000 population to 38.4 per 100,000. Changes in the way asthma data are collected were made in 1997, limiting the ability to compare current data with earlier reports.

There are regional differences in the prevalence of asthma with the highest prevalence in the Northeast (61.8 per 1,000 people) (Adams, et al., 1999). The prevalence in the Midwest was 56.6 per 1,000 people. The prevalence in the South (51.8 per 1,000) was similar to the prevalence in the West (52.9 per 1,000). People who lived in a central city reported a higher number of cases (61.7 per 1,000 people) than those who did not live in the central city (54.9 per 1,000). Those who did not live in a Metropolitan Statistical Area (an urbanized area with at least 50,000 inhabitants) had the lowest prevalence, 46.9 per 1,000 people.

Data Sources

Mortality: National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-27 for more information.)

Prevalence: National Health Interview Survey, Centers for Disease Control and Prevention. (See Appendix B, page B-27, for more information.)

Exhibit 4-19: Annual rate* of deaths with asthma as the underlying cause of death diagnosis, by race, sex, and age group, United States, 1980-1999

	1980	1985	1990	1995	1996	1997	1998	1999
Race								
White	12.9	15.6	17.5	18.8	18.1	17.4	17.0	14.2
Black	27.6	34.8	40.9	46.2	48.0	42.5	44.7	38.7
Other	13.5	16.9	23.6	23.3	27.6	26.6	22.7	20.4
Sex								
Male	14.7	15.9	17.8	17.9	17.7	16.6	16.5	13.1
Female	14.4	19.2	22.1	25.1	25.0	23.7	23.3	20.4
Age Group (years)								
0-4	1.8	1.5	2.0	1.8	2.3	1.9	2.1	1.7
5-14	1.9	2.9	3.2	4.0	4.6	3.4	3.8	3.6
14-34	3.0	4.2	5.0	6.7	6.5	6.1	6.4	5.9
35-64	14.0	17.7	18.8	20.6	20.3	19.0	17.8	15.8
65+	61.8	72.5	87.0	90.8	90.3	86.7	86.9	69.9
Total**	**14.4**	**17.7**	**20.2**	**21.9**	**21.8**	**20.6**	**20.3**	**17.2**

* Per 1,000,000 population. ** Age adjusted to the 2000 U.S. population.

Source: Mannino, D.M., et al. *Surveillance for Athma - United States, 1980-1999*. 2002.

Indicators

Asthma mortality - Category I (continued)
Asthma prevalence - Category I (continued)

Exhibit 4-20: Estimated annual prevalence of self-reported asthma (1980-1996) or an episode of asthma attack (1997-1999) during the preceding 12 months, by race, sex, and age group, United States, 1980-1999

	1980	1985	1990	1995	1996	1997	1998	1999
	Self-Reported Asthma Prevalence During the Preceding 12 Months					Episode of Asthma or Asthma Attack During the Preceding 12 Months		
Race								
White	31.4	37.0	41.5	54.5	53.6	40.5	37.5	37.6
Black	33.1	38.6	45.8	64.8	65.6	45.4	46.7	42.7
Other	19.9	12.8	40.2	44.4	43.2	34.7	33.7	38.9
Sex								
Male	30.5	33.8	39.1	48.6	43.0	33.0	31.7	31.6
Female	31.9	38.9	44.2	61.1	65.6	47.9	44.4	44.5
Age Group (years)								
0-4	23.0	36.7	44.0	60.5	40.1	41.2	46.4	42.1
5-14	45.1	50.9	63.7	82.0	69.8	60.0	57.8	56.4
15-34	30.0	36.1	37.3	57.8	67.2	44.2	37.5	42.2
35-64	29.9	30.8	38.4	50.1	46.2	37.0	35.7	33.4
65+	31.9	38.6	36.3	39.4	45.5	27.3	28.7	22.1
Total	**31.4**	**38.6**	**41.9**	**55.2**	**54.6**	**40.7**	**39.2**	**38.4**

Data are per 100,000 population, per year.

Source: Mannino, D.M., et al. *Surveillance for Asthma - United States, 1980-1999*. 2002.

4.3.3 What are the trends for gastrointestinal illness?

The human gastrointestinal tract includes the stomach, the large intestine, and the small intestine. Gastrointestinal infections and illnesses are caused by several types of microorganisms—that is, bacteria, protozoa, fungi, and viruses. Food and water contaminated with pathogenic microorganisms are the major environmental source of gastrointestinal illness. A system for reporting food- and waterborne disease outbreaks has been in place for many years in the U.S. This system enables public health officials to investigate and determine the role of food and water in contributing to intestinal illness, and identify actions that may be needed to protect public health. For example, the system tracks the number of waterborne disease outbreaks reported voluntarily by state, territorial, and local public health officials (See box, "Waterborne Disease Outbreaks Associated with Drinking Water 1971-2000"). These data should be interpreted with caution, however, because many factors can influence whether a waterborne disease outbreak is recognized, investigated, and reported. Changes in the number of outbreaks reported could reflect actual changes or simply changes in surveillance and reporting. (For additional information on waterborne disease, see Chapter 2, Purer Water.)

The number of deaths from microorganism-induced gastrointestinal illnesses recently increased in the U.S., after decades of relatively stable death rates (Peterson and Calderon, 2003). The increases were particularly dramatic in young children (less than 6 years of age) and older Americans (more than 65 years of age). Many milder cases of gastrointestinal illnesses go unreported or are not diagnosed, making it difficult to estimate the number of people affected every year. Often, symptoms are not serious enough to warrant a visit to a doctor or hospital, which further contributes to the underestimation of gastrointestinal illness.

Seven notifiable gastrointestinal diseases caused by microorganisms have been chosen as indicators for this report: cholera, cryptosporidiosis, *Escherichia coli* O157:H7, Hepatitis A, salmonellosis, shigellosis, and typhoid fever. The reporting period

includes five years 1997-2001. These include two diseases—cholera and typhoid fever—that are rarely identified in this country. These diseases are nevertheless included because they can be severe illnesses and a sudden increase in their reporting would signal a public health emergency for which prompt action would be needed. In addition to the seven diseases discussed here, a number of other gastrointestinal diseases are caused by microorganisms. These include giardiasis, caused by the pathogen *Giardia*. Giardiasis has become notifiable only as recently as 2002 (CDC, 2003), so no indicator is available at this time.

The primary means of transmission for the seven diseases reported here is oral-fecal. The disease microbes shed in the feces of infected individuals and then can be transmitted to humans through food, water, person-to-person contact, or contact with ill animals. The seven diseases are cholera, cryptosporidiosis, *E. coli* O157:H7, Hepatitis A, salmonellosis, shigellosis, and typhoid fever. Exhibit 4-22 shows the incidence of each for 1997 through 2001.

