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Public Health Surveillance of 1990 Injury Control Objectives for the Nation

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Foreword

The purpose of the *CDC Surveillance Summaries* is to make available the most current information on conditions of public health interest for which CDC has major responsibility. The reports in this publication complement data provided in the *Morbidity and Mortality Weekly Report (MMWR)* and other CDC publications.

Note: A complete inventory of public health surveillance systems maintained by CDC will be published in the next issue of *CDC Surveillance Summaries*.

INTRODUCTION: MOVING FROM THE 1990 INJURY CONTROL OBJECTIVES TO STATE AND LOCAL SURVEILLANCE SYSTEMS

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The 1990 Injury Control Objectives

The nine surveillance summaries in this issue of *CDC Surveillance Summaries* all deal with injury, a term that is not yet widely understood. How paradoxical it is that, in the United States, injury represents the leading cause of death before age 55, the largest cause of years of potential life lost, and a cost of over $100 billion a year (*1*)—yet few people know what injury really means. What accounts for this discrepancy between the public health significance of injury and the relative obscurity of injury control? One explanation, in part, is the use of the word "accident" to describe many injuries. Generally, accidents are considered to be random and unpredictable events. Since they cannot be predicted, they cannot be understood—and if they cannot be understood, they cannot be prevented. So why study them, and why take on an impossible task? Actually, as the surveillance summaries in this report show, most injuries are far from "accidental." In the past, injuries have not been studied sufficiently to be scientifically well understood. Gathering information about the most significant injury types, through epidemiologic surveillance, is the first step toward a scientific understanding.

Another explanation for the marked disparity between the importance of injury and the minimal recognition it has received is the lack of a coordinated approach to the injury problem. Instead, organizations and programs addressing different types of injuries have operated independently. Specific programs have pertained to burns, falls, suicides, drownings, motor vehicle crashes, and homicides, but no identified focus or leadership has addressed the field of injury as a whole. In 1986, acting on a report by the National Academy of Sciences (*1*), Congress charged CDC with this leadership role.

Tracking progress toward the 1990 objectives (*2*) is part of that charge. The nine summaries in this report all address health measures that were selected in 1979 to be objectives for the nation for 1990. These objectives have helped public health personnel initiate injury research and begin prevention programs at many different levels, both federal and nonfederal. This issue of *CDC Surveillance Summaries*, in addressing diverse injury types together in one document, is an important step toward consolidating the various elements of injury control into a unified field. In each article, surveillance data are used to monitor the nation's progress toward a specific objective. The problems impeding further progress and the steps still necessary to attain the objective are also discussed. These summaries should help describe and clarify the injury problem, as well as stimulate additional interest in applying surveillance methods to the field of injury control.

Eight of the following nine surveillance summaries focus on mortality data; however, there is a pressing need to develop and evaluate injury morbidity surveillance at state and local levels.

Developing State- and Local-Level Injury Surveillance

Most local injury control programs address problems identified in the analysis of data pertaining to large—usually nationwide—areas, and these data do not always reflect local problems associated with injury. Differences in communities, populations, and other conditions contribute to the geographic variations in the distribution of injuries. These differences underscore the need for local injury surveillance systems. Such systems enable public health personnel not only to measure the impact of injuries on a local level but also to set priorities in their control efforts and to evaluate the effectiveness of various injury control measures.

Although mortality data are readily available at state and local levels, morbidity data are not. Mortality data reflect the most serious injuries that occur in a community, but they represent less than 1% of all injuries (*3*). Many sources of morbidity data are available for the surveillance of injuries. One of the potentially most useful sources is hospital discharge databases. Hospital discharge summaries contain information about the patient's external cause of injury (E codes) and information about the nature of the injury (N codes). Often, however, the E codes are missing on discharge summaries because of various reasons described later. For injury surveillance purposes, the inclusion of E codes on the discharge summaries of all patients hospitalized because of injuries should be a major objective. In an attempt to reach this objective, the New York State Department of Health has recently mandated that E codes be added to their uniform hospital discharge database.

Other sources of data include registries for trauma, burns, and head and spinal injuries. These registries contain data about specific serious injuries, and methods for using them in injury surveillance are continuously being refined. Using sentinel injury events and making certain injuries reportable conditions are additional strategies for obtaining surveillance data (*4*). These approaches should be explored further on a pilot basis.

Some steps that must be included in an effective injury surveillance system are as follows:

- Identification of existing and potentially useful data sources for injuries
- Preparation of a surveillance plan that will include the collection, analysis, and dissemination of these data
- Identification of priority injuries that are amenable to prevention and control measures
- Continued surveillance on these priority areas to measure the effectiveness of interventions
- Dissemination of the surveillance data, including information on the effectiveness of injury interventions.

Evaluating an Injury Surveillance System

A completed injury surveillance system can be evaluated by determining the public health importance of the target injury, the usefulness and cost of the system, and the quality of the data that the system generates (*5*). A system should address injuries of public health importance to a particular community. The impact of an injury on a population varies according to the type of injury, the type of community, and even the population at risk. For example, bicycle-related injuries are a major problem concerning children, but they are of minor importance for adults over age 65.

A surveillance system is useful if it generates data that will lead to the prevention and control of injuries or if it leads to research about injury prevention and control. A system based on patients' records at emergency department treatment facilities may not be useful for identifying causative factors because these records do not always reflect the external cause of the injury. The cost of an injury surveillance system also influences its usefulness. A system that requires nosologists and medical records personnel to independently code and enter data from emergency department records rather than using an extant computerized data system may be too costly to sustain.

Various aspects of the quality of a surveillance system can be assessed, including acceptability, timeliness, representativeness, sensitivity, specificity, simplicity, and flexibility (*5*). The relative importance of each of these factors will vary greatly from community to community and will reflect different opportunities, needs, and resources.

The methods of collecting, analyzing, and disseminating the surveillance data should be acceptable to the persons actually operating the system. For example, in the past, hospital discharge summaries that include E codes have been the most widespread, useful, and cost-effective source of data for injury surveillance. Most hospital discharge summaries, however, are not E coded because 1) many medical practitioners do not provide enough details about the cause of injury, 2) many medical records personnel have difficulty using the International Classification of Diseases, Ninth Revision (ICD-9) E codes, and 3) abstracting companies do not provide sufficient or separate space in the discharge abstract for the codes because the E code is not related to reimbursements. Thus, in the past, hospital discharge summary databases have been less useful than desired. This situation is changing, however, as efforts are being made to educate medical practitioners and records personnel about the need for E codes, to improve the E codes for the Tenth Revision of the ICD, and to require their inclusion in uniform hospital discharge databases.

Surveillance data should be timely. Timeliness relates to the time between an injury and the reporting of that incident, as well as the frequency with which the surveillance data are analyzed. Although injury data may not need to be collected daily, they should be collected, analyzed, and used frequently enough to reflect clusters of new injury events, and the time span should be sufficient for measuring the effectiveness of control interventions.

An injury surveillance system should collect data that are representative of a defined population. A severe-trauma registry at one hospital, for example, does not necessarily represent all severe trauma in a population if it excludes fatalities or patients treated at other major local hospitals. Patients treated at other local hospitals must be periodically enumerated to assure that the registry is representative.

A surveillance system should be simple in its design and approach so that the collection and analysis of data are not arduous tasks. A system in which the data are manageable and can be readily analyzed is preferable to one that requires extensive personnel and technical resources to produce each report.

Last, a surveillance system should be flexible. It should provide for the collection of data about injuries or injury conditions that may not have been originally considered for inclusion in the surveillance system.

References

1. Committee on Trauma Research. Injury in America. Washington, DC: National Academy Press, 1985.

2. US Department of Health and Human Services, Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
3. Gallagher SS, Finison K, Guyer B, Goodenough S. The incidence of injuries among 87,000 Massachusetts children and adolescents: results of the 1980-81 Statewide Childhood Injury Prevention Program surveillance system. Am J Public Health 1984;74:1340-7.
4. Graitcer PL. The development of state and local injury surveillance systems. J Safety Res 1987;18:191-8.
5. Thacker SB, Parrish RG, Trowbridge FL. A method to evaluate systems of epidemiologic surveillance. World Health Statistics Quarterly, 1988 (in press).

DEATHS FROM MOTOR VEHICLE-RELATED INJURIES, 1978-1984

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Introduction

In 1978, motor vehicle collisions accounted for the largest number of traumatic deaths and injuries in the United States; approximately 52,400 deaths resulted from motor vehicle collisions or involved motor vehicles. These fatalities involved over 9,000 pedestrians, a 2% increase from 1977. Approximately 2 million disabling injuries resulted from motor vehicle crashes in 1978. Fatalities from all unintentional injuries were the fourth leading cause of death among all persons >1 year of age, and fatalities due to motor vehicle crashes ranked as the sixth leading cause of death in 1978. Because of the importance of motor vehicle collisions in the morbidity and mortality of the U.S. population, the following 1990 objective was established: "By 1990, the motor vehicle fatality rate should be reduced to no greater than 18 per 100,000 population" (*1*). In 1978, the rate was 24.0/100,000 population. With revised Bureau of the Census population estimates, the rate in 1978 was 23.6/100,000 population.

Among children <15 years of age, motor vehicle collisions are a major cause of injury and disability, accounting for 20% of all deaths in that age group. For children 5-15 years of age, motor vehicle fatalities accounted for 52% of all accidental deaths in 1978. That year, deaths following injuries sustained in motor vehicle crashes accounted for an estimated 270,000 years of life lost for children <15 years old. Because of this serious public health problem, the following 1990 objective was established: "By 1990, the motor vehicle fatality rate for children under 15 should be reduced to no greater than 5.5 per 100,000 children" (*1*). In 1978, the rate was 9.2/100,000 children <15, and with revised Bureau of the Census population estimates, the rate in 1978 was 9.1/100,000 children.

Methods

The Division of Vital Statistics, National Center for Health Statistics (NCHS), compiles mortality data from death-certificate information provided by the 50 states and the District of Columbia. This information includes age, race, sex, geographic region, date of death, and the cause of death for each person. The cause of death is coded according to the International Classification of Diseases (ICD), the Eighth Revision (ICDA-8) (*2*), which was used until 1979 when the Ninth Revision became effective. The latter revision did not have a major impact on the classification of deaths into the motor vehicle-related category, since the cause-of-death categories pertaining to motor vehicle collisions are similar in the two revisions, and a comparability study of the two revisions, conducted by NCHS, showed similar results (*3*).

For this report, the ICD classification "Motor Vehicle Traffic Accidents" (E810-E819) was used to identify public highway motor vehicle collisions, and "Motor Vehicle Nontraffic Accidents" (E820-E825) was used to identify motor vehicle collisions in recreational or sporting activities or motor vehicle-related injuries. All deaths that

occurred within 1 year of the motor vehicle crash and were attributable to injuries sustained in the crash were considered to be motor vehicle-related deaths.

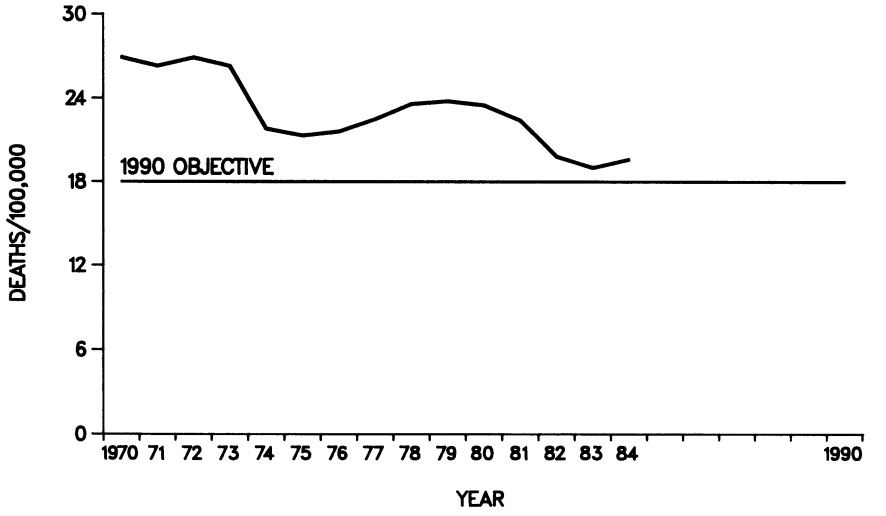
U.S. population data used to calculate rates were taken from reports prepared by the Bureau of the Census. Data for 1970 and 1980 were drawn directly from the 1970 and the 1980 census enumerations. Changes in the reporting of race in the 1980 census, however, resulted in inconsistencies between the 1970 and the 1980 enumerations. For this reason, the modified 1980 census enumeration consistent with 1970 racial data was used in this report to calculate motor vehicle-related rates by race for 1980. Population data for the intercensal years 1971-1979 and 1981-1985 were drawn from the P-25 series of the Current Population Reports compiled by the Bureau of the Census. These intercensal estimates incorporate data from both the 1970 census and the modified 1980 census.

Results

Figures 1 and 2 present the vital statistics data relevant to the two motor vehicle-related objectives. Figure 1 gives the death rate per 100,000 population from motor vehicle crashes for the entire population, and Figure 2 gives the same information restricted to the population <15 years of age. The death rates for both the entire population and the population <15 have declined from 1978 levels and are approaching the rate specified in the two objectives. In 1984, the death rate for the entire population was 19.6/100,000 population, and it was 6.6 for the population <15 years of age.

Males outnumbered females in motor vehicle-related deaths. For the general population, the ratio was almost three males to one female in each year (Table 1). For children <15, the ratio was 1.6 boys to each girl (Table 2). In the entire population, most of the decline in the number and rate of deaths due to motor vehicle crashes was among males (13.6% and 18.9%, respectively). In the population <15, the decline in the number of deaths and in the death rate was approximately the same for both males and females during this time frame. Among children, the rates were about the

FIGURE 1. Motor vehicle-related fatality rates, by year, United States, 1970-1984



same across racial groups, with persons in the other racial category having the greatest decline. Between 1978 and 1984, the number and rate of motor vehicle-related deaths declined in all four geographic regions. The fewest deaths occurred in the Northeast region, and this region also had the lowest death rates. In 1978 and 1979, the West had the highest death rates due to motor vehicle crashes. For all years from 1980 through 1984, the South had the largest number of deaths and the highest death rates. For persons of all ages, at least 28% of the reported deaths occurred in the months of June, July, and August, whereas for children <15 years old, more than a third of the deaths occurred during these months. And, in >75% of the deaths among children <15, the children were either pedestrians or occupants of a motor vehicle.

Discussion

The economic cost of motor vehicle collisions is conservatively estimated as $57 billion/year (*4*). If the decline in the motor vehicle-related deaths continues, the 1990 objectives for the general population and for children <15 years old will be met. Factors related to three different elements interact to affect the number of motor vehicle fatalities that occur in a given year: the driver and other occupants, the vehicle, and the environment (*5*). Two factors contributing to the achievement of the 1990 objectives involve occupants of vehicles: 1) increased use and improved design of seat belts and 2) decreased alcohol consumption by drivers. In 1985, laws on the use of seat belts became effective in eight states and the District of Columbia, and laws were passed in seven additional states that went into effect in 1986 or 1987. The National Highway Traffic Safety Administration (NHTSA) estimates that 263 lives were saved because of the seat belt laws in the first eight states (*6*). In a survey of 19 cities, the observed use of seat belts rose from 15.3% at the beginning of 1985 to 23.3% at the end of that year. The seat belts used in 1985 were predominantly lap and shoulder belts, compared with the lap-only belts that were more prevalent in the late 1970s (*7*).

FIGURE 2. Motor vehicle-related fatality rates for children under 15 years of age, by year, United States, 1970-1984

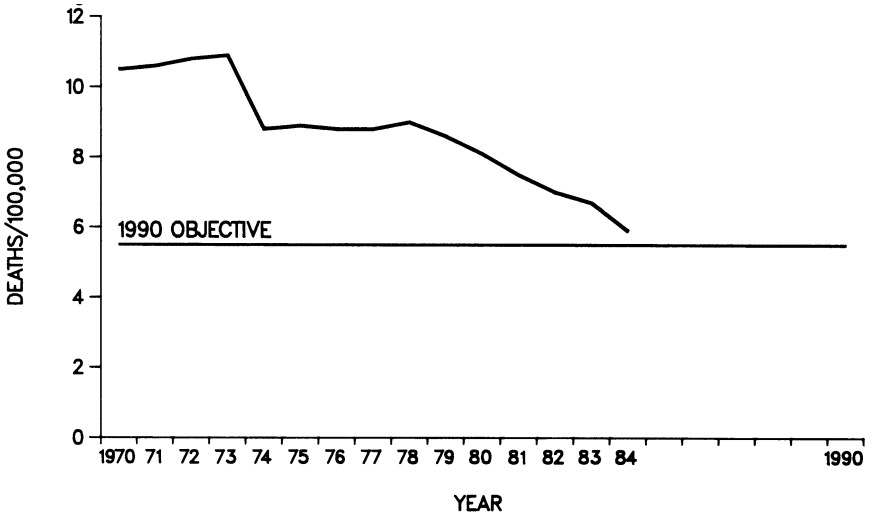


TABLE 1. Motor vehicle-related deaths and death rates, by sex, race, region, and season, United States, 1978-1984

	Sex								
	Males		Females		Total		Age-adjusted rates†		
Year	Deaths	Rate*	Deaths	Rate	Deaths	Rate	Males	Females	Total
1978	38,143	35.3	14,273	12.5	52,416	23.6	33.3	12.0	22.3
1979	39,309	36.0	14,215	12.3	53,524	23.8	33.7	11.8	22.4
1980	38,861	35.3	14,311	12.3	53,172	23.5	32.9	11.7	22.0
1981	37,533	33.6	13,852	11.7	51,385	22.4	31.3	11.1	20.9
1982	33,191	29.4	12,588	10.6	45,779	19.7	27.6	10.0	18.6
1983	31,907	28.0	12,545	10.4	44,452	19.0	26.4	9.9	17.9
1984	32,949	28.6	13,314	11.0	46,263	19.6	27.0	10.7	18.5

	Race							
	White		Black		Other		Total	
Year	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1978	45,978	24.0	5,254	20.3	1,184	27.9	52,416	23.6
1979	47,248	24.4	5,132	19.5	1,144	25.3	53,524	23.8
1980	46,863	24.0	5,081	19.0	1,228	23.6	53,172	23.5
1981	45,424	23.1	4,809	17.7	1,152	20.4	51,385	22.4
1982	40,191	20.3	4,493	16.3	1,095	18.1	45,779	19.7
1983	38,864	19.4	4,472	15.9	1,116	17.5	44,452	19.0
1984	40,429	20.1	4,721	16.6	1,113	16.5	46,263	19.6

	Region§									
	Northeast		Midwest		South		West		Total	
Year	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1978	8,090	16.4	13,120	22.4	19,634	26.9	11,572	28.0	52,416	23.6
1979	8,500	17.3	13,005	22.1	20,038	27.0	11,981	28.3	53,524	23.8
1980	8,480	17.3	12,598	21.4	20,459	27.1	11,635	27.0	53,172	23.5
1981	8,039	16.3	11,756	19.9	20,604	26.8	10,986	24.8	51,385	22.4
1982	7,081	14.4	9,988	17.0	18,892	24.1	9,818	21.7	45,779	19.7
1983	6,873	13.9	9,665	16.4	18,312	23.0	9,602	20.9	44,452	19.0
1984	6,934	13.9	10,154	17.2	19,027	23.6	10,148	21.6	46,263	19.6

	Season								
	Dec-Feb		Mar-May		June-Aug		Sept-Nov		Total
Year	Deaths	Percent	Deaths	Percent	Deaths	Percent	Deaths	Percent	Deaths
1978	10,365	19.8	12,297	23.5	15,219	29.0	14,535	27.7	52,416
1979	11,494	21.5	13,126	24.5	14,566	27.2	14,338	27.4	53,524
1980	11,425	21.5	12,365	23.3	15,726	29.6	13,656	26.1	53,172
1981	11,479	22.3	12,309	24.0	14,625	28.5	12,972	24.7	51,385
1982	9,777	21.4	11,140	24.3	12,884	28.1	11,978	22.9	45,779
1983	9,521	21.4	10,436	23.5	12,484	28.1	12,011	22.9	44,452
1984	9,916	21.4	10,824	23.4	13,067	28.2	12,456	23.8	46,263

*Deaths/100,000 population.
†With the 1970 U.S. population used as the standard.
§ Northeast (CT, NH, NJ, NY, MA, ME, PA, RI, VT), Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI), South (AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV), West (AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY).
Sources: National Center for Health Statistics and U.S. Department of Commerce, Bureau of the Census.