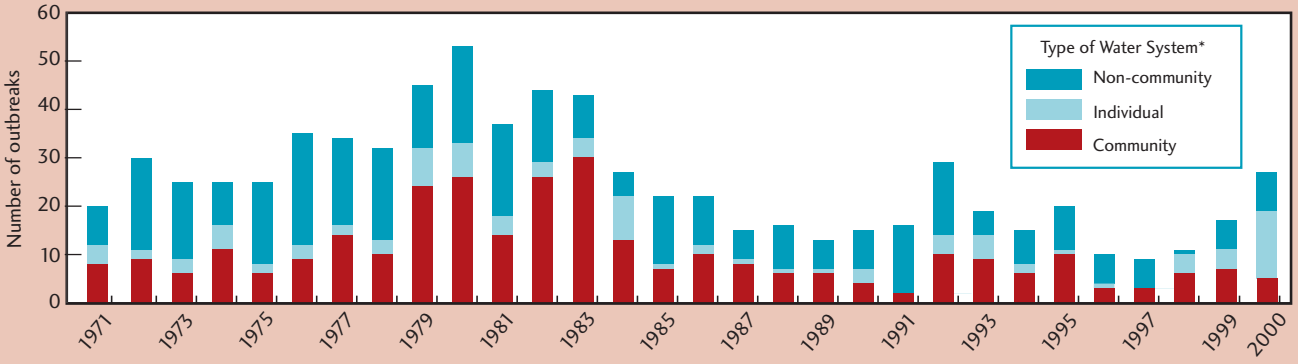
Waterborne Disease Outbreaks Associated with Drinking Water 1971-2000

Since 1971, the Centers for Disease Control and Prevention (CDC), EPA, and the Council of State and Territorial Epidemiologists have maintained a collaborative surveillance system for the occurrences and causes of waterborne-disease outbreaks (WBDO). These data are only a small part of the larger body of information related to drinking water quality in the United States. State, territorial, and local public health agencies are primarily responsible for detecting and investigating WBDOs and voluntarily reporting them to CDC. These data are used to identify types of water systems, their deficiencies, the etiologic agents (e.g., microorganisms and chemicals) associated with outbreaks, and to evaluate current technologies for providing safe drinking water and safe recreational waters. This system reports outbreaks and estimated numbers of people who become ill. It does not provide information on non-outbreak related or endemic levels of waterborne illness. Moreover, the focus is on acute illness. The system does not address chronic illnesses such as cancer, reproductive, or developmental effects. CDC and EPA are collaborating on a series of epidemiology studies to assess the magnitude of non-outbreak waterborne illness associated with consumption of municipal drinking water.

Between 1971 and 2000, there were 751 reported waterborne disease outbreaks associated with drinking water from individual, non-community systems, and community water systems (Exhibit 4-21). During 1999-2000, a total of 44 outbreaks (18 from private wells, 14 from non-community systems, and 12 from community systems) associated with drinking water were reported by 25 states (Craun and Calderon, 2003).

However, these data should be interpreted with caution. Many factors can influence whether a WBDO is recognized and investigated by local, territorial, and state public health agencies. For example, the size of the outbreak, severity of the disease caused by the outbreak, public awareness of the outbreak, whether people seek medical care or report to a local health authority, reporting requirements, routine laboratory testing for organisms, and resources for investigation can all influence the identification and investigation of a WBDO. This system underreports the true number of outbreaks because of the multiple steps required before an outbreak is identified and investigated. Thus, an increase in the number of outbreaks reported could either reflect an actual increase or improved surveillance and reporting at the local and state level.

Exhibit 4-21: Number of reported waterborne disease outbreaks associated with drinking water by year and type of water system, United States, 1971-2000 (n=751)



***Non-community water systems** are systems that either (1) regularly supply water to at least 25 of the same people at least 6 months per year, but not year round (e.g., schools, factories, office buildings, and hospitals that have their own water systems), or (2) provide water in a place where people do not remain for long periods of time (e.g., a gas station or campground).

Individual water systems are not regulated by the Safe Drinking Water Act and serve fewer than 25 persons or 15 service connections, including many private wells.

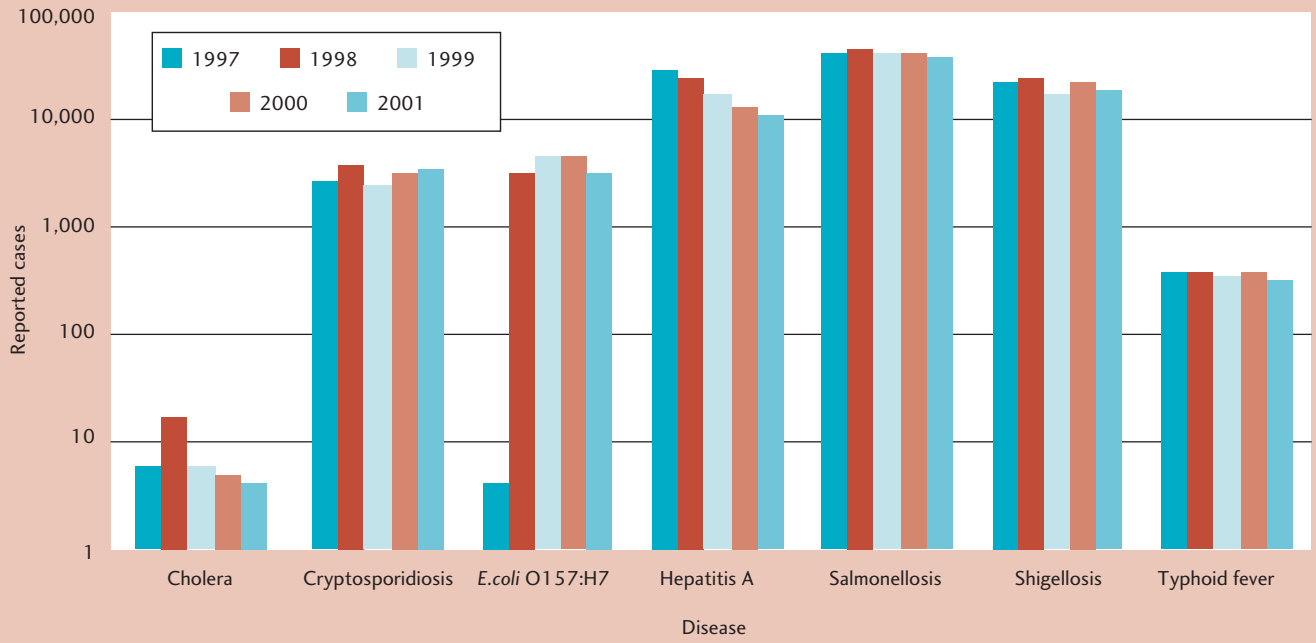
Community water systems provide water to at least 25 of the same people or service connections year round.

Source: Based on data presented in Craun, G.F. and R.L. Calderon. *Waterborne Outbreaks in the United States, 1971-2000.* 2003.

The data source for these seven indicators is the Centers for Disease Control and Prevention, Epidemiology Program Office, National Notifiable Diseases Surveillance System. This system provides weekly provisional information from the Council of State and Territorial Epidemiologists (CSTE) on the occurrence of diseases defined as notifiable. A notifiable disease is one that, when diagnosed, health providers report to state or local public health officials. Notifiable diseases are of public interest because of their contagiousness, severity, or frequency (Pastor, et al., 2002). State epidemiologists report cases of notifiable diseases to CDC, and CDC tabulates and publishes these data in *Morbidity and Mortality Weekly Report (MMWR)* and *Summary of Notifiable Diseases, United States*. Policies for reporting notifiable disease cases can vary by disease or reporting jurisdiction. CSTE and CDC annually review and recommend additions or deletions to the list of nationally notifiable diseases based on the need to respond to emerging priorities. *Reporting nationally notifiable diseases to CDC, however, is voluntary*. Reporting is currently mandated by law or regulation only at the local and state level. Therefore, the list of diseases that are considered notifiable varies slightly by state.