TABLE 2. Motor vehicle-related deaths and death rates for children under 15 years of age, by sex, race, season, and person role, United States, 1978-1984

	Sex					
	Males		Females		Total	
Year	Deaths	Rate*	Deaths	Rate	Deaths	Rate
1978	2,920	11.0	1,802	7.1	4,722	9.1
1979	2,755	10.5	1,693	6.7	4,448	8.6
1980	2,602	9.9	1,597	6.4	4,199	8.2
1981	2,435	9.3	1,443	5.8	3,878	7.6
1982	2,206	8.4	1,424	5.7	3,630	7.0
1983	2,216	8.4	1,285	5.1	3,501	6.8
1984	2,130	8.0	1,302	5.1	3,432	6.6

	Race							
	White		Black		Other		Total	
Year	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1978	3,850	8.9	744	9.7	128	10.9	4,722	9.1
1979	3,648	8.6	672	8.8	128	10.3	4,448	8.6
1980	3,387	8.0	671	8.8	141	10.0	4,199	8.2
1981	3,170	7.5	589	7.7	119	7.7	3,878	7.6
1982	2,934	7.0	593	7.6	103	6.2	3,630	7.0
1983	2,822	6.7	561	7.2	118	6.8	3,501	6.8
1984	2,767	6.6	555	7.1	110	6.0	3,432	6.6

	Season								
	Dec-Feb		Mar-May		June-Aug		Sept-Nov		Total
Year	Deaths	Percent	Deaths	Percent	Deaths	Percent	Deaths	Percent	Deaths
1978	732	15.5	1,192	25.2	1,617	34.2	1,181	25.0	4,722
1979	738	16.5	1,193	26.6	1,447	32.3	1,070	23.9	4,448
1980	735	17.5	1,048	25.0	1,441	34.3	975	23.2	4,199
1981	699	18.0	960	24.8	1,329	34.3	890	22.9	3,878
1982	638	17.6	876	24.1	1,258	34.7	858	23.6	3,630
1983	611	17.5	859	24.5	1,204	34.4	827	23.6	3,501
1984	623	18.2	839	24.4	1,142	33.3	828	24.1	3,432

	Person Role									
	Occupant, Motor Vehicle		Pedalcyclist		Pedestrian		Occupant, Other Vehicle		Total	
Year	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1978	1,629	3.1	424	0.8	2,020	3.9	18	0.0	4,722	9.1
1979	1,544	3.0	453	0.9	1,838	3.6	9	0.0	4,448	8.6
1980	1,551	3.0	407	0.8	1,713	3.3	6	0.0	4,199	8.2
1981	1,509	2.9	384	0.7	1,564	3.0	9	0.0	3,878	7.6
1982	1,462	2.8	342	0.7	1,453	2.8	5	0.0	3,630	7.0
1983	1,322	2.6	364	0.7	1,395	2.7	4	0.0	3,501	6.8
1984	1,310	2.5	344	0.7	1,340	2.6	8	0.0	3,432	6.6

*Deaths/100,000 population.

Sources: National Center for Health Statistics and U.S. Department of Commerce, Bureau of the Census.

Alcohol consumption by drivers is known to be associated with a higher than normal probability of being involved in a fatal crash. The involvement of alcohol in fatal crashes has decreased steadily over the 4 years from 1982 through 1985. In 1982, 30% of all drivers involved in fatal crashes had blood alcohol concentrations ≥0.1g%. In 1985, this percentage was down to 25%, a 16% decrease (*6*).

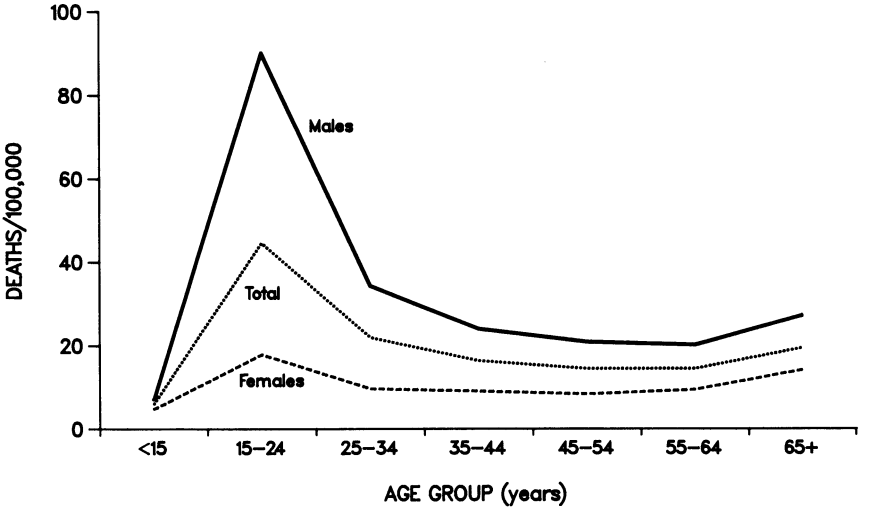
Safer vehicle designs also helped reduce the motor vehicle fatality rate. Many design features have been introduced that either assist in avoiding crashes, such as better braking systems and high-mounted taillights, or help prevent injuries if a crash occurs, such as padded dashboards and collapsible steering columns.

Recent legislation that permits a 65-mile-per-hour speed limit on rural interstate highways may have raised the motor vehicle-related fatality rate. Since crashes at higher speeds are more severe, the probability of death is increased if all other factors remain constant.

In formulating the objectives for the year 2000, public health personnel should consider changes in the units of measurement, in the targeted populations, and in the data used for surveillance. The 1990 objectives were formulated in terms of death rates/100,000 population; however, exposure is probably a risk factor for deaths due to motor vehicle crashes. For example, in this study more deaths occurred in the summer months, when people probably travel more, than in the other months. Exposure to automobile crashes is usually measured in terms of vehicular miles traveled (VMT), and trends in mortality are measured by deaths/100 million VMT (*6*). Formulating the year 2000 objectives in terms of deaths/100 million VMT should be considered.

Data provided by the NHTSA Fatal Accident Reporting System (FARS), 1985 (*6*), indicate that the motor vehicle-related fatality rate is highest, by far, among males 15-24 years of age (Figure 3). An objective that targets this specific age-sex group should be considered.

FIGURE 3. Motor vehicle-related fatality rates, by age group and sex, United States, 1985



Finally, there are two major limitations to the vital statistics data. First, the data are not available until 18-24 months after the end of a calendar year; thus, for example, the 1984 data were disseminated in April 1987. Second, the data contain only basic demographic information and do not contain details about each motor vehicle crash. This limitation does not allow investigators to evaluate the role of characteristics known to affect the probability of a crash and the probability of death once a crash has occurred. Two such characteristics are alcohol involvement and the use of seat belts. Because of these limitations, FARS data should be considered as an alternative source of surveillance data.

Since 1975, NHTSA has collected and stored information in the FARS data base on the circumstances surrounding all public highway crashes involving fatalities, including location, weather, and type of road. FARS also contains information on all persons involved in fatal crashes (both survivors and fatalities) and on all vehicles involved, regardless of whether an occupant from any particular vehicle was killed. This data base provides consistent information on the almost 500,000 fatal crashes that have occurred during the 11-year period 1975-1985. Besides the important advantage of offering more information about crashes, the FARS data base is available within the calendar year after the subject year—for example, 1985 data were available for analysis in the fall of 1986. The FARS data base defines an automobile-related fatality as a death that occurs within 30 days of, and as a direct consequence of, an automobile crash.

The only limitations of this data set are that the race of persons involved is not obtained, and it includes only deaths that occur within 30 days of a crash, whereas NCHS waits one calendar year for this cause-of-death determination. As a result of this time difference, NCHS data indicated 2% more motor vehicle-related deaths than FARS data indicated for the period 1978-1983.

Although the NCHS vital statistics information on underlying cause of death may be considered the "gold standard" for enumerating deaths, the slowness of its availability and the lack of any information about the circumstances of fatal crashes are major drawbacks to its use in the surveillance of motor vehicle-related deaths. Surveillance monitoring for the year 2000 objectives pertaining to motor vehicle-related deaths could be based on data from FARS. The FARS data are more timely and differ from the NCHS data only in defining a motor vehicle-related death as occurring within 30 days of the crash, as opposed to the NCHS definition of within 1 year of the crash. The trend in motor vehicle-related death rates is essentially the same in both data sets.

Neither FARS nor NCHS vital statistics contain information on morbidity associated with motor vehicle crashes. The National Accident Sampling System (NASS), also administered by NHTSA, contains information similar to that in the FARS system on a sample of all police-reported accidents in the United States; however, the sample size is very small, and the data are incomplete (*8*). None of the data sets discussed in this report (NCHS, FARS, NASS) are adequate for estimating the prevalence of seat belt usage or driving while drinking. The CDC Behavioral Risk Factor Surveillance System contains questions on seat belt usage and driving after drinking, thus providing important behavioral data for the states surveyed. This system, however, is based on self-reports and on rather limited information (*9*).

References

1. US Department of Health and Human Services, Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
2. National Center for Health Statistics. Eighth Revision International Classification of Diseases, adapted for use in the United States. Washington, DC: Public Health Service, 1967 (PHS publication no. 1963).
3. National Center for Health Statistics. Estimates of selected comparability ratios based on dual coding of 1976 death certificates by the Eighth and Ninth Revisions of the International Classification of Diseases. Monthly Vital Statistics Report vol 28, no. 11, supplement. Hyattsville, Maryland: National Center for Health Statistics, 1980. (DHEW publication no. (PHS) 80-1120).
4. National Safety Council. Accident facts, 1984. Chicago: National Safety Council, 1984.
5. National Safety Council. Accident facts, 1986. Chicago: National Safety Council, 1986.
6. National Highway Traffic Safety Administration. Fatal Accident Reporting System 1985. Washington, DC: US Department of Transportation, 1987. (DOT HS 807 071).
7. National Highway Traffic Safety Administration. Fatality trends: seat belts. Washington, DC: US Department of Transportation, 1986.
8. National Highway Traffic Safety Administration. National Accident Sampling System 1984. Washington, DC: US Department of Transportation, 1985. (DOT HS 806 867).
9. CDC. Behavioral risk factor surveillance—selected states, 1986. MMWR 1987;36:252-4.

DEATHS DUE TO INJURY IN THE HOME AMONG PERSONS UNDER 15 YEARS OF AGE, 1970-1984

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Introduction

Since 1950, mortality among children <15 years of age has declined substantially. Nearly all of this decline has been due to a reduction in the rate of deaths from natural causes (*1*). Injury has emerged as the leading cause of death among children 1-14 years of age, and incidents occurring in and around the home account for many of the fatal unintentional injuries to children (*2*).

The 1990 Objectives for the Nation include an objective to reduce the home injury fatality rate to no more than 5.0 per 100,000 for children <15 years of age. In 1978, the rate was 6.1 per 100,000 children <15 (*3*). This report is a review of the progress that has been made in meeting this 1990 objective, and it includes strategies to prevent children's deaths due to injury in the home.

Materials and Methods

Deaths. Data on the number of deaths occurring in the home were obtained from National Center for Health Statistics (NCHS) mortality tapes for the years 1970-1984. NCHS compiles mortality data from information recorded on death certificates. This information includes the decedent's age, race, sex, and date of death, and the underlying and contributory causes of death. The certificate also contains information on fatal injuries regarding the place of occurrence—for example, home, farm, street, or factory.

NCHS assigns the underlying cause of death and the place of occurrence of fatal injury according to the International Classification of Diseases (ICD) (*4*). The underlying cause is selected from the ICD external causes of injury and poisoning (E codes), a classification system based on the circumstances and intentionality of the injury event. NCHS assigns a separate code for the place where the injury occurred. The definition for home as the place of occurrence includes apartment, boarding house, home premises, driveway to home, garage, yard, and swimming pool in private house or garden. This report provides data on deaths resulting from injury for which NCHS has coded the place of occurrence as "home."

NCHS has assigned a place-of-occurrence code for fatal unintentional injuries under both the ICD Eighth Revision (ICD-8) (in use 1968-1978) and the ICD Ninth Revision (ICD-9) (in use since the beginning of 1979). No place of occurrence is assigned to deaths due to suicide, homicide, and injuries of undetermined intentionality. In this report, which describes trends for the period 1970-1984, the deaths discussed include only those due to injuries that were assigned a place-of-occurrence code according to ICD-9. (Place-of-occurrence codes are not assigned to unintentional injuries resulting from transport, medical and surgical procedures, or adverse reactions to drugs and medicinal substances in therapeutic use.)

Although death certifiers are instructed to enter on the death certificate the place where the injury occurred, the information they provide frequently does not allow

vital statisticians to assign a specific code. The proportion of injury-related deaths with unspecified place-of-occurrence codes varies from year to year, and it was particularly high in 1981 and 1982—42.5% and 43.0%, respectively (NCHS unpublished data). In those 2 years, NCHS did not report place-of-occurrence data in its annual bound volumes of vital statistics (*5,6*). In this report, except for Table 4, data on home injury-related fatalities for 1981 and 1982 are excluded.

Population Data. Only residents <15 years of age are considered in this report. Population data used to calculate rates were taken from reports prepared by the Bureau of the Census (*7-9*).

Results

From 1970 through 1984 (excluding 1981 and 1982), an average of 3,212 persons <15 years of age died each year from injuries that occurred in the home. During this period, the number of deaths in this category decreased 38%, from 4,046 in 1970 to 2,527 in 1984 (Table 1). The home injury-related fatality rate among children <15 years of age decreased from 7.0 in 1970 to 5.0 (the 1990 objective target value) in 1983, and to 4.9 in 1984 (Figure 1).

Table 2 presents fatality rates due to injury in the home by age group and sex for the years 1978 through 1984. The highest rate was for those <1 year of age. The rate for this age group declined from 16.8/100,000 in 1978 to 11.9/100,000 in 1984. This was the largest decrease in rate for any of the age groups. Males had a higher rate than females in all age groups.

TABLE 1. Deaths due to injury in the home among persons under 15 years of age, by year, United States, 1978-1984

Year	Total injury deaths*	Home injury deaths†	
		Number	%Total
1970	16,154	4,046	25.0
1971	16,077	3,791	23.6
1972	15,706	3,742	23.8
1973	15,629	3,467	22.2
1974	13,842	3,439	24.8
1975	13,186	3,196	24.2
1976	12,433	3,014	24.2
1977	12,279	2,971	24.2
1978	12,267	3,097	25.2
1979	11,428	2,929	25.6
1980	11,039	2,927	26.5
1983	9,597	2,605	27.1
1984	9,280	2,527	27.2

*Deaths for which the underlying cause assigned by NCHS was an injury or poisoning. The range of injury and poisoning codes (E800-E999) is the same in the eighth (ICD-8) and ninth (ICD-9) revisions of the International Classification of Diseases.

†Injury and poisoning deaths that are assigned a home place-of-occurrence code by ICD-9. In ICD-9, this code is used with categories E850-E869 and E880-E928. The corresponding ICD-8 categories are E850-E877 and E880-E929.

Source: National Center for Health Statistics (NCHS) mortality data tapes, 1970-1984.

Table 3 presents data on cause-specific categories. Fire and burn injuries (mainly from residential fires) were the largest category of home fatality, followed by drowning. After 1978, there was a decline in rate for every category, and the largest decreases occurred in the rates of falls and suffocation.

The pattern of cause-specific fatal injury in the home differed according to age group (Figure 2). In 1984, for children <1 year of age, suffocation was the leading cause of death, and no unintentional firearm fatalities were reported. For children 10-14 years of age, fire and burn injuries were the main cause of death, and firearms accounted for more than 30% of fatalities resulting from injuries that occurred in the home.