Notifiable disease data are useful for analyzing disease trends and determining relative disease burdens. These data, however, must be interpreted in light of reporting practices. The degree of completeness of data reporting is influenced by many factors such as the diagnostic facilities available; the control measures in effect; public awareness of a specific disease; and the interests, resources, and priorities of state and local officials responsible for disease control and public health surveillance. Finally, factors such as changes in case definitions for public health surveillance, introduction of new diagnostic tests, or discovery of new disease entities can cause changes in disease reporting that are independent of the true incidence of disease.

Exhibit 4-22: Prevalence of reported gastrointestinal diseases, United States, 1997-2001



Sources: CDC. *Notice to Readers: Final 2001 Reports of Notifiable Diseases*. 2002; CDC. *Notice to Readers: Final 2000 Reports of Notifiable Diseases*. 2001; CDC. *Notice to Readers: Final 1999 Reports of Notifiable Diseases*. 2000: CDC. *Notice to Readers: Final 1998 Reports of Notifiable Diseases*. 1999; CDC. *Notice to Readers: Final 1997 Reports of Notifiable Diseases*. 1998.

Indicator: Infectious disease prevalence - Cholera - Category 2

Cholera is a diarrhea illness caused by infection of the intestine with the bacterium *Vibrio cholerae*. Infections can often be mild or without symptoms, but can sometimes be severe, and even fatal. Approximately 1 in 20 infected persons has severe disease characterized by severe, watery diarrhea that can lead to dehydration and shock. Without treatment, death can occur within hours (ICTDRN, 2002).

What the Data Show

Very few cases of cholera are reported on an annual basis in the U.S. It is believed most cases are associated with consumption of contaminated seafood or with international travel to areas where cholera is endemic (e.g., South America) (CDC, 2001a).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-27, for more information.)

Indicator: Infectious disease prevalence - Cryptosporidiosis - Category 2

Cryptosporidiosis is an illness resulting from infection of the gastrointestinal tract with *Cryptosporidium parvum* and other species of *Cryptosporidium.* This pathogen is excreted by humans, as well as wild and domestic animals, including farm animals; it contaminates water sources via animal feces or domestic sewage. Runoff from agricultural operations into drinking water sources has been one cause of cryptosporidiosis outbreaks (Franzen and Muller, 1999).

Severe diarrhea is the most common symptom. Additional symptoms include gastric pain, fever, nausea, and fatigue (Guerrant, 1997). There is no antibiotic that is effective for treatment of cryptosporidiosis. As a result, a healthy immune system is important in limiting an individual's response to *Cryptosporidium parvum* infection. Cryptosporidiosis can be deadly when contracted by immunocompromised individuals. In extreme cases of cryptosporidiosis, infection can spread beyond the gastrointestinal tract to the gall bladder and biliary tract.

What the Data Show

The occurrence of symptoms or conditions associated with cryptosporidiosis are likely underreported. "We do not know exactly how many cases of cryptosporidiosis actually occur. Many people do not seek medical attention or are not tested for this parasite and so *Cryptosporidium* often goes undetected as the cause of intestinal illness" (CDC, 1998b).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-28, for more information.)

Indicator: Infectious disease prevalence - *E. coli* O157:H7 - Category 2

E. coli O157:H7 is one of over 170 strains and many hundred sub-strains of the bacterium *Escherichia coli*. Most strains are harmless and live in the intestines of healthy humans and animals; this strain can cause severe illness. *E. coli* O157:H7 is not a disease itself, but rather a cause of illness. The identifier in the name of the bacterium refers to the specific antigenic markers found on its cell wall and distinguishes it from other types of *E. coli*. Infection often leads to bloody diarrhea and occasionally to kidney failure, particularly in young children (CDC, 2001b). A 1982 outbreak of severe bloody diarrhea was traced to contaminated hamburgers.

What the Data Show

CDC estimates that 73,000 cases of *E. coli* O157:H7 occur annually in the U.S., and that 61 fatal cases occur annually. The illness is often misdiagnosed; therefore, expensive and invasive diagnostic procedures may be performed. Patients who develop severe disease may require prolonged hospitalization, dialysis, and long-term follow-up (CDC, 2001b).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-28, for more information.)

Indicator: Infectious disease prevalence - Hepatitis A - Category 2

Hepatitis A virus (HAV) is one of five viruses in the hepatitis group of viruses (A to E) that cause liver disease. Symptoms include jaundice, fatigue, abdominal pain, loss of appetite, nausea, diarrhea, and fever. Adults tend to be more symptomatic than children. HAV is found in the feces of infected people and is usually spread through contaminated food, water, or intimate contact (CDC, 2002d).

What the Data Show

The annual number of reported cases for HAV in the U.S. exceeds 10,000. The estimated number of new infections approaches 100,000 per year. It continues to occur in epidemics both nationwide and in communities. The number of cases is now reaching historic lows and continues to slowly decline, though about one-third of Americans show evidence of past infection (CDC, 2002e).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-28, for more information.)

Indicator: Infectious disease prevalence - Salmonellosis - Category 2

Salmonellosis is a disease caused by one of the more than 2,000 strains of the bacterial genus *Salmonella*. Most persons infected with *Salmonella* develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. The illness usually lasts 4 to 7 days, and most persons recover without treatment, though antibiotics can be used. In some persons, however, the diarrhea may be so severe that the patient needs to be hospitalized. In these patients, the *Salmonella* infection may spread from the intestines to the bloodstream and then to other body sites. It can cause death unless the person is treated promptly with antibiotics. The elderly, infants, and those with impaired immune systems are more likely to become severely ill from salmonellosis (CDC, 2001f).

What the Data Show

Every year, approximately 40,000 cases of salmonellosis are reported in the U.S. Because many milder cases are not diagnosed or reported, CDC estimates the actual number of infections to be 1.4 million. Salmonellosis is more common in the summer than winter. It is estimated that somewhat more than 500 persons die each year with acute salmonellosis (CDC, 2001f).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-29, for more information.)

Indicator: Infectious disease prevalence - Shigellosis - Category 2

Shigellosis is a bacterial disease affecting the intestinal tract. Anyone can get shigellosis, though it is most common in children between the ages of 1 and 14. Most who are infected with *Shigella* develop diarrhea, fever, and stomach cramps starting a day or two after they are exposed to the bacterium. The diarrhea is often bloody. Shigellosis usually resolves in 5 to 7 days. In some persons, especially young children and the elderly, the diarrhea can be so severe that hospitalization is necessary. Some persons who are infected may have no symptoms at all, but may pass the *Shigella* bacteria to others (CDC, 2001g).