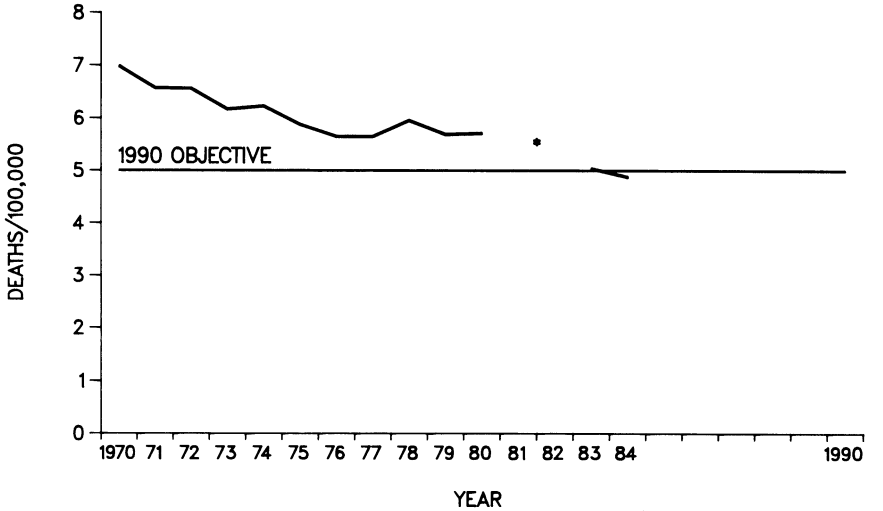
Table 4 shows the distribution of place-of-occurrence codes for fatal injuries to two age groups of children in the years 1978-1984. Children <5 years of age had a higher percentage of unspecified place-of-occurrence codes for each calendar year than did children 5-14 years of age. For both age groups, the data for 1981 and 1982 showed that the percentage of injuries with an unspecified place-of-occurrence code was one and a half to two times higher than the 1978-1980 levels.

Discussion

Mishaps occurring in and around the home cause one in four of the fatal injuries to children <15 years of age in the United States. From 1970 through 1984 (excluding 1981 and 1982), this proportion remained relatively constant, despite the decrease in the home injury fatality rates. Thus, although the 1990 objective of no more than 5.0 home injury deaths/100,000 children was met in 1983 and surpassed in 1984, a substantial proportion of children's injury mortality continues to result from injuries sustained in the home.

In this study, fatality rates varied by age and sex, with infants of both sexes and males of all age groups having the highest rates. Suffocation was the leading cause

FIGURE 1. Fatality rates due to injury in the home among persons under 15 years of age, by year, United States, 1970-1984



*Rates for 1981 and 1982 are omitted because the proportion of injury deaths with unspecified place-of-occurrence codes was particularly high in those years.

of home injury-related fatalities among children <1 year of age, and fires and burns were the main cause of these fatalities among children from 1 through 14 years of age.

Many injury control strategies have been implemented or made available to prevent childhood deaths from injuries in the home (*2,10,11*). The reduction of childhood suffocations has been attributed to the regulations and standards pertaining to the design of consumer products (*12,13*). The U.S. Fire Administration estimates that the use of smoke detectors decreases by half the risk of dying in a house fire (*14*). Although the percentage of U.S. homes with smoke detectors has increased steadily since the early 1970s, one community inspection showed that

TABLE 2. Deaths due to injury in the home among persons under 15 years of age, by age group, sex, and year, United States, 1978-1984

		Deaths					
		Males		Females		Total	
Age (years)		Number	Rate*	Number	Rate	Number	Rate
1978	<1	317	18.6	241	14.8	558	16.8
	1-4	845	13.3	566	9.3	1,411	11.4
	5-9	384	4.3	227	2.7	611	3.5
	10-14	362	3.7	155	1.7	517	2.7
	Total	1,908	7.2	1,189	4.7	3,097	6.0
1979	<1	278	15.9	225	13.4	503	14.7
	1-4	843	13.0	555	9.0	1,398	11.1
	5-9	349	4.0	211	2.5	560	3.3
	10-14	326	3.5	142	1.6	468	2.5
	Total	1,796	6.8	1,133	4.5	2,929	5.7
1980	<1	313	17.2	240	13.8	553	15.6
	1-4	838	12.7	563	8.9	1,401	10.9
	5-9	322	3.8	222	2.7	544	3.3
	10-14	292	3.1	137	1.5	429	2.4
	Total	1,765	6.7	1,162	4.6	2,927	5.7
1983	<1	262	13.9	196	10.9	458	12.4
	1-4	784	11.0	531	7.8	1,315	9.4
	5-9	250	3.0	193	2.4	443	2.7
	10-14	267	2.9	122	1.4	389	2.2
	Total	1,563	5.9	1,042	4.1	2,605	5.0
1984	<1	242	13.1	188	10.6	430	11.9
	1-4	768	10.6	474	6.8	1,242	8.7
	5-9	319	3.8	162	2.0	481	2.9
	10-14	270	3.0	104	1.2	374	2.1
	Total	1,599	6.0	928	3.7	2,527	4.9

*Deaths/100,000 children <15 years of age.

Source: National Center for Health Statistics mortality data tapes and Bureau of the Census population estimates.

nearly 30% of the installed detectors were nonfunctioning (*15*). Proper installation and frequent testing are necessary to ensure adequate protection (*16*). Other measures to prevent fatal home fires include automatic fire-suppressant sprinkler systems and self-extinguishing cigarettes (*17,18*).

Much of the decline in childhood poisoning fatalities in the home has been ascribed to interventions aimed at reducing the incidence of potentially lethal ingestions (*19*). An industry-government conference in 1966 led to the restriction of children's aspirin to 36 tablets per container, and the Poison Prevention Packaging Act of 1970 resulted in safety packaging of aspirin and other products (*20,21*). Steps to promote further risk reduction include technical improvements in child-resistant containers and instruction in the proper use of child-resistant packaging for persons who have frequent contact with children (*22*).

The rate of child drownings in fresh water is lower in communities that require swimming pool fencing than it is in communities without such regulations (*23*). Swimming lessons for infants are popular; still, controlled studies are needed to clarify benefits and risks (*24*).

Some prevention efforts directed at specific types of falls in childhood have proved effective (*25*). Identifying home hazards and providing free, easily installed window guards led to a reduction of deaths due to falls among children living in apartment buildings in New York City (*26*).

TABLE 3. Deaths due to injury in the home among persons under 15 years of age, by cause* and year, United States, 1978-1984

	Poisoning		Fall		Fire/Burn		Drowning		Suffocation		Firearm		Other	
Year	No.	Rate†	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
1978	119	0.23	179	0.34	1,524	2.93	426	0.82	489	0.94	201	0.39	159	0.31
1979	100	0.19	164	0.32	1,409	2.74	444	0.86	428	0.83	224	0.44	160	0.31
1980	93	0.18	146	0.28	1,378	2.69	463	0.90	472	0.92	211	0.41	164	0.32
1983	72	0.14	142	0.27	1,205	2.33	453	0.88	404	0.78	175	0.34	154	0.30
1984	79	0.15	87	0.17	1,243	2.40	382	0.74	400	0.77	181	0.35	155	0.30

*Cause-specific categories correspond to the following codes:

	ICD-8 (in use in 1978)	ICD-9 (in use since 1979)
Poisoning	E850-E877	E850-E869
Fall	E880-E887	E880-E888
Fire/Burn	E890-E899, E907, E923-E926	E890-E899, E907, E923-E926
Drowning	E910	E910
Suffocation	E911-E913	E911-E913
Firearm	E922	E922
Other	E900-E906, E908-E909, E914-E915, E916-E921, E927-E929	E900-E906, E908-E909, E914-E915, E916-E921, E927-E928

†Deaths/100,000 children <15 years of age.

Source: National Center for Health Statistics mortality data tapes and Bureau of the Census population estimates.

FIGURE 2. Distribution of fatalities due to injury in the home among persons under 15 years of age, by cause and age group (years), United States, 1984

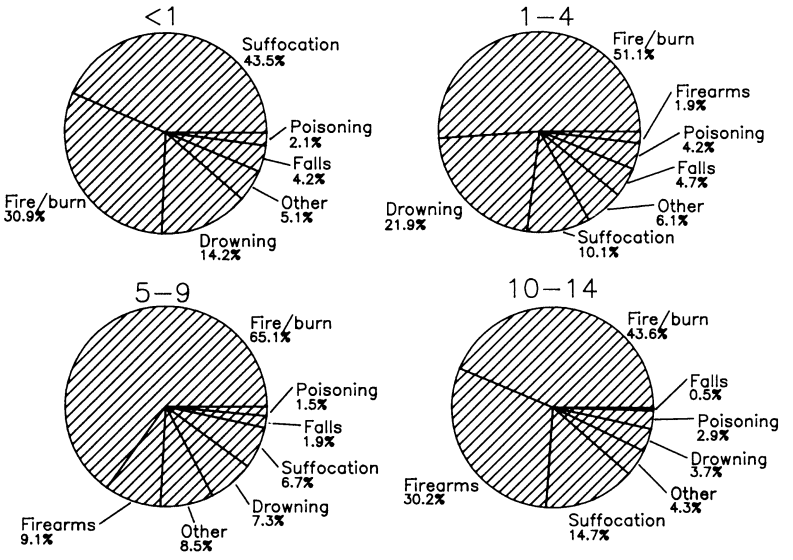


TABLE 4. Deaths due to injury in the home among persons under 15 years of age, by age group, place of occurrence, and year, United States, 1978-1984

		Under 5 years			5-14 years		
		Place of occurrence			Place of occurrence		
Year	Deaths	Home	Other	Unspecified	Home	Other	Unspecified
1978	No.	1,969	467	649	1,128	1,196	393
	%	63.8	15.1	21.0	41.5	44.0	14.5
1979	No.	1,901	470	499	1,028	1,110	301
	%	66.2	16.4	17.4	42.1	45.5	12.3
1980	No.	1,954	529	456	973	1,039	209
	%	66.5	18.0	15.5	43.8	46.8	9.4
1981	No.	1,595	344	844	828	639	597
	%	57.3	12.4	30.3	40.1	31.0	28.9
1982	No.	1,503	342	835	797	633	544
	%	56.1	12.8	31.2	40.4	32.1	27.6
1983	No.	1,773	490	394	832	856	199
	%	66.7	18.4	14.8	44.1	45.4	10.5
1984	No.	1,672	375	345	855	714	181
	%	69.9	15.7	14.4	48.9	40.8	10.3

*Source: National Center for Health Statistics mortality data tapes.

Unintentional firearm-related deaths among children can be reduced by interventions such as improving the design of safety catches so that firearms will not be discharged inadvertently (*27*).

Although the rate of children's fatalities due to injury in the home has declined in recent years, surveillance continues to be important in view of the magnitude of the problem and the need to evaluate the efficacy of intervention strategies. The use of NCHS mortality data for these purposes is limited by three constraints. First, the data tapes are not available for public use until at least 18 months after the end of the data year (*28*). Second, specific place-of-occurrence codes for all deaths resulting from injury are not available. This limitation impedes the determination of incidence and trends for particular calendar years and age groups. For example, although incidents occurring in the home are the leading cause of injury deaths among children <5 years old, a relatively high percentage of place-of-occurrence codes are unspecified for this age group (Table 4) (*2*). Third, NCHS mortality data provide important demographic information, but they do not contain details about the circumstances of the injury beyond the external cause and the place of occurrence. Injury events usually involve a complex interaction of many elements that are not fully described by means of the current external-cause coding system (*29*).

References

1. National Center for Health Statistics. Health: United States, 1982. Washington, DC: US Department of Health and Human Services, 1982.
2. Dershewitz RA, Christopherson ER. Childhood household safety: an overview. Am J Dis Child 1984;138:85-8.
3. US Department of Health and Human Services, Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
4. World Health Organization. Manual of the international statistical classification of diseases, injuries, and causes of death, ninth revision. Geneva: World Health Organization, 1977.
5. National Center for Health Statistics. Vital statistics of the United States, 1981: II. Mortality, part A. Washington, DC: US Department of Health and Human Services, 1986.
6. National Center for Health Statistics. Vital Statistics of the United States, 1982: II. Mortality, part A. Washington, DC: US Department of Health and Human Services, 1986.
7. US Department of Commerce, Bureau of the Census. Current population reports: preliminary estimates of the population of the United States, by age, sex, and race: 1970 to 1981. Washington, DC: US Department of Commerce, 1982. (Series P-25, no. 917).
8. US Department of Commerce, Bureau of the Census. Current population reports: estimates of the population of the United States, by age, sex, and race: 1980 to 1983. Washington, DC: US Department of Commerce, 1984. (Series P-25, no. 949).
9. US Department of Commerce, Bureau of the Census. Current population reports: estimates of the population of the United States, by age, sex, and race: 1980 to 1986. Washington, DC: US Department of Commerce, 1987. (Series P-25, no. 1000).
10. Gallagher SS, Hunter P, Guyer B. A home injury prevention program for children. Pediatr Clin North Am 1985;32:95-112.
11. Rivara FP. Traumatic deaths of children in the United States: currently available prevention strategies. Pediatrics 1985;75:456-62.
12. Baker SP, Fisher RS. Childhood asphyxiation by choking or suffocation. JAMA 1980;244:1343-6.
13. Kraus JF. Effectiveness of measures to prevent unintentional deaths of infants and children from suffocation and strangulation. Public Health Rep 1985;100:231-40.
14. Hall JR. A decade of detectors: measuring the effect. Fire J 1985;79:37-43,78.
15. CDC. Prevalence of smoke detectors in private residences—Dekalb County, Georgia, 1985. MMWR 1986;35:445-8.
16. US Consumer Product Safety Commission. What you should know about smoke detectors. Washington DC: US Consumer Product Safety Commission, 1983.

17. US Fire Administration. An ounce of prevention. Washington, DC: Federal Emergency Management Agency, 1983.
18. McGuire A. Cigarettes and fire deaths. NY State J Med 1983;83:1296-8.
19. Rodriguez JG, Sattin RW. Epidemiology of childhood poisonings leading to hospitalization in the United States, 1979-1983. Am J Prev Med 1987;3:164-70.
20. Clarke A, Walton WW. Effect of safety packaging on aspirin ingestion by children. Pediatrics 1979;63:687-93.
21. Walton WW. An evaluation of the Poison Prevention Packaging Act. Pediatrics 1982;69:363-70.
22. CDC. Unintentional ingestions of prescription drugs in children under five years old. MMWR 1987;36:124-6,131-2.
23. Pearn JH, Wong RYK, Brown J, et al. Drowning and near drowning involving children: a five-year total population study from the city and county of Honolulu. Am J Public Health 1979;69:450-4.
24. Pearn JH. Current controversies in child accident prevention: an analysis of some areas of dispute in the prevention of child trauma. Aust NZ J Med 1985;15:782-7.
25. Garretson LK, Gallagher SS. Falls in children and youth. Pediatr Clin North Am 1985;32:153-62.
26. Spiegel CN, Lindaman FC. Children can't fly: a program to prevent childhood morbidity and mortality from window falls. Am J Public Health 1977;67:1143-7.
27. Wintemute GJ, Teret SP, Kraus JF, et al. When children shoot children: 88 unintended deaths in California. JAMA 1987;257:3107-9.
28. Pearce ND. National Center for Health Statistics. Data systems of the National Center for Health Statistics. Hyattsville, Maryland: US Department of Health and Human Services, 1981. (Vital and health statistics; series 1; no. 16).
29. Langley J. The International Classification of Diseases codes for describing injuries and the circumstances surrounding injuries: a critical comment and suggestions for improvement. Accid Anal Prev 1982;14:195-7.

DEATHS FROM FALLS, 1978-1984

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Introduction

Falls are the leading cause of nonfatal injury and the second leading cause of unintentional injury-related deaths in the United States, surpassed only by motor vehicle-related deaths (*1-3*). Falls cause more deaths per year than drownings and fires combined (*2*). Although the cost of falls in the United States is not known, injuries cost this country between $75 billion and $100 billion each year in direct and indirect costs (*3*).

As a result of the Surgeon General's report in 1979 titled "Healthy People," which indicated that many deaths and injuries due to falls were preventable, a measurable objective of no more than two deaths per 100,000 persons by the year 1990 was established (*4,5*). This report 1) describes the epidemiology of falls in the United States, 2) reviews the progress made since 1978 toward meeting the 1990 objective, 3) discusses factors that may have either improved or hindered this progress, and 4) recommends ways to reduce fall-related mortality.

Methods

For this report, the number of deaths from falls for the years 1978-1984 were determined by using data from annual mortality tapes compiled by the National Center for Health Statistics (NCHS). The NCHS receives vital statistics on deaths from all 50 states and the District of Columbia. For this report, only U.S. residents who died in the United States are included. Information available from the NCHS mortality tapes includes age, sex, race (white, black, other), state of decedent's residence, state in which death occurred, and date of death.

For 1978, fall-related deaths were defined as those with an external underlying cause of death coded as E880 to E887 according to the International Classification of Diseases (ICD), Adapted, Eighth Revision. For the years 1979-1984, fall-related deaths were defined as those with an external underlying cause of death coded as E880 to E888 according to the ICD, Ninth Revision. Regions of the country (Northeast, Midwest, South, and West) were defined according to NCHS guidelines. Place where the fall occurred was defined according to NCHS and ICD criteria as home, farm, mine and quarry, industrial place and premises, place for recreation and sport, street and highway, public building, residential institution, other specified places, or place of occurrence not specified.

The population data used in computing crude death rates per 100,000 population were obtained from the Bureau of the Census. For 1980, the census enumeration of the population was used, and for 1978-1979 and 1981-1984, population estimates from the Bureau of the Census were used. Regional rates were based on deaths of residents of the respective regions.

Results

The number of deaths from falls declined from 13,690 in 1978 to 11,937 in 1984 (Table 1). The annual death rate from falls for the same period dropped from 6.2 to

5.1/100,000 persons. During the 7-year period, the percent declines in the total number of fall deaths and in the fall death rate were 12.8 and 17.7, respectively. For each of the four age groups, the overall death rate declined 18%-26% from 1978 through 1984. A slight increase in rate occurred in 1984 among persons ages 65-84 years. In 1984, the ratio of fall-related death rates for persons ages ≥85 years was 98.0 when compared with those <65 years, 14.4 when compared with those ages 65-74 years, and 4.0 when compared with those ages 75-84 years.

More males than females died from falls each year (Table 1). Regardless of sex, both the number and the rate of fall-related deaths declined overall. For males, however, the number of deaths and the death rate rose slightly in 1980; for females, the number of deaths, but not the death rate, rose slightly in 1983. The ratio of fall-related death rates for males compared with females was 1.2 for each of the years 1978-1982 and for 1984, and it was 1.1 for 1983.

Overall, all races had declines in both the number of deaths and the death rate from falls (Table 1). In 1980, however, the number of deaths for whites and blacks did increase slightly, and both the number and rate increased for other races. In 1984, the number but not the rate of fall-related deaths increased slightly for other races. Whites consistently had the highest death rates from falls, whereas other races had the lowest. Compared with other races, whites had a 2.7-fold increased rate, and blacks had a 1.8-fold increased rate in 1984.

Regional rates also varied (Table 1). The Northeast, the region with the highest fall-related death rate for each of the years, had a decline in rates over the entire

TABLE 1. Deaths due to falls, by characteristics and year, United States, 1978-1984

	1978		1979		1980		1981		1982		1983		1984	
Characteristic	**No.**	**Rate***	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**	**No.**	**Rate**
Age group (years)†														
<65	4,008	2.0	3,801	1.9	3,941	2.0	3,601	1.8	3,448	1.7	3,367	1.6	3,168	1.5
65-74	1,852	12.4	1,956	12.8	1,840	11.8	1,721	10.8	1,635	10.1	1,656	10.1	1,702	10.2
75-84	3,715	50.1	3,612	47.5	3,482	44.7	3,313	41.4	3,232	39.2	3,113	36.5	3,204	37.2
85+	4,109	196.2	3,844	175.0	4,026	177.3	3,985	169.5	3,757	154.2	3,880	155.0	3,857	147.0
Sex														
Male	7,181	6.7	6,928	6.3	7,036	6.4	6,627	5.9	6,354	5.6	6,279	5.5	6,210	5.5
Female	6,509	5.7	6,288	5.4	6,258	5.4	6,001	5.1	5,723	4.8	5,745	4.8	5,727	4.7
Race														
White	12,405	6.5	11,999	6.2	12,016	6.2	11,417	5.8	10,930	5.5	10,877	5.5	10,829	5.4
Black	1,145	4.4	1,110	4.2	1,124	4.2	1,074	3.9	1,027	3.7	1,018	3.6	976	3.5
Other	140	3.3	107	2.4	154	2.9	137	2.4	120	2.0	129	2.0	132	2.0
Region														
Northeast	3,373	6.9	3,281	6.7	3,192	6.5	2,907	5.9	2,918	5.9	2,909	5.9	2,790	5.7
Midwest	3,911	6.7	3,736	6.4	3,632	6.2	3,480	5.9	3,282	5.6	3,404	5.8	3,202	5.4
South	4,151	5.7	4,009	5.4	4,093	5.4	3,984	5.2	3,747	4.8	3,602	4.6	3,662	4.7
West	2,255	5.5	2,190	5.2	2,377	5.5	2,257	5.2	2,130	4.8	2,109	4.6	2,283	5.0
Total	13,690	6.2	13,216	5.9	13,294	5.9	12,628	5.5	12,077	5.2	12,024	5.1	11,937	5.1

*Deaths/100,000 persons.
†Number of deaths may not reflect total because in some instances the decedent's age was unknown.

period. In 1984, that region's death rate from falls was about 1.2 times that for the South, the region with the lowest rate. The trend in the Midwest, the region with the second highest fall-related death rate, was similar to that for the Northeast except for a slight increase in rate in 1983. Despite a 1980 increase in the West and a 1984 increase in the West and South in fall-related mortality rates, the West and South—regions with the lowest death rates—had overall declines in fall-related death rates in the period 1978-1984.

White males ages ≥85 years had the highest age-, sex-, race-specific death rate of 187.2/100,000 persons in 1984 (Figure 1). For persons ages 5-29 years and ages ≥75 years, white males had the highest fall-related death rate. Males of all other races had the highest rate among persons <5 years and those ages 30-69 years. Females of all other races had higher death rates than white females until the age of 65 years, the only exceptions being the 10- to 24- and the 50- to 54-year age groups. After age 65, females of all other races had the lowest race- and sex-specific death rate from falls. After age 75, the death rate for white females exceeded that for males and females of all other races.

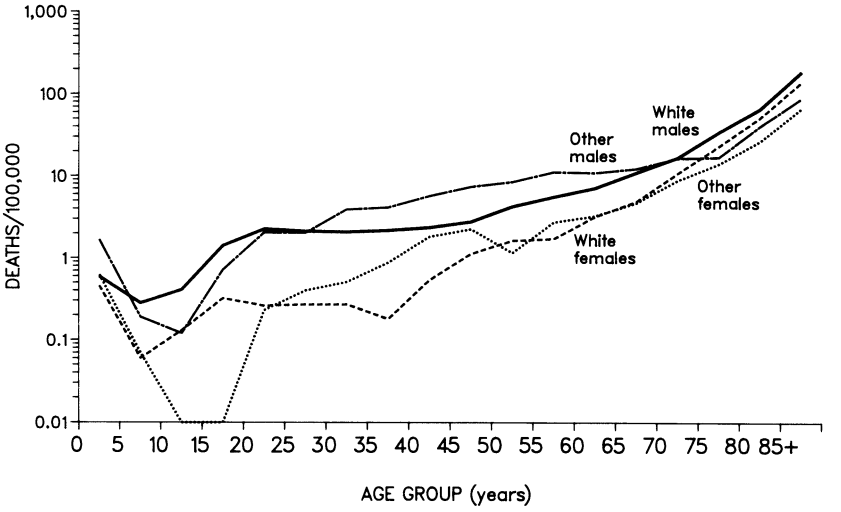
The largest proportion of fall-related deaths occurred in the winter and autumn (Table 2). However, the percentage of deaths both overall and by region did not vary considerably or consistently by season.

In about one-fourth (3,299) of the fall-related deaths, the place where the fall occurred was not specified on the death certificate (Table 3). In 1984, over 43% of the deaths (5,166) occurred in the home. Almost 67% of children <5 years old who died from a fall died in the home. Of all persons ≥65 years of age who died from falls, about 45% died from a fall in the home and about 15% from a fall in a residential institution.

Discussion

In this study of deaths caused by falls, the results show that the crude annual death rate/100,000 persons declined from 6.2 in 1978 to 5.1 in 1984. Children of races other

FIGURE 1. Rate of fall-related deaths, by age group, race, and sex, United States, 1984



than white, especially males <5 years old, males of races other than white ages 30-69 years, and white males ≥70 years of age were among those with the highest death rates. The Northeast had the highest regional rate, and the South had the lowest. Most children <5 years of age and many elderly persons who died from falls had fallen at home.

Several limitations may have affected the estimated fall-related death rates in this report. First, the rates may have been underestimated because falls are underreported as the underlying cause of death (*1*). No data exist to show if this underreporting changed between 1978 and 1984. Second, death rates from falls may have been overestimated for blacks, who were underenumerated in the 1980 census (*6*). However, adjusting the rates found in this study by the proposed underenumeration did not appreciably alter the findings.

Unfortunately, much useful information about the place and type of the fall is often unavailable. For example, in about one-fourth of the deaths in this study, the death certificate did not show the place of occurrence. Moreover, about 46% of fall-related deaths were coded as E888 (other and unknown), and about 22% were coded as E887 (fracture with unspecified cause), thus precluding a useful analysis by the type of fall.

As people age, the risk of death from a fall increases. People ≥85 years of age are at the greatest risk of death from a fall. Impairments such as poor vision, unsteady

TABLE 2. Number and percentage of fall-related deaths, by time of year and region of residence, United States, 1984

	Region								Total	
	Northeast		Midwest		South		West			
Months	No.	(%)*	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Dec-Feb	725	(26.0)	793	(24.8)	927	(25.3)	600	(26.3)	3,045	(25.5)
Mar-May	688	(24.7)	814	(25.4)	925	(25.3)	520	(22.8)	2,947	(24.7)
Jun-Aug	649	(23.3)	780	(24.4)	895	(24.4)	581	(25.4)	2,905	(24.3)
Sep-Nov	728	(26.1)	815	(25.5)	915	(25.0)	582	(25.5)	3,040	(25.5)
Total	2,790	(100.0)	3,202	(100.0)	3,662	(100.0)	2,283	(100.0)	11,937	(100.0)

*Percentages may not total 100.0 because of rounding.

TABLE 3. Number of fall-related deaths, by age group and place where fall occurred, United States, 1984

	Place				
Age group (years)*	Home	Residential institution	Other specified	Unknown	Total
<5	76	1	16	21	114
5-9	9	0	12	6	27
10-19	17	4	149	17	187
20-44	315	38	710	153	1,216
45-64	798	87	491	248	1,624
≥65	3,951	1,356	602	2,854	8,763
Total	5,166	1,486	1,980	3,299	11,931

*Six deaths were excluded because decedent's age was unknown.

gait, and chronic medical conditions may predispose an individual to fall or may contribute to the death once a fall occurs (*1*). Environmental factors, such as stairway design and disrepair, inadequate lighting, and slipping and tripping on water, ice, clutter, loose rugs, or electrical cords, may also play a key role in the occurrence of a fall (*1,7*).

During their middle-aged years, males are at greater risk than females of dying from a fall. The larger number of men working in hazardous occupations, such as construction, may increase their risk of falling from heights and sustaining more severe injuries than females. Why black males have an increased risk of dying from falls during the middle-aged years is unclear and needs further study.

Black children are at a greater risk of death from falls than white children. Several reasons for this finding might include a higher percentage of blacks living in substandard high-rise buildings (*8*), less ability of the poor to provide constant supervision for their children, and delayed emergency response time in rural areas.

The higher fall-related death rates in the Northeast and Midwest compared with those in the South and West might be explained by differences in the climate, the level of urbanization, and the age and racial distribution in the four regions. For example, the Northeast has more inclement weather, more urban areas, more whites, and a larger older population than the South. The percentage of fall-related deaths by season, however, did not appreciably differ in any of the regions.

Overall, fall-related mortality rates are declining in the United States. The reason is unclear, but the decline may be due to improved medical care and services (*1*). Several interventions may have helped to reduce the number of deaths due to falls, although few have been evaluated for their effectiveness (*1,7-10*). In New York City, after a law was passed requiring landlords to provide window guards in apartments where young children live, the number of falls dropped significantly (*9*). Improved lighting and handrail installation and use have also been suggested to reduce the incidence of falls (*1,7,10*). In addition, increased dietary intake of calcium and estrogen replacement therapy for postmenopausal women are believed to delay or reduce osteoporosis, thus reducing injuries that result from falls (*10*).

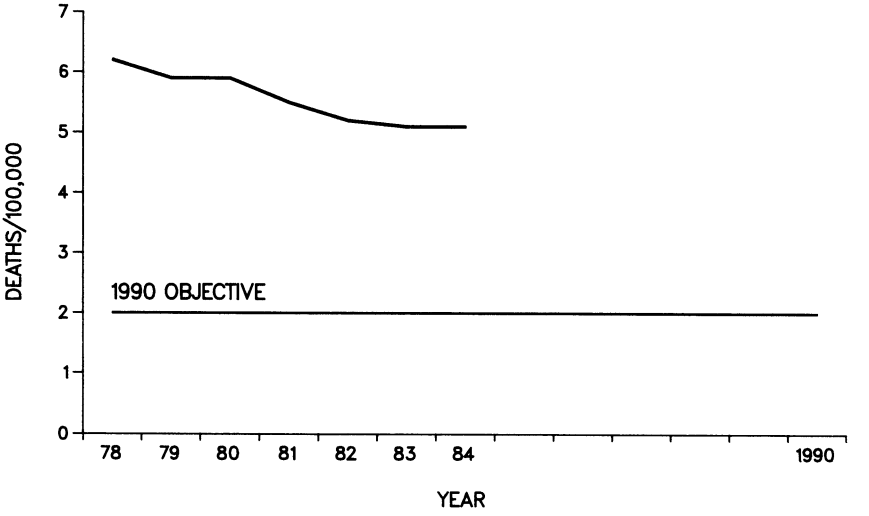
To reduce morbidity and mortality caused by falls, public health personnel need more information about the effectiveness of interventions and the contributing factors to the risk of falling and sustaining an injury. More complete information is also needed about the circumstances of falls that result in injury or death.

The 1990 objective has limited usefulness as an indicator of the public health impact of fall-related mortality. The objective is based on an overall crude death rate and does not focus on specific high-risk groups. For example, elderly persons account for an increasing percentage of the population; therefore, the overall crude death rate from falls may increase in the future because of high death rates in this group. Future objectives for the nation related to falls should focus on morbidity and mortality in high-risk populations.

Given the current rate of decline, the death rate due to falls would be 4.2/100,000 persons in 1990, far short of the 1990 target of 2.0/100,000 persons (Figure 2). If fall-related injuries and deaths are to be substantially reduced, efforts should focus on determining risk factors for falls, determining which risk factors can be prevented or ameliorated, and evaluating the effectiveness of the prevention measures in reducing morbidity, severity, and mortality. Furthermore, the public health impact of falls cannot be fully understood without assessing the incidence of nonfatal injuries from

falls. To close this gap in knowledge, national surveys that now collect data on the anatomic nature (N codes) of injuries due to falls should also collect information on the external cause (E codes) of these injuries.

FIGURE 2. Death rates from falls, by year, United States, 1978-1984



References

1. Baker SP, O'Neill B, Karpf RS. The injury fact book. Lexington, Massachusetts: Lexington Books, DC Heath and Company, 1984.
2. National Safety Council. Accident facts. Chicago: National Safety Council, 1985.
3. Committee on Trauma Research, Commission on Life Sciences, National Research Council, and the Institute on Medicine. Injury in America. Washington, DC: National Academy Press, 1985.
4. US Department of Health, Education, and Welfare, Public Health Service. Healthy people: the Surgeon General's report on health promotion and disease prevention. Washington, DC: US Department of Health, Education, and Welfare, 1979; DHEW (PHS) publication no. 79-55071.
5. US Department of Health and Human Services, Public Health Service. Promoting health/ preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
6. Savage IR. Who counts? Am Stat 1982;36:195-200.
7. Archea JC. Environmental factors associated with stair accidents by the elderly. Clin Geriatr Med 1985;1(August):555-69.
8. Garrettson LK, Gallagher SS. Falls in children and youth. Pediatr Clin North Am 1985;32:153-62.
9. Spiegel CN, Lindaman FC. Children can't fly: a program to prevent childhood morbidity and mortality from window falls. Am J Public Health 1977;67:1143-7.
10. Hogue CC. Injury in late life: II. Prevention. Am Geriatr Soc 1982;30(April):276-80.

DROWNINGS IN THE UNITED STATES, 1978-1984

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Introduction

Drowning is the third leading cause of injury deaths, surpassed only by motor vehicle- and fall-related deaths. It is also the second leading cause of injury deaths for persons ages 5-44 years (*1*). The U.S. Department of Health and Human Services set a national objective to reduce the crude death rate for drowning from 3.2/100,000 persons in 1978, the baseline year, to 1.5/100,000 persons in 1990 (*2*).

The purpose of this summary is to 1) describe the epidemiology of drowning in the United States, 2) review progress made since 1978 toward the 1990 objective, 3) discuss factors affecting progress toward this objective, and 4) recommend measures that will help attain this objective.

Methods

Data used to determine the number of drownings in the United States for 1978-1984 were obtained from annual mortality tapes of the National Center for Health Statistics (NCHS). NCHS receives reports of all deaths of U.S. residents in the 50 states and the District of Columbia. Deaths are coded according to the International Classification of Diseases (ICD), Adapted—Eighth Revision for 1978 and Ninth Revision for 1979-1984.

In this summary, nonboat-related drownings are defined according to ICD with an underlying external cause of death coded as E910; boat-related drownings are those coded E830 and E832. Information in the NCHS mortality tapes includes age, sex, date of death, race (white, black, or other), state where death occurred, and decedent's state of residence.

U.S. population estimates from the Bureau of the Census for 1978-1984 were used to compute rates (*3*). These data for the United States and for each of the four NCHS regions (Northeast, Midwest, South, and West) were used to compute crude death rates for drownings per 100,000 population. Regional rates were based on the number of deaths that occurred in a region rather than on the number of deaths to residents of the region, because regional environmental factors might be important determinants of rates. In fact, rates calculated both ways were almost identical.

Results

Between 1978 and 1984, an average of 6,503 persons drowned each year (Table 1). The number of drowning deaths decreased from a high of 7,026 in 1978 to a low of 5,388 in 1984. The overall crude death rate from drowning dropped 28% between 1978 and 1984, from a high of 3.2 deaths/100,000 population to a low of 2.3. Much of this decrease occurred among whites ages 5-24 years, blacks ages 10-24 years, and others ages 19-44 years. The rate of drowning for males dropped 28% between 1978 and 1984, whereas the rate for females dropped 20%. For each of these years, the death rate was nearly four times greater for males than for females and two times greater for blacks than for whites. For 1984, the South continued to have the highest drowning rates (3.0 deaths/100,000 population), followed by the West (2.9

deaths/100,000 population). The Northeast continued to have the lowest rates (1.4 deaths/100,000 population), and the overall death rate/100,000 population declined markedly, from 2.7 in 1983 to 2.3 in 1984.

The highest drowning rates occurred among children <5 years of age, especially among 2-year-olds (Figure 1). Rates generally declined with age; however, young adults ages 15-24 years also had high rates.

Drowning rates for blacks were consistently higher than those for whites except at ages 0-3 years. At these ages, white children had between 1 1/2 and 2 1/2 times the rate of black children. In the first six decades, other races had drowning rates between those of blacks and whites (Figure 2); however, after age 64, drowning death rates for other races were higher than those for blacks and whites. At ages ≥85, other races had the highest death rates of any age or racial group.

The number of drownings peaked in the summer (Figure 3). More than 50% of these deaths occurred from June through August; less than 10% occurred from December through February. Most drownings (about 82%) were not associated with boats (Table 2). Nonboat-related drowning rates were highest for blacks and lowest for whites. Boat-related drownings per 100,000 population were similar in the three racial groups, but remained lowest in whites except in 1980 and 1981, when the rates were lowest in other races.