What the Data Show

Every year, about 14,000 cases of shigellosis are reported in the U.S. Because many milder cases are not diagnosed or reported, the CDC estimates the actual number of infections to be 448,000. Shigellosis is particularly common and causes recurrent problems in settings where hygiene is poor (CDC, 2001g).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-29, for more information.)

Indicator | Infectious disease prevalence - Typhoid fever - Category 2

Typhoid fever is a life-threatening illness caused by the bacterium *Salmonella typhi*. Typhoid fever is characterized by fever, headache, nausea, and loss of appetite. *Salmonella typhi* lives only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract. In addition, a small number of persons (2 to 5 percent), called carriers, recover from typhoid fever but continue to carry and shed the bacteria. Both ill persons and carriers shed *S. typhi* in their feces and urine (WHO, 1997).

What the Data Show

In the U.S., about 400 *S. typhi* cases occur each year, many of which are acquired while traveling internationally. Typhoid fever is transmitted by eating food or drinking beverages that have been handled by a person who is shedding *S. typhi*, or by consuming water contaminated with *S. typhi* bacteria (CDC, 2001h).

Data Source

National Notifiable Diseases Surveillance System, Centers for Disease Control and Prevention. (See Appendix B, page B-30, for more information.)

4.3.4 What are the trends for children's environmental health issues?

Special consideration must be given to children's health issues because children may be more susceptible to disease and generally may be more vulnerable to their surroundings for many physiological reasons. This section discusses five indicators for children's environmental health issues: infant mortality, low birthweight, childhood cancer, childhood asthma, and birth defects.

Indicator | Infant mortality - Category 1

Infant mortality in the U.S. is defined as the death of a child before age 1.

What the Data Show

In 1999, a total of 27,937 deaths occurred in infants under 1 year of age (Hoyert, et al., 2001). The infant mortality rate was 7.1 per 1,000 live births, the lowest ever recorded in the U.S. The infant mortality rate for African American infants was 14.6 per 1,000 live births, more than twice the rate for White infants (5.8 per 1,000 live births). The infant mortality rate for Hispanic infants was 5.8 per 1,000 live births. The 10 leading causes of infant deaths account for 67.6 percent of all infant deaths in the U.S. (Exhibit 4-23). Delaware, Maine, Massachusetts, and Utah have the lowest infant mortality rates. Mississippi, Alabama, and Louisiana have the highest (Hoyert, et al., 2001).

Data Source

National Vital Statistics System, Centers for Disease Control and Prevention. (See Appendix B, page B-30, for more information.)

Exhibit 4-23: Number of infant deaths, percent of total deaths, and infant mortality rates for the 10 leading causes of infant death, United States, 1999

Rank	Cause of Death	Deaths	Rate	Percent of Total Deaths
	All causes	27,937	705.6	100.0
1	Congenital malformations, deformations, and chromosomal abnormalities	5,437	138.2	19.6
2	Disorders related to short gestation and low birthweight	4,392	110.9	15.7
3	Sudden Infant Death Syndrome	2,648	66.9	9.5
4	Newborn affected by maternal complications of pregnancy	1,399	35.3	5.0
5	Respiratory distress of newborn	1,110	28.0	4.0
6	Newborn affected by complications of placenta, cord, and membranes	1,025	25.9	3.7
7	Accidents	845	21.3	3.0
8	Bacterial sepsis of newborn	691	17.5	2.5
9	Diseases of the circulatory system	667	16.8	2.4
10	Atelectasis	647	16.3	2.3
	All other causes	9,040	228.3	32.4

Rate is per 100,000 live births in 1999.

Source: Hoyert, D.L., et al. *Deaths: Final Data for 1999*. 2001.

Indicator

Low birthweight - Category I

An infant with low birthweight is defined as a full-term infant, born between week 37 and 44 of pregnancy, and weighing 2,500 grams or less at birth. Weight is a critical health measure because low birthweight children are more prone to death and disability than their counterparts.

What the Data Show

The percentage of infants who were born with a low birthweight (weighing less than 2,500 grams) was 7.6 percent in 2000 (Martin, et al., 2002). In 2000, the low birthweight rate for non-Hispanic African Americans (13.1 percent) was twice the rate of that for non-Hispanic Whites (6.6 percent), a relationship that existed for at least the 9 prior years as well (Exhibit 4-24). In 2000, the low birthweight rate for Hispanics was similar to that of non-Hispanic Whites (6.4 and 6.6, respectively). Also shown in Exhibit 4-24 is that non-Hispanic African Americans had the highest proportion of very low birthweight infants (weighing less than 1,500 grams) in 2000, compared with Hispanic and non-Hispanic White populations in the U.S.

Data Source

National Vital Statistics System, Centers for Disease Control and Prevention. (See Appendix B, page B-30, for more information.)

Exhibit 4-24: Percent of live births of very low birthweight and low birthweight, by race and Hispanic origin of mother, United States, 1991-2000

	Very Low Birthweight[1]			Low Birthweight[2]		
	White Non-Hispanic	Black Non-Hispanic	Hispanic[3]	White Non-Hispanic	Black Non-Hispanic	Hispanic[3]
2000	1.14	3.10	1.14	6.6	13.1	6.4
1999	1.15	3.18	1.14	6.6	13.2	6.4
1998	1.15	3.11	1.15	6.6	13.2	6.4
1997	1.12	3.05	1.13	6.5	13.1	6.4
1996	1.08	3.02	1.12	6.4	13.1	6.3
1995	1.04	2.98	1.11	6.2	13.2	6.3
1994	1.01	2.99	1.08	6.1	13.3	6.2
1993	1.00	2.99	1.06	5.9	13.4	6.2
1992	0.94	2.97	1.04	5.7	13.4	6.1
1991	0.94	2.97	1.02	5.7	13.6	6.1

[1] Less than 1,500 grams (3 lb. 4 oz.)

[2] Less than 2,500 grams (5 lb. 8 oz.)

[3] Includes all persons of Hispanic origin of any race.

Source: Martin, J.A., et al. *Births: Final Data for 2000.* 2002.

Indicators

Childhood cancer mortality - Category 1
Childhood cancer incidence - Category 2

Cancer is a disease characterized by uncontrolled growth of cells. A cancerous cell loses its ability to regulate its own growth, control cell division, and communicate with other cells. These cellular changes are complex and occur over a period of time. They may be accelerated in children. Cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body (NCI, 2003). The classification of cancers in children differs from the classification used for adult cancers.

What the Data Show

In 1999, there were nearly 2,200 deaths due to cancer in children and adolescents under 20 years of age (Anderson, 2001). The age-adjusted cancer mortality rates by race and age group are presented in Exhibit 4-25. In 1999, cancer was the third leading cause of death in children 1 to 4 years of age, accounting for 8 percent of the total deaths in this age group (Anderson, 2001). The death rate for cancer in this age group was 2.8 per 100,000 population. For children 5 to 9 years of age, cancer was the second leading cause of death accounting for 14.7 percent of total deaths. The death rate was 2.6 per 100,000 for children 5 to 9 years of age. In older children (15 to 19 years of age), 5.4 percent of total deaths in this age group were due to cancer. Cancer ranked fourth among leading causes of death, with a mortality rate of 3.8 per 100,000 population.