Discussion

The overall drowning rates decreased modestly between 1980 and 1981, remained steady between 1981 and 1983, and declined in 1984. Children <5 years old and young adults ages 15-24 had the highest rates. For children <5 years old, whites had rates almost twice as high as those of blacks; for almost all other ages, drowning rates for blacks exceeded those for whites. The South had the highest drowning rates, and the Northeast had the lowest. The rates of boat-related drownings were slightly

TABLE 1. Drownings and drowning rates, by sex, race, and region, United States, 1978-1984

	1978		1979		1980		1981		1982		1983		1984	
	No.	Rate*	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Sex														
Male	5,875	5.4	5,779	5.3	6,121	5.5	5,335	4.8	5,294	4.7	5,342	4.7	4,420	3.9
Female	1,151	1.0	1,093	0.9	1,136	1.0	942	0.8	1,057	0.9	1,011	0.8	968	0.8
Race														
White	5,407	2.8	5,302	2.7	5,623	2.9	4,836	2.5	4,884	2.5	4,975	2.5	4,137	2.1
Black	1,415	5.5	1,370	5.2	1,429	5.3	1,254	4.6	1,254	4.5	1,171	4.2	1,048	3.7
Other	204	4.8	200	4.4	205	3.9	187	3.3	213	3.5	207	3.2	203	3.0
Region														
Northeast	836	1.7	839	1.7	911	1.9	763	1.6	771	1.6	779	1.6	710	1.4
Midwest	1,368	2.3	1,316	2.2	1,304	2.2	1,174	2.0	1,125	1.9	1,129	1.9	934	1.6
South	3,169	4.3	3,164	4.4	3,397	4.5	2,790	3.7	2,935	3.8	2,891	3.7	2,397	3.0
West	1,653	4.0	1,553	3.6	1,645	3.8	1,550	3.5	1,520	3.4	1,554	3.4	1,347	2.9
Total deaths	7,026	3.2	6,872	3.1	7,257	3.2	6,277	2.7	6,351	2.7	6,353	2.7	5,388	2.3

*Drownings/100,000 population.

lower for whites than for other racial groups except in 1980 and 1981, and most of these drownings occurred in the summer.

Circumstances of drowning and the profile of a person who has drowned vary by age, race, and sex. For instance, swimming pools have been shown to present the greatest aquatic hazard for toddlers (*4*). This hazard is most evident in California, the state with the highest number of children's drownings in pools and spas (*5*). Diving in swimming pools also presents risks of spinal cord injuries and deaths (*4*), and bathtub drownings present hazards for children and for adults >70 (*6,7*). Although drownings

FIGURE 1. Drowning rates, by age group, United States, 1978-1984

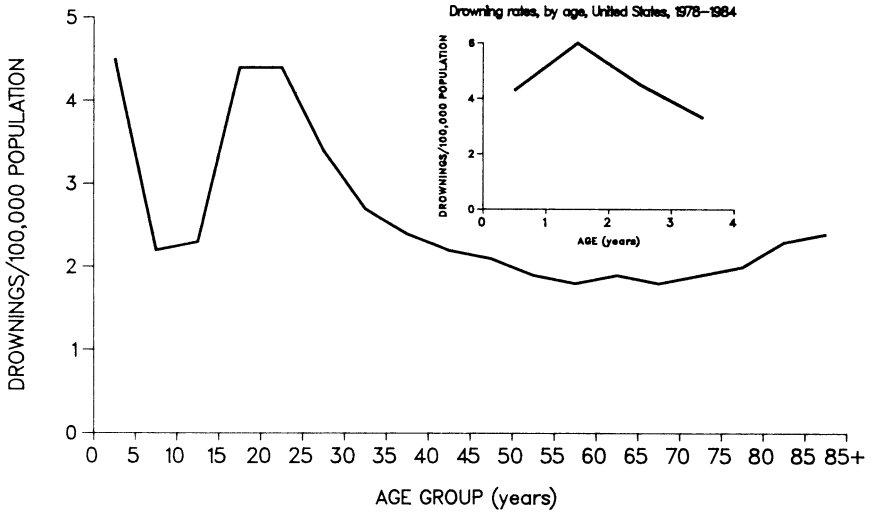
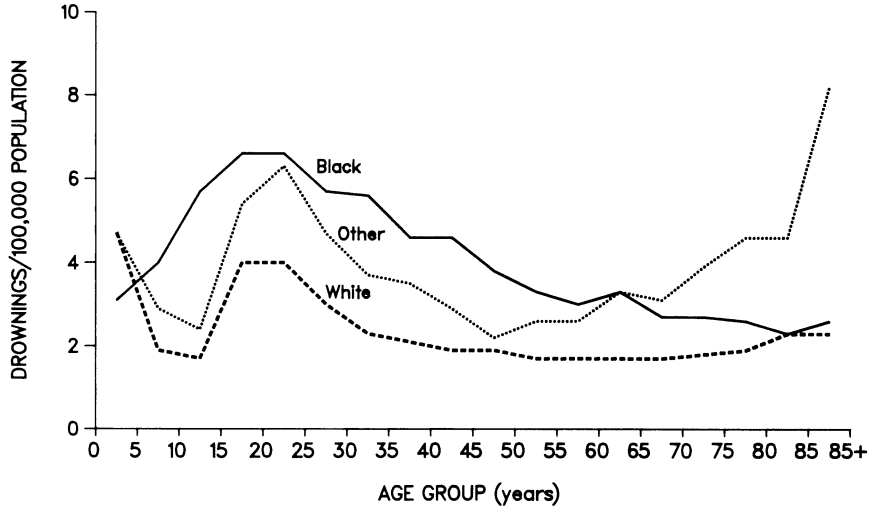


FIGURE 2. Drowning rates, by age group and race, United States, 1978-1984



are much less common among females than males, in one study bathtub drownings accounted for almost 29% of all drownings among females, a much larger percentage than among males (*7*). More males than females drown at other sites, such as in rivers and lakes. The boat-related drowning rate is highest among blacks; further research is needed to determine reasons for this increased risk.

Reasons for the increased risk of drowning among young males ages 15-24 are less clear than those among children. Evidence points to many complex human and

FIGURE 3. Distribution of drownings, by season, United States, 1978-1984

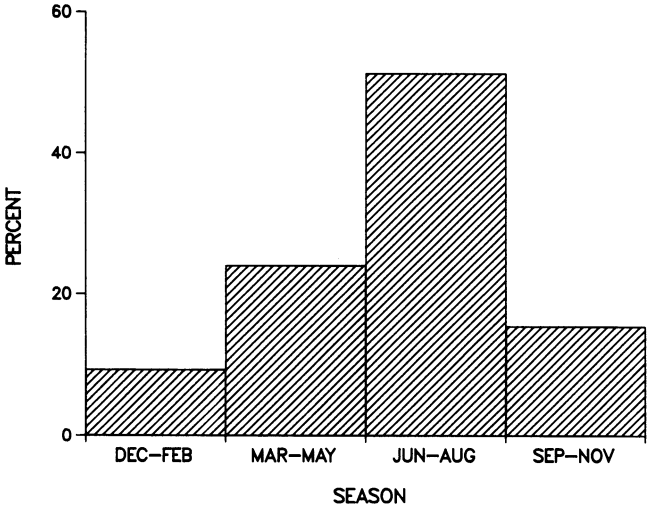


TABLE 2. Drownings and drowning rates, by cause and race, United States, 1978-1984

	1978		1979		1980		1981		1982		1983		1984	
	No.	Rate*	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Boat-related														
Race														
White	1,026	0.5	1,000	0.5	1,013	0.5	878	0.4	882	0.4	923	0.5	768	0.4
Black	170	0.7	165	0.6	182	0.7	152	0.6	180	0.7	143	0.5	150	0.5
Other	46	1.1	29	0.6	19	0.4	14	0.2	31	0.5	33	0.5	26	0.4
Total	1,242	0.6	1,194	0.5	1,214	0.5	1,044	0.5	1,093	0.5	1,099	0.5	944	0.4
Nonboat-related														
Race														
White	4,381	2.3	4,302	2.2	4,610	2.4	3,958	2.0	4,002	2.0	4,052	2.0	3,369	1.7
Black	1,245	4.8	1,205	4.6	1,247	4.7	1,102	4.1	1,074	3.9	1,028	3.7	898	3.2
Other	158	3.7	171	3.8	186	3.5	173	3.0	182	3.0	174	2.7	177	2.6
Total	5,784	2.6	5,678	2.5	6,043	2.7	5,233	2.3	5,258	2.3	5,254	2.3	4,444	1.9

*Drownings/100,000 population.

environmental risk factors that include consumption of alcohol, nonuse of personal flotation devices (PFDs), poverty, climate, increased use of spas and hot tubs, inability to swim, and risks associated with the use of certain types of boats (*4,5,8-10*). An increased risk of drowning is associated with race; however, the increased risk among blacks and Native Americans may be associated with poverty, rural residence, and inability to swim (*9*). The variation in drowning rates for persons ages ≥49 years in the "other races" category may be due to the small number of persons who drown at these ages.

The high frequency of death in summer suggests that climate is a causative factor in drowning. Discomfort caused by summer heat probably leads to swimming in undesignated swimming areas, where about 80% of drownings occur (*9*). Although unquantified, the increased frequency and duration of exposure to water may explain the higher rates of drowning deaths in the summer; however, in areas with colder climates, such as Alaska, exposure to cold water may increase the risk of drowning (*9*). Most boat-related drownings occur in the summer. Data from the U.S. Coast Guard show that 82% of boat-related drownings in 1985 were associated with inappropriate PFDs or with the nonuse of PFDs. Open boats, small boats (<16 ft), and high-speed boats (≥75 hp) were most frequently involved in fatalities (*10*).

Several interventions have helped reduce the number of drownings. Adding a fence with latchgates to home pools has substantially reduced drownings in pools (*11-13*). For boat-related drownings, reasons for the decline in fatalities per 100,000 recreational boats (from 20.8/100,000 in 1979 to 6.9 in 1985) have not been determined. This decline, however, may be due to improvements in boat safety, regulations, increased use of PFDs, and—in cold climates—the use of lifesaving equipment suits (*10*).

Since approximately 50% of teenage and adult drownings are alcohol related (*6,8*), interventions concerning alcohol use and the restriction of alcohol use in boats may have an impact on drowning mortality. Research and health promotion initiatives continue to heighten public awareness of associations between alcohol abuse and adverse health effects, including injuries. Governmental and nongovernmental agencies responsible for these initiatives include the U.S. Coast Guard; the Alcohol, Drug Abuse, and Mental Health Administration, Public Health Service; the Center for Health Promotion and Education, CDC; and various state, community, private, and voluntary organizations.

Several limitations have led to an underestimated drowning rate in one instance and may have led to overestimated rates in another. The overall drowning rate is underestimated because the 1990 objective excludes drownings related to motor vehicles, suicides, and undetermined intentionality, which together account for about 1,500 deaths per year (*9*). Some regional rates may be slightly overestimated because computations were based on the number of deaths that occurred in states, which may include some deaths of nonresidents. Nevertheless, findings of this study were not measurably affected, since such large (regional) populations were used as denominators. Thus, the findings of this study provide a good estimate of drowning rates as delineated by the 1990 objective.

Overall, the 1990 objective is limited as an indicator of the public health impact of drowning because it uses crude death rates without addressing the importance of specific high-risk populations. For example, the objective of 1.5 deaths/100,000 persons is met for females and, overall, nearly met for adults ages 50-79. However,

the objective is not met for males, blacks, other races, children <5 years old, or young adults ages 15-34. Future objectives should address the mortality and morbidity of the population. To monitor the impact of future interventions in achieving their objectives, injury surveillance systems should be strengthened or initiated where they do not exist. The only source of nationwide drowning information is NCHS, and data from that source are subject to an 18-month delay. Drowning surveillance at the state level can be based either on death certificates or on medical examiner/coroner data. Data from these sources are subject to fewer delays.

In conclusion, progress has been made since 1978, as shown by the decline in drowning rates in the U.S. population. Yet, much needs to be done if the projected rate, which is almost two-thirds the current rate of 2.3 deaths/100,000 persons, is to be achieved by 1990. Further reduction of aquatic deaths and injuries is possible, but this will require implementing intervention strategies such as those suggested by 25 leaders in injury control during a 1981 National Conference on Injury Control cosponsored by CDC (Appendix) (*4,14*). In addition, more research is needed before public health personnel can evaluate implemented strategies and unravel the complex human, technologic, and mechanical factors associated with drowning, especially for high-risk groups.

References

1. National Safety Council. Accident facts, 1985. Chicago: National Safety Council, 1986.
2. CDC. Mid-course review report for the 1990 injury prevention objectives. Atlanta, Georgia: CDC, 1985.
3. US Department of Commerce, Bureau of the Census. Current population estimates and projections. Washington, DC: US Department of Commerce. (Series P-25, nos. 917, 1982; 957, 1984; 998, 1986; and 1,000, 1987.)
4. CDC. Aquatic deaths and injuries—United States. MMWR 1982;31:417-9.
5. US Consumer Product Safety Commission, National Pool and Spa Institute. National pool and spa safety conference (report). Washington DC: US Consumer Product Safety Commission, 1985.
6. CDC. Drownings—Georgia, 1981-1983. MMWR 1985;34:281-3.
7. O'Carroll P. Drowning mortality in Los Angeles County, 1978-84. Presented at the APHA Meeting, Washington DC, November 20, 1985.
8. Dietz PE, Baker SP. Drowning epidemiology and prevention. Am J Public Health 1974;64:303-12.
9. Baker SP, O'Neill B, Karpf RS. The injury fact book. Lexington, Massachusetts: DC Heath, 1984:155-65.
10. US Coast Guard. Boating statistics, 1985. Technical report COMDITINST M16754.1g. Washington, DC: US Department of Transportation, 1986.
11. Pearn JH, Wong RYK, Brown J III, Ching Y-C, Bart R Jr, Hammar S. Drowning and near-drowning involving children: a five-year total population study from the city and county of Honolulu. Am J Public Health 1979;69:450-4.
12. Pearn J, Brown J III, Hsia EY. Swimming pool drownings and near-drownings involving children: a total population study from Hawaii. Milit Med 1980;145:15-8.
13. Milner N, Pearn J, Guard R. Will fenced pools save lives? a 10-year study from Mulgrave Shire, Queensland. Med J Aust 1980;2:510-1.
14. Teret SP, Baker SP, Trinkoff AM, DeFrancesco S, eds. Report of the National Conference on Injury Control (Johns Hopkins School of Hygiene and Public Health, May 18-19, 1981). Atlanta, Georgia: CDC, 1981.

Appendix

Selected Strategies of Intervention for Aquatic Deaths and Injuries

1. Develop and implement standards that govern safe pool design.
2. Require licensing for private and public pool construction and ownership based on certain safety requirements, including adequate fencing and accessible rescue and resuscitation equipment.
3. Require sign-posting in known hazardous-water areas regarding depth, undertow, or slippery banks.
4. Restrict the sale and consumption of alcoholic beverages in boating, pool, harbor, marina, and beach areas.
5. Impose sanctions for drunken boat drivers.
6. Integrate information into health department home-visit programs to make parents aware of pool, pond, and bathtub hazards.
7. Develop and institute programs for employees who work in or near bodies of water on how to recognize hazardous, environmental conditions and on emergency procedures that reduce the consequences of water-related injuries (e.g., procedures for extrication).
8. Conduct surveillance programs using emergency medical service logs, lifeguard data, coroners' records, and data from environmental groups, which are critical to evaluating the effectiveness of interventions.

Source: MMWR 1982;31:417-9.

HOSPITALIZATIONS DUE TO TAP WATER SCALDS, 1978-1985

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Introduction

Each year, approximately 112,000 people with scald burns are treated in hospital emergency rooms; approximately 6% of them are hospitalized. More than 2,600 of these burns are caused by hot tap water. Generally, tap water burns are more severe and extensive than other scald burns, and about 25% of the patients with these burns require hospitalization (*1*). Household water heaters that have been set at temperatures above 120° F (48.9° C) cause many of these tap water burns (*2*).

Young children, the elderly, and the physically impaired account for approximately 85% of hot tap water burns (*3*). Scalds often occur when infants or other young children are put into bathtubs in which the water is excessively hot, and they are unable to remove themselves. Similarly, the elderly and the handicapped are often unable to remove themselves from excessively hot water. Elderly persons have an increased risk for serious injury from burns because their skin has a reduced sensitivity to temperature.

In the light of these findings, and to reduce the incidence of what is considered an easily preventable problem, the U.S. Department of Health and Human Services set the following objective in 1979: "By 1990, the number of tap water scald injuries requiring hospital care should be reduced to no more than 2,000 per year." In 1978, the estimated number was 4,000 per year.

Methods

Accurate nationwide data sources are not available for determining the number of hospitalizations due to tap water scalds. Until 1984, the U.S. Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) provided estimates of the number of emergency room visits for hot water scalds. However, because of changes in the NEISS sampling design and in product injury coding in 1984, NEISS is no longer an appropriate source of data for such scalds. As a result, although the number of hot water scalds reported through NEISS has declined dramatically, this decline is artifactual. Tap water scalds are a portion of all hot water scalds.

The 1985 Health Interview Survey conducted by the National Center for Health Statistics (NCHS) provides nationwide population-based data about awareness of preventive measures for tap water scalds. Local and regional studies of scald injuries provide additional epidemiologic data. Although these studies have described risk groups and environmental factors affecting tap water scalds, the study results cannot be reliably extrapolated to derive national estimates.

Results

Based on NEISS data, the estimated number of hospital emergency room visits for scald injuries in the United States decreased slightly from 1978 to 1984. Each year, hot water scalds accounted for about half of these emergency visits (Table 1).

In the NCHS Health Interview Survey, 36.2% of the persons surveyed reported that they knew the temperature of the hot water in their homes (*4*). When asked how they estimated this temperature, 62.9% said that they used the setting on the water heater, 25.7% "guessed" the temperature, and 4.0% tested it with a thermometer. In households with children, compared with households without children, respondents had slightly more knowledge about tap water scalds and how to prevent them.

Local studies of tap water scalds help to identify risk factors. In Dane County, Wisconsin, risk factors were identified for 88% of the patients hospitalized for tap water scalds. Of the hospitalized patients, >50% were children <5 years of age, 9% were >65 years, and 30% were physically or mentally disabled (*1*). Almost all of these injuries could have been prevented by lowering the temperature of the household water heater to 120° F.

Discussion

The lack of a nationwide source of morbidity data hampers the accurate tracking of the 1990 objective concerning tap water scalds. Because of significant changes in NEISS, obtaining future usable data through this system is unlikely. NCHS Health Interview Survey data show that families reportedly know that high water temperatures can cause severe burns; however, these are self-reported data, and the interviewers do not actually measure water temperatures. Few households reported actually measuring their hot water temperature (*4*).

Local and regional studies of scald injuries have provided an epidemiologic basis for characterizing these injuries. Local data can help public health personnel determine target groups, identify risk factors, and find possible interventions. Local and regional studies have shown that residential water heaters with temperature settings above 120° F are the principal cause of tap water scalds.

A New Zealand retrospective study identified the child's environment as being the most important risk factor for scald injuries, although supervision of children did not appear to be a risk factor for hot water injuries (*5*). Child abuse has been implicated as another cause of tap water scalds; however, no published studies have quantified this risk.

The majority of tap water scald injuries are directly related to inappropriate or inadvertent exposure to tap water heated to an excessive temperature. Primary preventive measures are based on three strategies: 1) increase public knowledge

TABLE 1. Hospital emergency room visits and hospitalizations for scald injuries, by year, United States, selected years

	Year	All scald injuries	Hot water scalds
Emergency room visits	1983	133,516	69,863
	1984	129,238	65,843
Hospitalizations	1978	*	4,000
	1983	7,079	4,738
	1984	6,403	4,270

*Not available

Source: Consumer Product Safety Commission, National Electronic Injury Surveillance System (NEISS).

about the danger of hot tap water, 2) measure water temperature at the tap, and 3) reduce water temperature to 120° F by lowering the setting of water heater thermostats.

Several community-sponsored programs are based on these strategies. In the Liberty City area of Miami, Florida, community injury control workers visited households, measured tap water temperature, and, if necessary, reduced the water temperature (Ros A. and Devito C., personal communication). These workers also discussed the dangers of hot tap water with parents of young children and with the elderly. In southern Wisconsin, the Wisconsin Electric Power Company distributed (with each electric bill) a brochure that described the danger and cost of excessively hot water. Each subscriber was offered a free liquid-crystal thermometer to use for testing hot water temperature at the tap. Of the approximately 750,000 subscribers, 140,211 requested thermometers. During the same period, a public information campaign was conducted, and messages were transmitted by radio and television to inform the public about hot tap water burns. A follow-up telephone evaluation indicated that after the campaign, nearly 90% of the general population was aware that tap water could cause severe burns in just seconds (*6*). Although changes in the number of tap water scalds were not measured in these campaigns, the informational activities demonstrably increased the public's awareness that excessively hot tap water can cause severe injuries.

Other approaches to reducing the number of tap water scalds also focus on reducing tap water temperature. Local ordinances have been proposed in some areas to establish a maximum tap water temperature in public buildings, but the effectiveness of such ordinances may be marginal since most scalds occur in the home. Some pediatricians have recommended that manufacturers preset thermostats on water heaters before shipping them from the factory. These manufacturers could also provide warning labels about the risk of higher temperatures (*2*). Wisconsin and Washington have legislation requiring manufacturers of home water heaters to set the thermostats at a safe level (Weiss H. and Rivara F., personal communication).

Although tap water scalds produce serious injuries in young children, the elderly, and the handicapped or physically impaired, the relatively small number of tap water scalds per year makes these injuries less of a public health problem than many other household injuries. For example, from 1978-1983, about 4,000-5,000 persons were hospitalized each year for hot water scalds, whereas 5,000 persons died each year in residential fires.

Since a distinct causative agent (excessively hot tap water) and several intervention strategies exist, reducing the number of tap water scalds is clearly an attainable objective. The lack of a nationwide data source, however, prevents the measurement of a reduction. Because the number of hospitalizations due to hot water scalds is small, data from the National Hospital Discharge Survey are not adequate for tracking this objective (*7*). Alternative data sources for national surveillance of tap water scalds need to be explored. Consideration may be given to reevaluating the tracking of this 1990 objective. Efforts to prevent tap water scalds should not be diminished, however, since the intervention is simple, cost beneficial, effective, and easily implemented.

References
1. Katcher ML. Scald burns from hot tap water. JAMA 1981;246:1219-22.
2. Feldman KW, Schaller RT, Feldman JA, McMillon M. Tap water scald burns in children. Pediatrics 1978;62:1-7.
3. Katcher ML, Delventhal SJ. Burn injuries in Wisconsin: epidemiology and prevention. Wis Med J 1982;81:25-8.
4. Hoffman RE. Tracking 1990 objectives for injury prevention with 1985 NHIS findings. Public Health Rep 1986;101:581-6.
5. Langley J, Dodge J, Silva PA. Scalds to preschool children. NZ Med J 1981;93:84-7.
6. Katcher ML. Prevention of tap water scald burns: evaluation of a multi-media control program. Presented at the 24th annual meeting of the Ambulatory Pediatric Association, San Francisco, California, May 1984.
7. National Center for Health Statistics, Graves EJ. Utilization of short stay hospitals, United States—1985. Hyattsville, Maryland: National Center for Health Statistics, May 1987; DHHS publication no. (PHS)87-1752. (Vital and health statistics; series 13, no. 91).

DEATHS FROM RESIDENTIAL FIRES, 1978-1984

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Introduction

Residential fires account for most deaths from fire and flames, the fourth leading cause of injury-related deaths in the United States after motor vehicles, falls, and drownings (*1*). Each year residential fires cause an estimated 19,275 injuries among civilians and involve more than $3.4 billion in property damages (*2*). In 1979, the U.S. Department of Health and Human Services, in its health objectives for 1990, set a specific objective pertaining to residential fires: to reduce the crude death rate due to residential fires from 2.4/100,000 persons in 1978, the baseline year, to 1.5/100,000 persons in 1990 (*3*).

This report provides information on 1) the epidemiology of residential fires in the United States, 2) progress made since 1978 toward the 1990 objective, 3) factors enhancing or impeding progress toward this objective, and 4) recommended measures that will help attain this objective.

Methods

Data used to determine the number of deaths from residential fires for 1978-1984 are from annual mortality tapes of the National Center for Health Statistics (NCHS). NCHS receives reports of all deaths of U.S. residents in the 50 states and the District of Columbia. Deaths are coded according to the International Classification of Diseases (ICD), Adapted—Eighth Revision for 1978 and Ninth Revision for 1979-1984.

In this report, deaths from residential fires are defined as those with an underlying external cause of death coded according to the ICD as E890-E899 and with a location of injury coded as "0" (home) in the NCHS tapes on mortality data. Information in these tapes includes the decedent's age, sex, date of death, race (white, black, or other), and state of residence, and the state in which the death occurred.

Conflagrations (E890) are defined as uncontrolled fires in private dwellings; clothing ignitions (E893) are defined as fires caused by ignition of clothing. An additional 5%-9% of residential fires were due to miscellaneous or unspecified causes, identified in this report as "other fires." The latter category includes the following: other fires in unspecified buildings or structures (E891), fires not in buildings or structures (E892), ignition from highly inflammable materials (E894), controlled fires in private dwellings (E895), controlled fires in other unspecified buildings or structures (E896), controlled fires not in buildings or structures (E897), other unspecified fires and flames (E898), and other unspecified fires (E899).

Population estimates from the Bureau of the Census for 1978-1984 were used to compute rates (*4*). These data for the United States and for each of the NCHS regions (Northeast, Midwest, South, and West) were used to compute crude death rates (deaths from residential fires per 100,000 population). Crude death rates were used because they are very similar to the age-adjusted rates, which were computed by using the 1980 U.S. census as a standard. Regional rates that were determined by using as the numerator either the number of deaths that occurred in a region or the

number of deaths of residents in a region were similar. Only regional rates compiled from deaths that occurred in the region were reported.

Results

From 1978 through 1984, an average of 4,897 persons died each year from residential fires (Table 1). The number of these deaths decreased from 5,401 in 1978 to 4,466 in 1984. A 21% reduction occurred in the overall annual residential fire-related death rate per 100,000 persons (from 2.4 in 1978 to 1.9 in 1984). Although more of these deaths occurred among males than females, the death rate per 100,000 males decreased 20%, from 3.0 in 1978 to 2.4 in 1984. The death rate per 100,000 females decreased 26%, from 1.9 in 1978 to 1.4 in 1984.

Blacks had the highest residential fire-related death rate. Whites and others had identical rates in 1978 and 1979. After 1980, however, the rate for whites was higher than that for others, except in 1984 when the rates for whites and others were similar. Between 1978 and 1984, the residential fire-related death rates decreased for all three groups: 19% for blacks, 25% for whites, and 25% for others. The South had the highest rates, and the West had the lowest (Table 1). In all regions, however, between 1978 and 1984 rates decreased 24% in the Northeast, 25% in the Midwest, 22% in the South, and 24% in the West.

Persons ≥65 years old and children <5 years old had the highest death rates from residential fires (Figure 1). Rates declined up to ages 15-19, increased slightly at ages 20-24, leveled off at 25-39, and rose sharply after age 75. Blacks had higher death rates from residential fires in every age group than whites and others (Figure 2). Black children under age 5 had nearly a fourfold greater death rate than white children, and blacks over age 74 had death rates at least five times higher than those of whites and others in this age group. Persons listed as whites and others had similar death rates until age 84. After 84, the rate of whites exceeded that of others.

TABLE 1. Number and rate of deaths from residential fires, by sex, race, and region, United States, 1978-1984

	1978		1979		1980		1981		1982		1983		1984	
	No.	Rate*	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate
Sex														
Male	3,230	3.0	3,197	2.9	3,003	2.7	2,959	2.7	2,726	2.4	2,684	2.4	2,712	2.4
Female	2,171	1.9	2,102	1.8	2,080	1.8	1,997	1.7	1,836	1.5	1,828	1.5	1,754	1.4
Race														
White	3,785	2.0	3,645	1.9	3,550	1.8	3,382	1.7	3,155	1.6	3,028	1.5	2,997	1.5
Black	1,530	5.9	1,568	6.0	1,461	5.5	1,514	5.6	1,333	4.8	1,399	5.0	1,368	4.8
Other	86	2.0	86	1.9	72	1.4	60	1.1	74	1.2	85	1.3	101	1.5
Region														
Northeast	1,029	2.1	1,016	2.1	973	2.0	958	1.9	914	1.9	873	1.8	820	1.6
Midwest	1,418	2.4	1,445	2.5	1,271	2.2	1,170	2.0	1,117	1.9	1,041	1.8	I,089	1.8
South	2,303	3.2	2,188	2.9	2,239	3.0	2,283	3.0	1,936	2.5	2,092	2.7	2,008	2.5
West	651	1.6	650	1.5	600	1.4	545	1.2	595	1.3	506	1.1	549	1.2
Total deaths	5,401	2.4	5,299	2.4	5,083	2.2	4,956	2.2	4,562	2.0	4,512	1.9	4,466	1.9

*Deaths/100,000 population.

Deaths from residential fires are more common in the winter than in other seasons of the year (Figure 3). In this study, 40.1% of the deaths occurred during the winter, and only 14.2% occurred during the summer.

Most deaths from residential fires in the United States (86%-91%) are classified as conflagrations (Table 2). The remainder result from clothing ignition (3%-5%) and from other fires (5%-9%). For the U.S. population, the death rate from conflagrations decreased 19%—from 2.1/100,000 persons in 1978 to 1.7 in 1984. From 1979 through

FIGURE 1. Death rates from residential fires, by age group, United States, 1978-1984

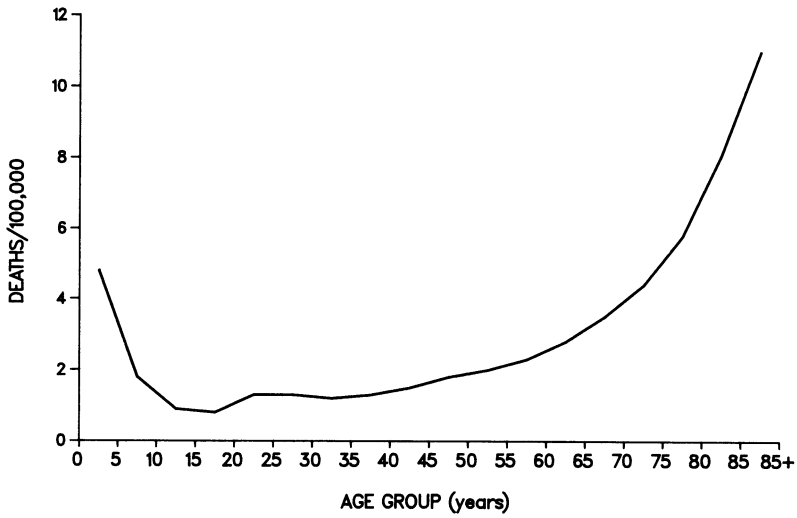
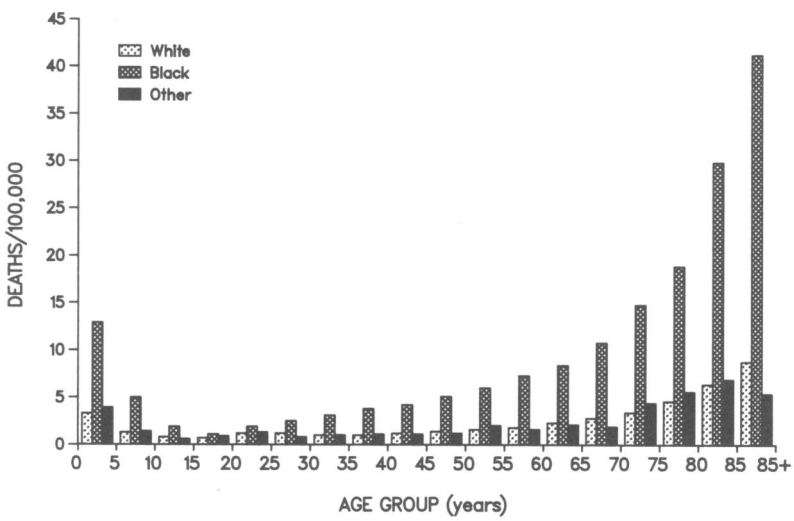


FIGURE 2. Death rates from residential fires, by age group and race, United States, 1978-1984



1984, the death rate from clothing ignition remained stable at a rate of 0.1/100,000 persons, and the death rate from other fires decreased 43%. In 1984, the risk of dying from conflagrations was more than 21 times greater than the risk of dying in a residential fire from clothing ignition. By racial group, blacks had the highest death rates in every category of residential fire. Whites and others had similar rates, although in clothing ignition and other fires, the rates for other races should be interpreted with caution, since they were based on small numbers.

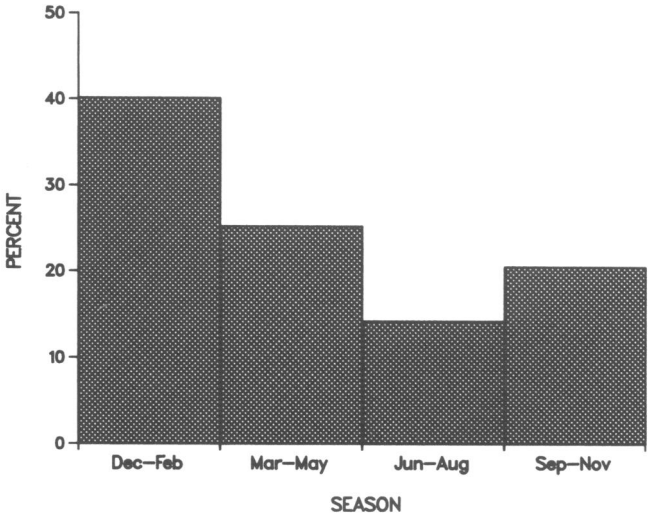
Discussion

The elderly, children <5 years old, and blacks of all ages are at high risk for death from residential fires. Most such deaths occur when a structure catches fire (conflagration), as opposed to burns from clothing ignition. Most deaths from residential fires occur in the winter, and the South is the region with the highest residential fire-related death rates.

The findings of this study have several limitations. First, the number of deaths reported here may be less than the true number of deaths from residential fires in the United States, because some fires in which the place of occurrence was undetermined (location coded as "9" on the death certificate) may have been residential. Second, the rates for blacks were not adjusted for the 1980 undercounted census report for that population (7.5% for black males and 2.1% for black females) (*5*). When the data were adjusted for this undercount, however, the results did not change appreciably. Third, the computation of regional rates was based on the number of deaths occurring in states that included some deaths of nonresidents. The findings were not appreciably affected, however, because such large populations (regional) were used as denominators. Therefore, the findings reported here provide a good estimate of death rates from residential fires.

An increased risk of dying in residential fires is associated with a number of human, environmental, and behavioral factors. The elderly and children are at

FIGURE 3. Distribution of deaths from residential fires, by season, United States, 1978-1984



increased risk, for example, partly because of the difficulty they may have in escaping from a house fire (*6*). The elderly are also less likely to own smoke detectors, as are blacks, the poor, and people who did not finish high school (*7*). Children are often at increased risk as a result of playing with matches (*6*). An increased risk for blacks may also be associated with poverty and with residence in older buildings (*8*), in rural areas, and in locations where the service of a fire department is delayed or unavailable (*9*).

More deaths from residential fires occur in winter than in other seasons of the year, possibly because of greater exposure to heating sources, improper installation and maintenance of wood- or coal-burning stoves, and the use of kerosene or space heaters (*9,10*). The use of kerosene and space heaters appears to be more common in the South (*9*). In addition, the winter season is shorter and milder there than in the Northeast or Midwest, and therefore space heaters may be more economical to use than central heating.