Exhibit 4-26 presents the age-adjusted incidence rates for cancers in children of all races between the ages of 0 and 19 years, 1975 to 1998. There has been an increase in the incidence for all types of childhood cancer since 1975. There also has been a substantial decline in the cancer death rate for children, largely due to improved treatment (EPA, December 2000).

Data Sources

Mortality: National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-31, for more information.)

Incidence: Surveillance, Epidemiology, and End Results Program, National Cancer Institute. (See Appendix B, page B-31, for more information.)

Exhibit 4-25: Age-adjusted Surveillance, Epidemiology and End Results (SEER) childhood cancer (all sites) incidence and United States mortality rates by race and age group, 1994-1998

	Ages 0-14						Ages 0-19					
	Incidence			Mortality			Incidence			Mortality		
Race	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
All Races	14.4	15.4	13.4	2.7	3.0	2.4	15.9	16.7	15.0	3.0	3.3	2.6
White	14.8	15.6	13.9	2.7	3.0	2.4	16.4	17.2	15.6	3.0	3.4	2.6
Black	12.0	13.0	10.9	2.8	2.9	2.6	12.5	13.3	11.7	3.1	3.2	2.9

Rates are deaths per 100,000 per year and are age adjusted to the 1970 U.S. standard population.

Source: Ries L.A.G., et al. *SEER Cancer Statistics Review, 1973-1988*. 2001

Indicators

Childhood cancer mortality - Category 1 (continued)
Childhood cancer incidence - Category 2 (continued)

Exhibit 4-26: Age-adjusted Surveillance, Epidemiology and End Results (SEER) cancer incidence rates by international classification of childhood cancer (ICCC) selected group and subgroup and year of diagnosis, children 0 to 19 years, 1975-98

	1975-1980	1981-1986	1987-1992	1993-1998
All groups combined	140.0	149.0	157.5	159.1
Leukemia	33.2	36.3	37.6	37.4
Lymphomas and reticuloendothelial neoplasms	24.1	24.9	24.8	23.9
Central nervous system	23.4	24.3	29.6	27.8
Sympathetic nervous system tumors	7.7	8.1	7.6	8.5
Retinoblastoma	2.6	2.7	2.9	3.1
Renal tumors	6.0	6.6	6.3	7.1
Hepatic tumors	1.2	1.5	1.7	1.8
Malignant bone tumors	7.8	9.2	8.9	9.4
Soft tissue sarcomas	10.4	10.9	11.2	11.4
Germ cell, trophoblastic and other gonadal neoplasms	8.6	9.8	11.3	11.7
Carcinomas and other malignant epithelial neoplasms	13.9	13.5	14.6	15.0

Notes: Rates are cases per 1,000,000 per year and are age adjusted to the 1970 U.S. standard population.

Source: Ries, L.A.G., et al. *SEER Cancer Statistics Review, 1973-1998*. 2001.

Indicators

Childhood asthma mortality - Category I
Childhood asthma prevalence – Category I

Asthma is a chronic respiratory disease characterized by inflammation of the airways and lungs. During an asthma attack, the airways that carry air to the lungs are constricted. As a result, less air is able to flow in and out of the lungs (NCHS, 2001). Currently, there are no preventive measures or cure for asthma; however, children and adolescents who have asthma can still lead quality, productive lives if they control their asthma. Asthma can be controlled by taking medication and by avoiding contact with environmental "triggers" for asthma. Environmental triggers include cockroaches, dust mites, furry pets, mold, tobacco smoke, and certain chemicals (CDC, 2002g; CDC, 2003b).

What the Data Show

In 2001, approximately 6 million (9 percent) of U.S. children had asthma, compared to approximately 3.6 percent of children in 1980 (EPA, 2003a).

In 1999, there were 32 deaths due to asthma for children under 5 years of age and 144 deaths for children 5 to 14 years of age (Mannino, et al., 2002). This number is slightly lower than the 189 asthma deaths among children under 15 years of age in 1998.

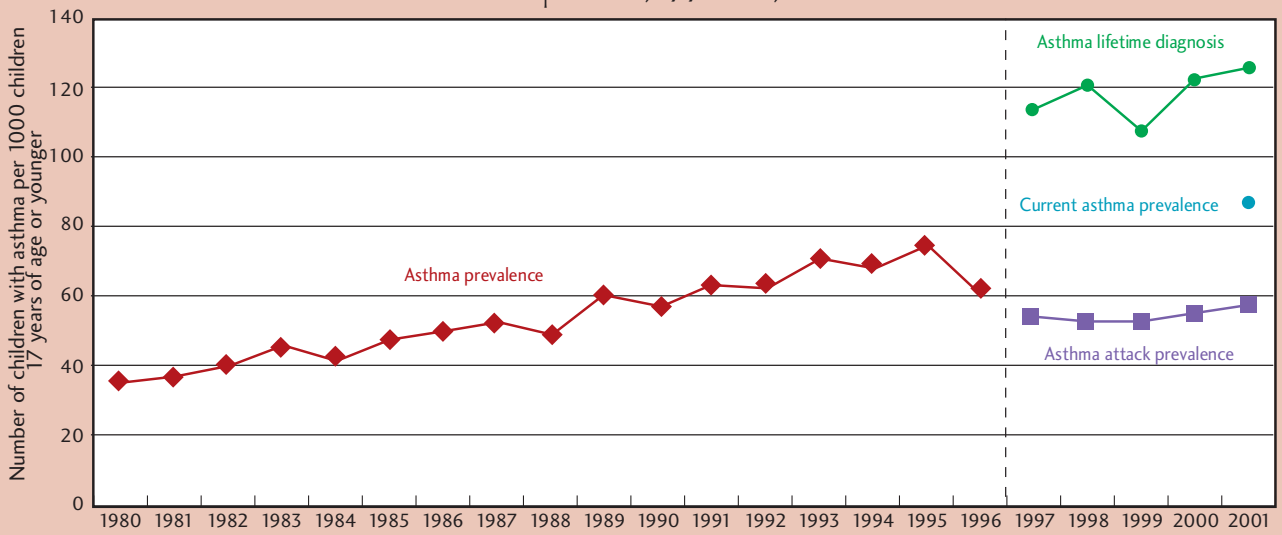
Boys were more likely to have been diagnosed with asthma than girls; the condition was diagnosed in 13 percent of boys compared with 10 percent for girls. Of the 4 million children who reported that they had an asthma attack in the last 12 months, boys were most likely to have had an attack when they were 5 to 11 years of age. Girls were most likely to have had an attack in the previous year at 12 to 17 years of age. Fourteen percent of non-Hispanic African American children had been diagnosed with asthma. The proportion of non-Hispanic White and Hispanic children who had ever been diagnosed with asthma was nearly the same, 11 percent and 10 percent, respectively. Asthma rates in children have increased since 1980, especially for children age 4 and younger and for African-American children (Exhibit 4-27).

Data Sources

Mortality: National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-31, for more information.)

Prevalence: National Health Interview Survey, Centers for Disease Control and Prevention (See Appendix B, page B-32, for more information.)