TABLE 2. Deaths and death rates from residential fires, by type of fire, year, and race, United States, 1978-1984

	White		Black		Other		Subtotal	
Year	Deaths	Rate*	Deaths	Rate	Deaths	Rate	Deaths	Rate
			Conflagrations (E890)					
1978	3,229	1.7	1,358	5.2	76	1.8	4,663	2.1
1979	3,192	1.6	1,407	5.3	79	1.7	4,678	2.1
1980	3,081	1.6	1,315	4.9	67	1.3	4,463	2.0
1981	3,030	1.5	1,393	5.1	55	1.0	4,478	2.0
1982	2,859	1.4	1,247	4.5	68	1.1	4,174	1.8
1983	2,643	1.3	1,254	4.5	76	1.2	3,973	1.7
1984	2,654	1.3	1,248	4.4	94	1.4	3,996	1.7
			Clothing ignition (E893)					
1978	203	0.1	58	0.2	4	0.1	265	0.1
1979	185	0.1	53	0.2	3	0.1	241	0.1
1980	195	0.1	60	0.2	2	0.0	257	0.1
1981	140	0.1	41	0.2	0	0.0	181	0.1
1982	116	0.1	30	0.1	2	0.0	148	0.1
1983	158	0.1	62	0.2	3	0.0	223	0.1
1984	143	0.1	43	0.2	0	0.0	186	0.1
			Other fires (E891, E892, E894-E899)					
1978	353	0.2	114	0.4	6	0.1	473	0.2
1979	268	0.1	108	0.4	4	0.1	380	0.2
1980	274	0.1	86	0.3	3	0.1	363	0.2
1981	212	0.1	80	0.3	5	0.1	297	0.1
1982	180	0.1	56	0.2	4	0.1	240	0.1
1983	227	0.1	83	0.3	6	0.1	316	0.1
1984	200	0.1	77	0.3	7	0.1	284	0.1

*Deaths/100,000 population.

Behavioral risk factors also contribute to residential fires. These include cigarette smoking and alcohol use. Cigarettes are involved in half of the deaths caused by house fires (*9*), and cigarette-ignited fires typically occur at night when people fall asleep smoking in bed (*9*). Alcohol intoxication could hamper the chances of escape during a fire, and several investigations have indicated that 39%-43% of victims of residential fires who were tested for alcohol were legally intoxicated (blood alcohol concentration of $\geq$0.1 mg/dl) (*8,11*).

Various intervention strategies have been started to decrease the number of deaths from residential fires. The National Fire Protection Association collects and disseminates data on the estimated prevalence of fires, fire-related injuries, and fire-related property damage. The risk of dying from fires in homes with smoke detectors is half that in homes without detectors (*7*). The technology of smoke detectors was developed in the 1960s, but smoke detectors were not widely used until the 1980s, as suggested by national surveys on smoke detector ownership (5% in 1970 and 74% in 1985) (*7*). The increased ownership of smoke detectors may be the result of heightened public awareness of their safety value, a substantial decrease in smoke detector prices, and legislation requiring the installation of smoke detectors in homes (*7,12*).

Other intervention strategies have focused on improving the flame-retardant property of sleepwear (*13*), decreasing the number of cigarette smokers (*3*), and promoting self-extinguishing cigarettes and matches (*14*).

Since 1978, progress has been made in reducing deaths from residential fires. Overall rates have declined, although the elderly, children, blacks, and residents in the South remain at high risk.

The 1990 objective is limited as an indicator of the public health impact of residential fires. One overall crude death rate is used as an indicator of progress; therefore, the objective does not address the importance of specific high-risk populations. For example, the objective of 1.5 deaths/100,000 persons has been met or nearly met for females, whites, others, and residents of the Northeast, Midwest, and West. The objective is far from being met, however, for the elderly, children, and blacks. Unless particular attention is focused on effective interventions in these high-risk groups, the crude residential fire-related death rates may actually begin to increase. For example, the number of elderly people in the United States is expected to almost double by the year 2030 (from 11.6% in 1982 to 21.2 in 2030) (*15*).

The 1990 objective does not take nonfatal fire-related injuries into account. The Federal Emergency Management Agency, National Fire Protection Association, Consumer Product Safety Commission, and state, local, and nongovernmental agencies could jointly develop an objective that would reflect both mortality and morbidity. Such an objective would require the ability to collect reliable morbidity data that are currently unavailable.

To meet the 1990 objective concerning deaths from residential fires, health personnel need to increase their efforts to 1) examine high-risk groups, 2) develop a better surveillance system on the causes of fires, 3) implement effective interventions, and 4) evaluate intervention strategies. Further efforts toward attaining the 1990 objective should focus on increasing the use of smoke detectors, decreasing the number of persons who smoke, lowering the ignition potential of cigarettes, requiring that cigarettes and matches be self-extinguishing, and enforcing building codes related to fires.

References

1. National Safety Council. Accident facts 1985 edition. Chicago: National Safety Council, 1986.
2. Karter MJ Jr. Fire loss in the United States during 1984. Fire J 1985;Sept:14-25,67-75.
3. CDC. Mid-Course review report for the 1990 injury prevention objectives. Atlanta, Georgia: CDC, 1985.
4. US Department of Commerce, Bureau of the Census. Current population estimates and projections. Washington, DC: US Department of Commerce. (Series P-25, nos. 917, 1982; 957, 1984; 998, 1986; and 1,000, 1987.)
5. Savage IR. Who counts? Am Stat 1982;36:195-200.
6. Karter MJ Jr. Patterns of fire deaths among the elderly and children in the home. Fire J 1986;Mar:19-22.
7. Hall JR Jr. A decade of detectors: measuring the effect. Fire J 1985;Sept:37-43,78.
8. Mierley MC, Baker SP. Fatal house fires in an urban population. JAMA 1983;249:1466-8.
9. Baker SP, O 'Neill B, Karpf RS. The injury fact book. Lexington, Massachusetts: DC Heath, 1984:139-54.
10. Harwood B, Kluge P. Hazards associated with the use of wood- or coal-burning stoves or free-standing fireplaces. Washington, DC: US Consumer Product Safety Commission, 1985.
11. CDC. Deaths associated with fires, burns, and explosions—New Mexico, 1978-1983. MMWR 1985;34:623-5.
12. McLoughlin E, Marchone M, Hanger SL, German PS, Baker SP. Smoke detector legislation: its effect on owner-occupied homes. Am J Public Health 1985;75:858-62.
13. Robertson LS. Injuries: causes, control strategies, and public policy. Lexington, Massachusetts: DC Heath, 1983:153-4.
14. McGuire A. Cigarettes and fire deaths. NY State J Med 1983;83:1296-8.
15. US Department of Commerce, Bureau of the Census. Current population estimates and projections: projections of the population of the United States, by age, sex, and race: 1983 to 2080. Washington, DC: US Department of Commerce, 1984.

UNINTENTIONAL FIREARM-RELATED FATALITIES, 1970-1984

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Introduction

Unintentional firearm-related fatalities are an important problem in the United States, especially for children and young adults. In 1983, firearm-related fatalities ranked as the sixth leading cause of death from unintentional injuries, as well as the sixth leading cause of years of potential life lost (*1*).

In 1978, 1,800 unintentional firearm-related fatalities occurred in the United States. The magnitude of this problem led to the Department of Health and Human Services objective for the nation that by the year 1990 the number of unintentional fatalities from firearms should be no more than 1,700 (*2*). This report provides information 1) on the numbers and rates of unintentional firearm-related fatalities for the period 1970-1984 and 2) on temporal trends, weapon use, circumstances, and geographic variations in unintentional firearm-related fatalities.

Materials and Methods

Data on unintentional firearm-related fatalities for each year from 1970 through 1984 were obtained from the mortality computer files compiled by the National Center for Health Statistics (NCHS). NCHS creates these files from death certificate information provided by the 50 states and the District of Columbia. Deaths of nonresident aliens and U.S. citizens living abroad were not included in this report. Unintentional firearm-related fatalities reported here are those deaths coded E922 according to the International Classification of Diseases, Adapted—the Eighth Revision for 1970-1978 and the Ninth Revision for 1979-1984. U.S. population data for 1970-1984 were obtained from the P-25 series of the Current Population Reports compiled by the Bureau of the Census (*3*).

Results

In 1984, unintentional firearm-related fatalities accounted for about 5.0% of all firearm-related fatalities, ranking behind suicides and homicides, which represented 54.6% and 37.7%, respectively, of all deaths from firearms (Figure 1). During the period 1970-1984, 31,515 unintentional firearm-related deaths were reported to NCHS. The number peaked at 2,618 in 1973 and then dropped to a low of 1,668 in 1984 (Figure 2). The 1990 objective of 1,700 unintentional firearm-related fatalities was reached in 1983.

Unintentional firearm-related fatality rates decreased from 1970 through 1984, from 1.18 deaths/100,000 in 1970 to 0.71 in 1984—an approximately 3% annual decrease (Table 1). The rate of decline was greater for males than for females.

Males, adolescents, and young adults were at highest risk of unintentional firearm-related fatality. In 1984, the rate for males was 1.27 compared with 0.17 for females, placing males at a sevenfold greater risk than females (Table 1). Males ages 15-19 had the greatest risk; the next greatest risk groups were males ages 20-24 and those ages 10-14 (Figure 3).

From 1970 through 1984, rates for black, white, and other races all declined. Blacks had the highest rates; however, their rates decreased much faster than those for whites or persons of other races. The rate ratio between blacks and whites decreased from 2.5 in 1970 to 1.1 in 1984. This pattern of decline for blacks and whites is similar to the decline for homicide, in which the rate ratio between blacks and whites decreased from 8.9 in 1970 to 5.3 in 1983 (*4*). Unintentional firearm-related fatality rates declined for both black and white males and females during the 15-year study

FIGURE 1. Percentage distribution of firearm-related fatalities, by cause of death, United States, 1984

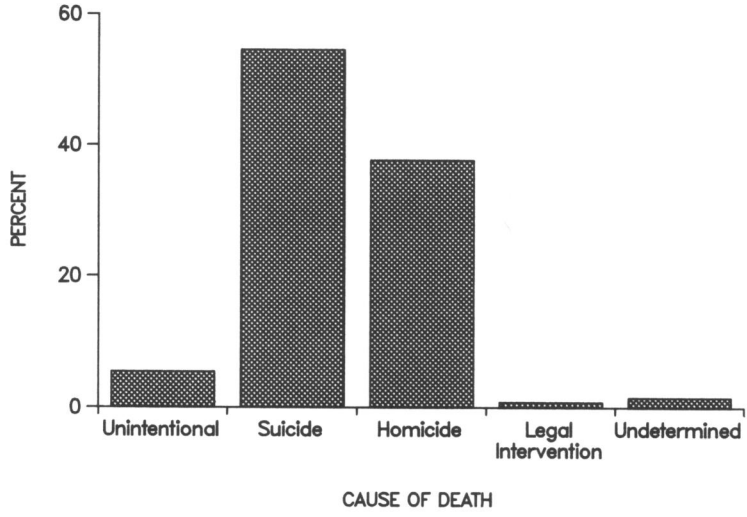


FIGURE 2. Unintentional firearm-related fatalities, by year, United States, 1970-1984

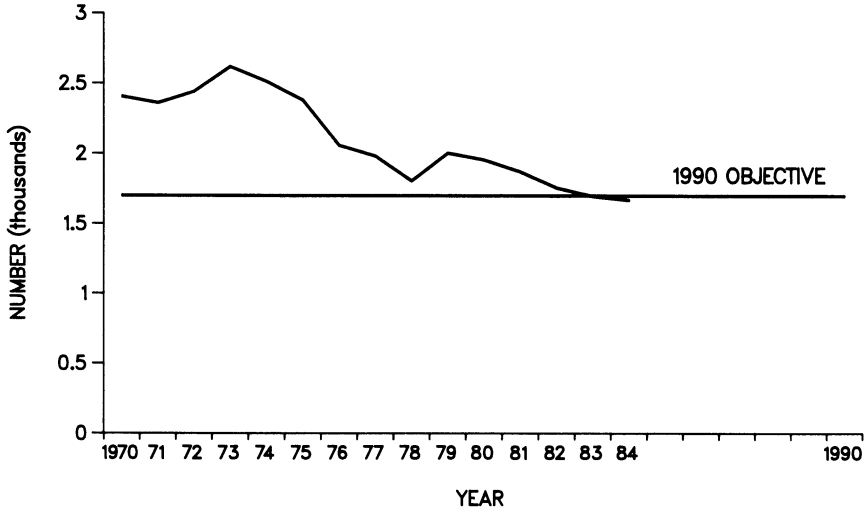


TABLE 1. Number and rate of unintentional firearm-related fatalities, by race, year, and sex, United States, 1970-1984

Year		White		Black		Other		Total	
		No.	Rate*	No.	Rate	No.	Rate	No.	Rate
1970	Male	1,569	1.80	464	4.30	27	2.09	2,060	2.07
	Female	234	0.26	104	0.87	8	0.61	346	0.33
	Total	1,803	1.01	568	2.50	35	1.35	2,406	1.18
1971	Male	1,548	1.75	497	4.51	27	1.99	2,072	2.06
	Female	195	0.21	88	0.73	5	0.36	288	0.27
	Total	1,743	0.96	585	2.53	32	1.17	2,360	1.14
1972	Male	1,624	1.82	446	3.97	20	1.39	2,090	2.05
	Female	224	0.26	102	0.83	6	0.41	352	0.33
	Total	1,848	1.02	548	2.32	26	0.89	2,442	1.17
1973	Male	1,754	1.95	482	4.23	33	2.17	2,269	2.20
	Female	254	0.27	89	0.71	6	0.38	349	0.32
	Total	2,008	1.09	571	2.38	39	1.26	2,618	1.24
1974	Male	1,681	1.85	417	3.61	29	1.81	2,127	2.05
	Female	280	0.29	99	0.78	7	0.42	386	0.35
	Total	1,961	1.06	516	2.12	36	1.10	2,513	1.18
1975	Male	1,636	1.79	378	3.22	28	1.61	2,042	1.95
	Female	250	0.26	77	0.59	11	0.61	338	0.31
	Total	1,886	1.01	455	1.84	39	1.10	2,380	1.10
1976	Male	1,431	1.55	316	2.66	27	1.46	1,774	1.68
	Female	218	0.23	59	0.45	8	0.41	285	0.26
	Total	1,649	0.87	375	1.50	35	0.92	2,059	0.95
1977	Male	1,375	1.48	273	2.26	27	1.38	1,675	1.57
	Female	228	0.23	75	0.56	4	0.19	307	0.27
	Total	1,603	0.84	348	1.37	31	0.77	1,982	0.90
1978	Male	1,295	1.38	240	1.96	31	1.50	1,566	1.45
	Female	189	0.19	48	0.35	3	0.14	240	0.21
	Total	1,484	0.77	288	1.11	34	0.80	1,806	0.81
1979	Male	1,390	1.47	283	2.27	42	1.91	1,715	1.57
	Female	215	0.22	71	0.51	3	0.13	89	0.25
	Total	1,605	0.83	354	1.35	45	1.00	2,004	0.89
1980	Male	1,374	1.44	281	2.22	31	1.22	1,686	1.53
	Female	208	0.21	54	0.38	7	0.26	269	0.23
	Total	1,582	0.81	335	1.25	38	0.73	1,955	0.86
1981	Male	1,316	1.37	245	1.90	31	1.12	1,592	1.43
	Female	207	0.21	60	0.42	12	0.42	279	0.24
	Total	1,523	0.77	305	1.12	43	0.76	1,871	0.82
1982	Male	1,266	1.31	208	1.59	50	1.69	1,524	1.35
	Female	191	0.19	40	0.27	1	0.03	232	0.19
	Total	1,457	0.74	248	0.90	51	0.84	1,756	0.76
1983	Male	1,208	1.24	215	1.62	42	1.35	1,465	1.29
	Female	185	0.18	40	0.27	5	0.15	230	0.19
	Total	1,393	0.70	255	0.91	47	0.74	1,695	0.72
1984	Male	1,230	1.25	196	1.45	35	1.07	1,461	1.27
	Female	171	0.17	31	0.21	5	0.15	207	0.17
	Total	1,401	0.70	227	0.80	40	0.60	1,668	0.71

*Deaths/100,000.

period. Because of these declines, the rate ratio between black and white males decreased from 2.4 in 1970 to 1.2 in 1984, and the rate ratio for black and white females decreased from 3.4 to 1.2.

Discussion

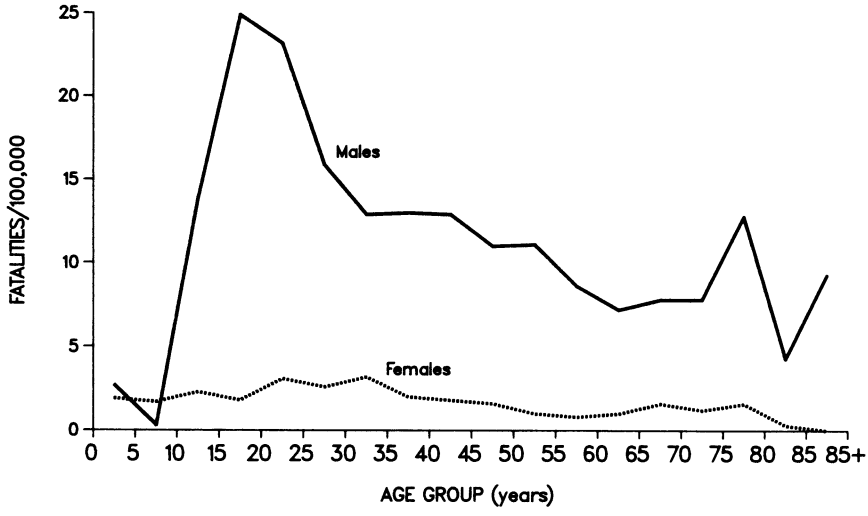
The Surgeon General's Report on Health Promotion and Disease Prevention, *Healthy People,* identified 15 priority areas for improving the nation's health, including injury control (*5*). As a result, specific and quantifiable objectives were set for the year 1990, including reducing the numbers of unintentional firearm-related fatalities (*2*). The 1990 health objective of no more than 1,700 unintentional firearm-related deaths was met in 1983 (1,695 deaths) and in 1984 (1,668 deaths).

Firearms rank second, after motor vehicles, as the most important cause of injury mortality. In 1984, firearms accounted for 31,331 deaths (1,668 unintentional deaths, 17,113 suicides, 11,815 homicides, 253 legal interventions, and 482 deaths of undetermined intent). There are 13.4 firearm-related deaths for every 100,000 persons compared with 19.7 motor vehicle-related fatalities per 100,000 persons.

Firearms have an impact on public health not only because of mortality, but also because of morbidity. The National Health Interview Survey conducted in 1972 showed that an estimated 155,000 nonfatal firearm-related injuries, regardless of intent, occurred that year (*6*). In 1972, there were approximately 29,000 firearm-related deaths; consequently, more than five nonfatal firearm-related injuries occurred for each firearm-related fatality that year (*7*).