Exhibit 4-27: Asthma prevalence, 1980-1996, asthma lifetime diagnosis, current asthma, and asthma attack prevalence, 1997-2001, in children



Note: The survey questions for asthma changed in 1997; data before 1997 cannot be directly compared to data in 1997 and later.

Source: Based on and updated from Akinbami, L.J. and K.C. Schoendorf. *Trends in Childhood Asthma: Prevalence, Health Care Utilization and Mortality.* 2002. Data from CDC, National Center for Health Statistics, National Health Interview Surveys, 1980-2001.

Indicators

Deaths due to birth defects - Category I
Birth defect incidence - Category I

Congenital anomalies, or birth defects, are structural defects that are present in the fetus at birth. Because the causes of about 70 percent of all birth defects are unknown, the public continues to be anxious about whether environmental pollutants cause birth defects, developmental disabilities, or other adverse reproductive outcomes. The public also has many questions about whether various occupational hazards, dietary factors, medications, and personal behaviors cause or contribute to birth defects (CDC, 2002c).

What the Data Show

Birth defects (congenital anomalies) are a leading cause of infant deaths, accounting for 5,473 (19.6 percent) of the 27,937 infant deaths in 1999 (Hoyert, et al., 2001). The most frequently occurring types of birth defects were those affecting the heart and the lungs. Because some birth defects are not recognized immediately, they are underreported on the death certificate, so the numbers underestimate the problem (Friis, et al., 1999). Exhibit 4-28 presents the number and rate of live births with congenital anomalies.

Data Source

National Vital Statistics System, National Center for Health Statistics. (See Appendix B, page B-32, for more information.)

Exhibit 4-28: Number and rate of live births with selected congenital anomalies, United States, 2000

Congenital Anomaly (All races)	Number of Congenital Anomalies Reported	Rate
Anencephalus	425	10.7
Spina bifida/Meningocele	822	20.7
Hydrocephalus	940	23.7
Microcephalus	284	7.2
Other central nervous system anomalies	822	20.7
Heart malformations	4,958	124.9
Other circulatory/respiratory anomalies	5,484	138.1
Rectal atresia/stenosis	333	8.4
Tracheo-esophageal fistula/Esophageal atresia	481	12.1
Omphalocele/Gastroschisis	1,180	29.7
Other gastrointestinal anomalies	1,185	29.9
Malformed genitalia	3,344	84.2
Renal agenesis	547	13.8
Other urogenital anomalies	3,943	99.3
Cleft lip/palate	3,259	82.1
Polydactyly/Syndactyly/Adactyly	3,460	87.2
Clubfoot	2,271	57.2
Diaphragmatic hernia	427	10.8
Other musculoskeletal/integumental anomalies	8,614	217.0
Down's syndrome	1,863	46.9
Other chromosomal anomalies	1,575	39.7

Rates are number of live births with specified congenital anomaly per 100,000 live births in specified group.

Note: Of the 4,031,591 live births, there was no response recorded for the congenital anomaly item for 61,744 births.

Source: Martin, J.A., et al. *Births: Final Data for 2000.* 2002.

4.3.5 What are the trends for emerging health effects?

In addition to the diseases reported in the preceding pages, several other diseases are the cause of emerging concern because of their potential impacts on the health of the U.S. population. Information for eight such diseases—diabetes, Alzheimer's disease, Parkinson's disease, renal disease, autism, and three arthropod-borne diseases (Lyme disease, Rocky Mountain spotted fever, and West Nile virus)— is presented in this section. The increasing prevalence of these "emerging" illnesses positions them as potential future candidates for consideration as EPHIs. This will be dependent on their increasing prevalence in the population or a better determination of the role of exposure to environmental pollutants in the onset or exacerbation of these diseases. No specific indicators have been presented for these diseases at this time, but data collected by the CDC, individual states, and other sources illustrate the recent trends in these diseases.

Diabetes

Diabetes is a set of metabolic disorders. Diabetes mellitus (type 2) is the most common form of diabetes and is a disease whereby the body's insulin activity is altered. Insulin is a hormone that signals many biological processes such as the conversion of glucose to glycogen. Glycogen is the form in which food energy is stored in the body. The general symptoms of diabetes are elevated blood glucose levels, excessive thirst, frequent urination, and unexplained weight loss. Heredity, obesity, and age are factors that also contribute to diabetes. Estimates of the prevalence of diabetes vary widely. However, CDC estimates that there are about 11.1 million diagnosed cases of diabetes (CDC, 2002b). In addition to these cases, CDC estimates that there may be about 5.9 million more cases that are undiagnosed (CDC, 2002b). The total of 17 million diagnosed and undiagnosed cases combined amounts to a prevalence of 6.2 percent of the U.S. population. CDC estimates that 1 million new cases of diabetes are diagnosed per year among people aged 20 years and older (CDC, 2002b).

In 1999, diabetes ranked as the sixth leading cause of death in the U.S. There were 68,399 deaths due to diabetes (Hoyert, et al., 2001). The age-adjusted death rates for diabetes increased between 1980 and 1996 from 15.3 to 20.6 per 100,000 people. By 1999, the rate had risen to 25.2 per 100,000 people.

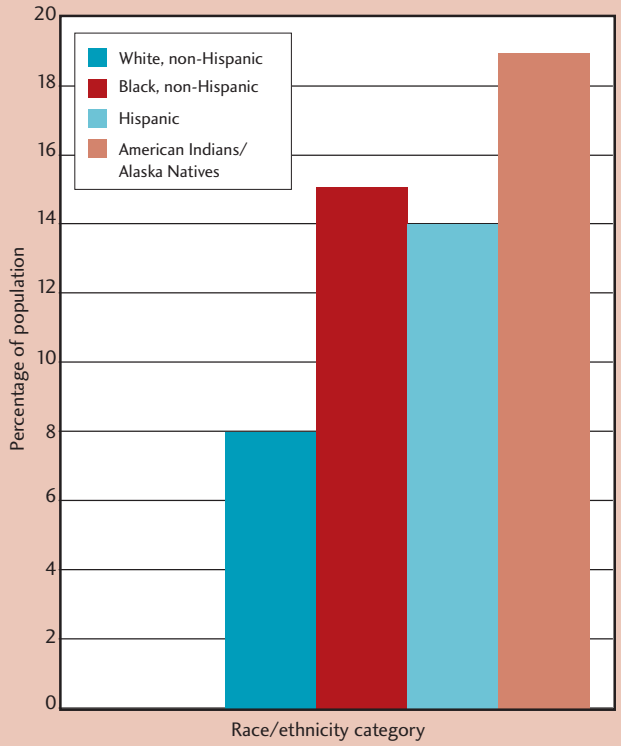
On average, Hispanic Americans are 1.9 times more likely to have diabetes than non-Hispanic Whites of similar age. The risk of diabetes for Mexican Americans and non-Hispanic Blacks is almost twice that for non-Hispanic Whites. Similarly, residents of Puerto Rico are 2.0 times more likely to have diagnosed diabetes than U.S. non-Hispanic Whites. On average, American Indians and Alaska Natives are 2.6 times more likely to have diabetes than non-Hispanic Whites of similar age. Approximately 15 percent of American Indians and Alaska Natives receiving care from the Indian Health Service have diabetes. At the regional level, diabetes is least common among Alaska Natives (5.3 percent) and most common among American Indians in the southeastern U.S. (25.7 percent) and in certain tribes from the Southwest (CDC, 2002b). Exhibit 4-29 shows age-adjusted prevalence data for diabetes in the U.S. by race/ethnicity.

Alzheimer's Disease

Alzheimer's disease is a neurodegenerative disorder. The symptoms of Alzheimer's disease may include dementia, loss of memory, and decreasing physical abilities such as dressing or eating. In the U.S., an estimated 4 million people, mostly elderly, have Alzheimer's disease (Hoyert and Rosenberg, 1999). In 1999, an estimated 354,000 non-institutionalized adults 18 to 64 years of age reported Alzheimer's disease as their main disability (CDC, 2001e).

The death rate due to Alzheimer's disease rose steadily from 1979 to 1996. In 1999, Alzheimer's disease was the eighth leading cause of

Exhibit 4-29: Age-adjusted prevalence of physician-diagnosed diabetes in persons 20 years of age and older, by race/ethnicity, United States, 2000



Source: CDC. *National Diabetes Fact Sheet.* 2002. Data from CDC, National Center of Health Statistics, National Health Interview Survey, 1997-1999 and National Health and Nutrition Examination Survey, 1988-1994.

death in the U.S. (Hoyert, et al., 2001). There were 44,536 deaths attributed to Alzheimer's disease (16.3 deaths per 100,000 population). The death rate for Alzheimer's disease rises sharply with age. In 1999, among people 75 to 84 years of age, there were 15,836 deaths and in this age group Alzheimer's disease ranked as the seventh leading cause of death (Anderson, 2001). The death rate for Alzheimer's disease for this age group was 130.4 per 100,000 population. Among persons 85 years of age and older, there were 24,980 deaths due to Alzheimer's disease for a death rate of 598.3 per 100,000 population.

Death rates for Alzheimer's disease are higher for women than for men and higher for Whites than African Americans (Hoyert, et al., 2001). The 1999 death rates for Alzheimer's disease are highest for White females (25.6 per 100,000), followed by White males (11.4), African American females (9.0), and African American males (4.2). The Alzheimer's disease death rate for Hispanics is 3.1 per 100,000. Hispanic females have a higher death rate (4.3 per 100,000 population) than Hispanic males (2.0 per 100,000). The death rates from Alzheimer's disease are higher in the Northeast and in the Northwest regions of the U.S. (Hoyert and Rosenberg, 1999).

Parkinson's Disease

Parkinson's disease is a neurodegenerative disorder characterized by symptoms such as tremors, muscle rigidity, and changes in walking patterns. The National Institute of Neurological Diseases and Stroke (NINDS) estimates that there are about 500,000 people in the U.S. with Parkinson's disease (NINDS, 2002). The disease mostly affects elderly people and is second only to Alzheimer's disease in the number of older people that are affected (Checkoway and Nelson, 1999). It affects about 0.4 percent of those 40 years of age and older, 1 percent of those older than 65 years, and about 3 percent of those 80 years of age and older. Males are 1.3 times more likely than females to have Parkinson's disease.

A steady increase in the death rate due to Parkinson's disease among people 75 years of age and older has been observed in the U.S. In 1999, there were 14,593 deaths due to Parkinson's disease (Hoyert, et al., 2001). Virtually all of the deaths (14,298) occurred in people 65 years of age and older. The death rate was 5.4 per 100,000 population, with males having a higher death rate than females (6.2 versus 4.5 per 100,000).

The 1999 death rate due to Parkinson's disease was higher for Whites (6.2 per 100,000 people) than for African Americans (1.5 per 100,000) (Hoyert, et al., 2001). The death rate for White males was 7.1 per 100,000 and for White females 5.3 per 100,000. The death rate for African American males was 1.6 and for African American females 1.3 per 100,000. The death rate for Hispanics was 1.2 per 100,000, with Hispanic males having a slightly higher death rate (1.4 per 100,000) than Hispanic females (1.1 per 100,000).

Renal Disease

The kidneys are vital organs and can be seriously affected by a number of primary diseases such as diabetes or hypertension. As these diseases progress, the kidneys may fail to function. Total and permanent kidney failure is called end stage renal (kidney) disease (ESRD). It is estimated that about 424,179 people in the U.S. have ESRD (NIDDK, 2001). Most ESRD occurred in people who have diabetes (150,404 people), hypertension (100,169 people), or glomerulonephritis, a kidney disease (62,119 people).

The U.S. government maintains the U.S. Renal Data System, which provides information on the incidence, prevalence, and mortality for ESRD (CDC, 2000a). Data from this system indicate that there were 89,252 people with ESRD who began treatment in 1999. These cases of ESRD resulted from diabetes for 38,160 people and from hypertension for 23,133 people. Kidney diseases and other primary diseases were responsible for the remainder.

Between 1979 and 1998, the age-adjusted death rates for all types of kidney disease increased, peaking between 1984 and 1988. The age-adjusted death rates for all types of kidney disease are higher among African Americans than among Whites, with African American males having the highest rates during the 1979 to 1998 period.

In 1979, the death rate for total kidney disease was 8.6 per 100,000 people. By 1999, kidney disease had risen to rank as the ninth leading cause of death in the U.S. (Hoyert, et al., 2001). That year there were 35,525 deaths due to all types of kidney disease; 34,719 of them were due to kidney failure. The death rate for kidney disease was 13.0 per 100,000 people; the death rate for kidney failure was 12.7 per 100,000 people (Exhibit 4-30). Death rates for kidney failure were highest for African American females at 19.0 per 100,000, followed by African American males at 17.8 per 100,000.

African Americans and American Indians have higher rates of ESRD than Whites or Asians (AHA, 2001). African Americans represent 32 percent of the patients receiving treatment for ESRD. Recently there has been an increase in ESRD due to diabetes among American Indians and Alaskan Natives (CDC, 2000c). Between 1990 and 1996, the age-adjusted rate of new ESRD treatment among American Indians with diabetes increased 24 percent, from 472 to 584 per 100,000 persons with diabetes.

Autism

Autism is one of several related severe cognitive and neurobehavioral disorders that are classified under the term autistic spectrum disorders. Information about the prevalence of autism in the U.S. is limited, reflecting the use of different diagnostic criteria and a lack of research. First described in the 1940s, autism was thought to affect 2 to 4 children per 10,000 population. Today the prevalence is currently believed to be as high as 1 in 500 children` for all autistic

Exhibit 4-30: Death rates for kidney disease, United States, 1999

	All Races			White			All Other			Black		
Cause of Death	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
Nephritis, nephrotic syndrome, nephrosis	13.0	12.8	13.3	12.5	12.4	12.6	15.6	14.8	16.3	19.3	18.2	20.2
Kidney failure	12.7	12.5	13.0	12.2	12.1	12.3	15.2	14.4	16.0	18.9	17.8	19.0
Other	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3*	0.4	0.4*	0.4*

Rates are per 100,000 population.

*Figure does not meet the standards of reliability or precision.

Source: Hoyert, et al. *Deaths: Final Data for 1999*. 2001.

spectrum disorders (Iversen, 2000). Currently, autism affects about 400,000 people in the U.S., and occurs about four times more often in boys than in girls.

Researchers have reported that the number of persons with autism is increasing. For example, a recent California Department of Developmental Services (CDDS) report showed an over 200 percent increase in the number of persons entering the regional center service system with autism between 1987 and 1998 (CDDS, 1999). Other states have reported increasing numbers as well (Yazbak, 1999). However, these reports do not necessarily reflect a change in the rate of autism because they do not consider the increase in the total population (Fombonne, 2001).

The number of cases of autism in children in the U.S. has increased over time. The number of children 0 to 21 years old with autism who are also enrolled in federally supported programs for the disabled has grown from 5,000 in 1991 to 79,000 in 2000 (NCES, 2001). This represents an increase from 0.1 to 1.1 percent of all children with disabilities served, or an increase from 0.01 to 0.14 percent of all children in public schools.

Arthropod-Borne Diseases

Certain ticks and mosquitoes (arthropods) can carry bacteria and viruses that cause disease in humans. They acquire the bacteria and viruses when they bite an infected mammal or bird. Arthropod-borne diseases include Lyme disease, Rocky Mountain spotted fever (RMSF), and West Nile virus (WNV).

Lyme Disease

Lyme disease is the most commonly reported arthropod-borne disease in the U.S. (Orloski, et al., 2002). The illness was first described in Europe during the 1800s; however, it was not identified in the U.S. until the early 1970s when a cluster of children with "juvenile rheumatoid arthritis" in Lyme, Connecticut, was reported by their parents (Shapiro and Gerber, 2000). Investigation of the cluster led to the description of Lyme arthritis in 1976 and then to the identification of the causal pathogen. Between 1992 and 1998, there were 88,967 cases of Lyme disease reported to the CDC. The number of cases increased from 9,896 in 1992 to 16,802 in 1998 (Exhibit 4-31).

The incidence of Lyme disease was highest in eight northeastern and mid-Atlantic states and two north central states. These states accounted for 92 percent of the total cases.

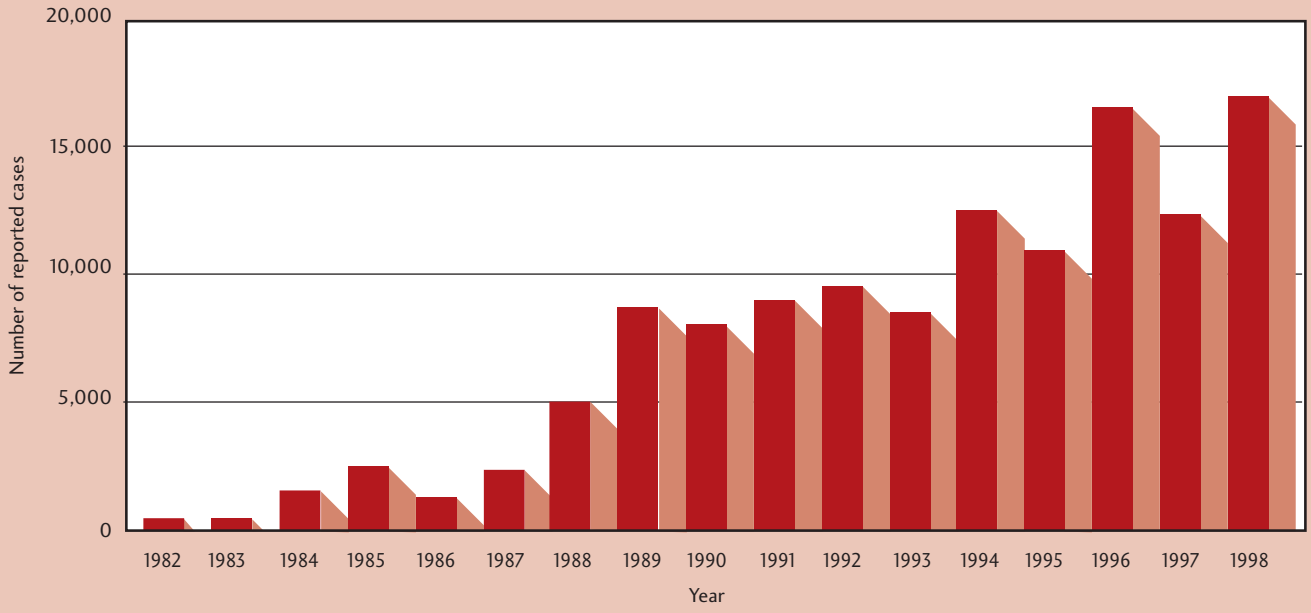
Rocky Mountain Spotted Fever

Although Lyme disease is the most commonly reported tick-borne disease in the U.S., RMSF is the most commonly *fatal* tick-borne disease in the U.S. (Holman, et al., 2001). Physicians first recognized RMSF in the northwestern U.S. during the late 1800s; Howard Ricketts identified the causal pathogen in the early 1900s (Gayle and Ringdahl, 2001; Paddock, et al., 1999). RMSF was the first disease in the U.S. shown to be transmitted by tick bite (Walker, 1998). Although RMSF was first identified in the Rocky Mountain states, fewer than 3 percent of cases were reported from that area between 1993 and 1996. The highest incidence of cases in that time period was found in North Carolina and Oklahoma. These two states accounted for 35 percent of the total cases from 1993 to 1996 (CDC, 2002c). RMSF has been reported throughout the continental U.S. (except in Maine, New Hampshire, and Vermont).

Between 1990 and 1998, there were approximately 4,800 cases of RMSF reported to the CDC (CDC, 2000b). The annual number of cases has varied between 250 and 1,200 cases since 1942, with a peak between 1975 and 1981.

The ratio of the number of deaths due to RMSF compared to the number of cases of the disease is the highest in children under 10

Exhibit 4-31: Number of reported cases of Lyme disease, United States, 1982-1998



Source: Orloski K.A., et al. *Surveillance for Lyme Disease*. 2002.

years of age (2 to 3 percent) and those over 70 years of age (9 percent) (CDC, 2000b).

West Nile Virus

In 1937, WNV, a strain of encephalitis, was first identified as a human pathogen in the West Nile region of Uganda. The pathogen was found in blood taken from a woman during a yellow fever investigation (Rappole, et al., 2000). Since 1937, WNV has been determined to be widespread in many areas of the world, particularly Africa, the Middle East, Europe, Russia, India, and Indonesia (Horga and Fine, 2001).

Cases of WNV were first documented in the U.S. in 1999 (CDC, 2000d). A total of 80 cases in humans were reported in 1999 (62 cases) and 2000 (18 cases). Because severe neurological illness (encephalitis meningitis) occurs in fewer than 1 percent of persons infected, it is thought that a greater number of cases with less severe symptoms may go unreported. Based on this assumption, it is estimated that approximately 2,000 persons may have been infected with WNV during 2000 (CDC, 2000d). The prevalence of the disease in humans is increasing. During 2002 there were 3,989 diagnosed cases in humans (CDC, 2002f). The number of deaths caused by West Nile encephalitis has increased from 7 in 1999 to 259 in 2002 (CDC, 2002f).