Unintentional firearm-related fatalities, although representing a small proportion of all firearm-related deaths, have drawn some attention in recent years. Baker *et al.* reported that from 1930 to 1980, the unintentional firearm-related death rate decreased by two-thirds (*8*). They cited rural-to-urban migration and general improvements in the economic status of Americans as being possible contributors to the decline. This speculation is consistent with their finding of a high rural-to-urban

FIGURE 3. Rates of unintentional firearm-related fatalities, by age group and sex, United States, 1984



unintentional firearm-related fatality rate ratio and a strong inverse association between unintentional firearm-related fatality rate and per capita income (*8*).

Baker *et al.* also reported that more than one-fourth of unintentional firearm-related deaths occur between November and December (*8*). The hunting season presumably accounts for this seasonal pattern. However, a study of unintentional firearm-related fatalities in the Cleveland, Ohio, metropolitan area showed no seasonal pattern (*9*). This finding suggests that nationwide seasonal patterns may be strongly influenced by rural patterns.

The South and the northern mountain states reportedly have the highest unintentional firearm fatality rates (*8*). Within regions and states, remote rural areas have the highest rates (*8*). Although generally the magnitude of unintentional firearm-related fatality rates appears to lessen with urbanization, one study reported higher rates in central cities than in suburbs (*9*).

Most unintentional firearm-related fatalities occur in or around the home. In one rural setting, 65% of such fatalities occurred in or around the home (*10*), whereas in the Cleveland metropolitan area, 78% occurred in or around the home (*9*).

The distribution of the type of weapon involved in unintentional firearm-related fatalities differs by location. In the Ohio study, investigators found that 83% of the fatalities involved handguns (*9*). In the North Carolina study, however, investigators found that most fatalities involved long guns—41%, shotguns; 16%, rifles; and 39%, handguns (*9*).

The North Carolina study focused on some interesting patterns in the circumstances associated with these fatalities. For example, 67% of self-inflicted unintentional firearm-related fatalities reportedly resulted because persons had pointed a gun at themselves in jest or play (*10*). On the other hand, unintentional firearm-related fatalities inflicted by someone else were more likely to be related to hunting or to young children playing with a gun (*10*). Alcohol has been potentially associated with unintentional deaths from firearms; in one study, investigators reported that approximately half of the deaths were alcohol related (*9*).

Unintentional firearm-related fatality rates in the United States have been found to be highest in low-income areas (*8*). The inverse association between death rate and per capita income is greater for unintentional firearm-related injuries than for any other cause of unintentional injury fatality (*8*).

To develop specific ways to prevent unintentional firearm-related fatalities, public health personnel need more complete information in several key areas. First, information is needed about the prevalence and distribution of firearms by type and intended use. Currently, an estimated 45-200 million firearms, including 45-60 million handguns, are owned by civilians (*11-14*), but even crude estimates are not available for regions, states, or counties in the United States. Consequently, the association between the prevalence of firearm ownership and the risk of death from a firearm cannot be explored. Second, case-control studies are needed to assess more precisely the risk of firearm death relative to such factors as firearm ownership and the manner and place in which weapons are stored. Firearms that are kept loaded and readily accessible in the home, for instance, may pose a significant risk for household members. Investigators in one metropolitan area found that for every instance of self-protection homicide involving a firearm kept in the home, there were 1.3 unintentional firearm-related deaths, 4.6 criminal homicides, and 37.0 suicides (*15*). Third, the role of emergency medical services in preventing firearm fatalities needs to

be evaluated. Data are not available to show the extent to which improvements in the efficiency and quality of emergency medical services have contributed to the decline in the rate of unintentional firearm-related fatalities.

Several modifications in the 1990 objective to decrease unintentional firearm-related fatalities should be considered for the year 2000 objectives. First, this objective should be expressed in terms of the rate of unintentional firearm-related injury rather than the number. Changes in the number over time may reflect only changes in the size of the U.S. population and not actual changes in the level of risk. Second, the objective should be broadened to include firearm-related fatalities due to homicide, suicide, legal intervention, and undetermined intent. Strategies to prevent unintentional firearm-related fatalities also may be effective in preventing intentional firearm-related fatalities and vice versa.

Setting the year 2000 objectives along these lines will help 1) direct more attention to the problem of firearm-related deaths in this country, 2) create support for identifying risk factors for unintentional firearm-related fatalities and other forms of firearm-related deaths, and 3) encourage the development and evaluation of intervention strategies in this area.

References

1. CDC. Premature mortality due to unintentional injuries—United States, 1983. MMWR 1986;35:353-6.
2. US Department of Health and Human Services, Public Health Service. Promoting health/preventing disease: objectives for the nation. Washington, DC. US Department of Health and Human Services, 1980.
3. US Department of Commerce, Bureau of the Census: Estimates of the population of the United States, by age, sex, and race: 1980 to 1984. Current Population Reports, series P-25, no. 965. Washington, DC: US Department of Commerce, 1985.
4 CDC. Homicide surveillance: high-risk racial and ethnic groups—blacks and Hispanics, 1970 to 1983. Atlanta: CDC, November 1986.
5. US Department of Health, Education, and Welfare, Public Health Service. Healthy people: the Surgeon General's report on health promotion and disease prevention. Washington, DC: US Department of Health, Education, and Welfare, 1979; DHEW (PHS) publication no. 79-55071.
6. National Center for Health Statistics. Persons injured and disability days by detailed type and class of accident, United States, 1971-1972. Rockville, Maryland: US Department of Health, Education, and Welfare, 1976.
7. Jagger J, Dietz PE. Death and injury by firearms: who cares? JAMA; 1986;255:3143-4.
8. Baker SP, O'Neill B, Karpf RS. The injury fact book. Lexington, Massachusetts: Lexington Books, DC Heath, 1984:129-36.
9. Rushforth NB, Hirsch CS, Ford AB, Adelson L. Accidental firearm fatalities in a metropolitan county (1958-1973). Am J Epidemiol 1974;100:499-505.
10. Morrow PL, Hudson P. Accidental firearm fatalities in North Carolina, 1976-80. Am J Public Health 1986;76:1120-3.
11. Newton GD, Zimring FE. Firearms and violence in American life: a staff report to the National Commission on the Causes and Prevention of Violence. Washington, DC: US Government Printing Office, 1969.
12. Wright JD, Marston L. The ownership of the means of destruction: weapons in the United States. Social Problems 1975;23:93-107.
13. Patterson PJ, Smith LR. Firearms in the home and child safety. Am J Dis Child 1987;141:221-3.
14. Schetky DH. Children and handguns: a public health concern. Am J Dis Child 1985;139:229-31.
15. Kellerman AL, Reay DT. Protection or peril? an analysis of firearm-related deaths in the home. N Engl J Med 1986;314:1557-60.

HOMICIDES AMONG BLACK MALES 15-24 YEARS OF AGE, 1970-1984

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Introduction

Homicide has emerged as one of the most challenging health problems in the United States and as the number one health problem among young black Americans. Among blacks 15-34 years of age, more lives are lost to homicide than to any other cause of death, including unintentional injuries, suicide, heart disease, and cancer (*1*). Young black males are at especially high risk of death from homicide, with mortality rates five to 12 times greater than those of young white males (*2*). In response to this problem, the Department of Health and Human Services established the following objective in 1978 (*3*):

> By 1990, the death rate from homicide among black males ages 15 to 24 should be reduced to below 60 per 100,000. (In 1978, the homicide rate for this group was 72.5 per 100,000.)*

This report provides the numbers and rates of homicide among black males 15-24 years of age for the period 1970-1984; describes patterns of homicide in terms of circumstance, weapon use, and victim-assailant relationship for the period 1976-1984; and discusses the prospects for attaining the stated objective.

Materials and Methods

The mortality data on which this report is based were compiled by the National Center for Health Statistics (NCHS). These data reflect death certificate information submitted to NCHS from all 50 states and the District of Columbia. Deaths of nonresident aliens and U.S. citizens living abroad are not included.

The determination of homicide as an external cause of death is considered relatively straightforward (*4*), and the U.S. vital statistics registry system has provided essentially complete mortality coverage since 1933 (*5*).

The category "homicide" on death certificates includes deaths from injuries purposely inflicted by other persons (International Classification of Diseases, Adapted, Eighth Revision [ICDA-8], and International Classification of Diseases, Ninth Revision [ICD-9], codes E960-E969), deaths from injuries resulting from legal intervention (i.e., homicides committed by law enforcement officers—ICDA-8 and ICD-9 codes E970-E977), and deaths caused by legal execution (ICDA-8 and ICD-9 code E978). A certification of homicide in a vital statistics report is not typically a legal decision, but rather represents the professional opinion of the physician or coroner certifying the cause of death.

Data on homicide circumstance, weapon use, and victim-assailant relationship for the period 1976-1984 were obtained from the Supplemental Homicide Report (SHR) computer files compiled by the Federal Bureau of Investigation's (FBI's) Uniform Crime Reporting Program. The SHR includes homicide deaths classified by the FBI

*With the use of population figures published in 1982 by the U.S. Department of Commerce, Bureau of the Census, the rate of homicide in 1978 for black males ages 15-24 was 70.7 (*6*). For purposes of comparison, this rate will be used throughout the remainder of this report.

into the following categories: murder, nonnegligent manslaughter (the willful killing of one human being by another), citizen-justifiable homicide (e.g., homicides committed in self-defense), legal execution, and homicide committed by law enforcement officers. These FBI categories are comparable to the NCHS homicide categories.

Population data were obtained from the Bureau of the Census (*6,7*).

Results

During the period 1970-1984, 31,920 homicides among black males 15-24 years of age were reported to NCHS. In general, both the numbers and the rates of homicide for this group were highest during the early 1970s, and they gradually declined to a 15-year low in 1984 (Table 1). The 1984 rate of 61.5/100,000 population represents a 39.2% decrease from the 1970 rate of 101.1 and a 13.0% decrease from the 1978 index year rate of 70.7. In 1984, the homicide rate of 61.5 for black males 15-24 years of age only slightly exceeded the 1990 objective of 60.0 (Figure 1). In contrast, the homicide rates for white males 15-24 years of age rose steadily during the period 1970-1984, resulting in an overall increase of 40.5% (Table 1). Rates for this group were lowest in 1970 at 7.9, reached a high of 15.5 in 1980, then declined to 11.1 in 1984.

Because of these differing trends, the relative magnitude of homicide rates for young black males compared with those for young white males decreased during this period. In 1970, the homicide rate for black males 15-24 years of age was 12.8 times greater than the rate for white males in the same age group. In 1984, the rate was 5.5 times greater for black males than for white males in this age group.

TABLE 1. Numbers and rates* of homicides among males 15-24 years of age, by race and year, United States, 1970-1984

	Black		White	
Year	No.	Rate	No.	Rate
1970	2,092	101.1	1,219	7.9
1971	2,376	108.2	1,386	8.6
1972	2,454	106.7	1,564	9.5
1973	2,196	92.2	1,749	10.4
1974	2,354	95.4	1,933	11.3
1975	2,262	89.0	1,929	11.0
1976	1,992	76.1	1,850	10.4
1977	1,889	70.5	2,207	11.3
1978	1,934	70.7	2,202	12.2
1979	2,129	76.5	2,622	14.4
1980	2,365	83.9	2,800	15.5
1981	2,231	78.8	2,575	14.4
1982	2,066	73.3	2,303	13.1
1983	1,870	66.8	1,979	11.5
1984	1,710	61.5	1,874	11.1
1990 Target:		60.0		

*Rates per 100,000 population.

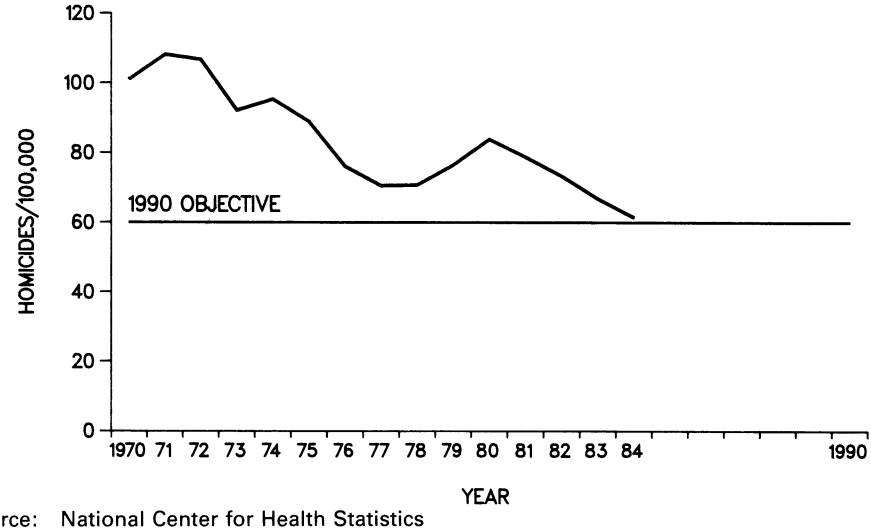
Source: National Center for Health Statistics.

In every year of the period studied, the risk of homicide was over two times higher for black males 20-24 years of age than for black males 15-19 years of age (Figure 2). For black males 15-19, the rate of homicide peaked at 65.3 in 1971, then declined to 39.3 in 1984. Overall, the rate for this group decreased 39.7% from 1970 to 1984. For black males 20-24 years of age, the rate of homicide peaked at 170.8 in 1972, then declined to 84.5 in 1984. Overall, the homicide rate for this group decreased 45.8% from 1970 to 1984. Despite widely differing rates of homicide, the temporal patterns were similar for black males 15-19 and 20-24 years of age.

Several cohorts of black males entered the age group 15-24 years during the 15-year study period. Patterns of homicide for these cohorts were examined separately, and age-specific homicide rates for successive 5-year birth cohorts were calculated (Figure 3). Two general patterns became apparent: 1) cohorts born more recently tended to have their highest homicide rates at a younger age and to have lower homicide rates at an older age than cohorts born before them, and 2) the two most recently born 5-year cohorts had successively lower peak homicide rates than cohorts born before them.

Reliable FBI data on homicide circumstances, victim-assailant relationship, and weapon use are not available for the years before 1976. From 1976 through 1984, no trends are apparent for any of these variables. In the period 1976-1984, most (61.1%) homicides among black males 15-24 years of age occurred during an argument or other nonfelony circumstance (Figure 4), 14.5% were associated with a felony or suspected felony, 8.6% were justifiable homicides (i.e., homicides committed by law enforcement officials), and 15.7% occurred under unknown circumstances. More than half of the victims (52.8%) were killed by persons they knew (7.4% of the assailants were family members and 45.4% were other acquaintances), 19.9% were killed by strangers, and the victim-assailant relationship was undetermined in 27.3% of the cases (Figure 4). Over three-fourths (76.8%) of the victims were killed with firearms;

FIGURE 1. Homicide rates for black males ages 15-24, by year, United States, 1970-1984



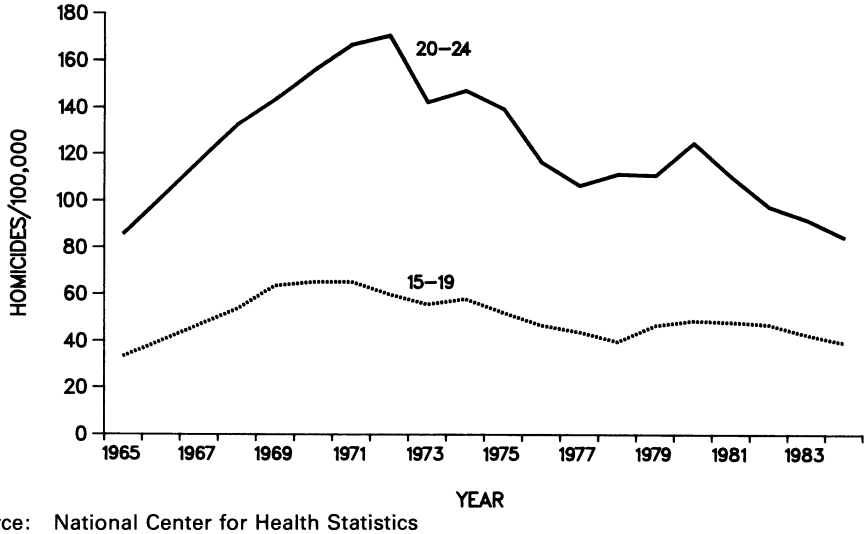
Source: National Center for Health Statistics

18.6%, with cutting or piercing instruments; 3.0%, with some bludgeoning instrument; and 1.7%, with other weapons (Figure 5).

Discussion

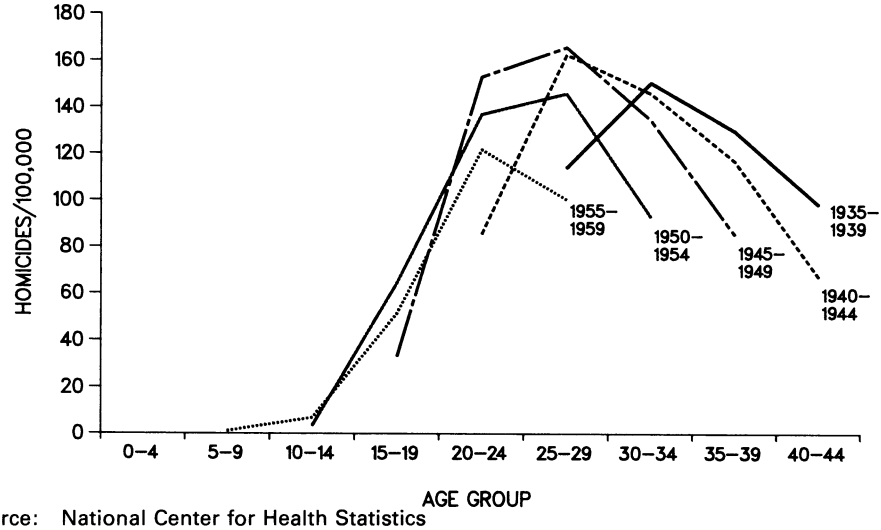
The first Surgeon General's Report on Health Promotion and Disease Prevention identified 15 priority areas for improving the health of Americans, including the

FIGURE 2. Homicide rates for black males ages 15-24, by 5-year age group and year, United States, 1965-1984



Source: National Center for Health Statistics

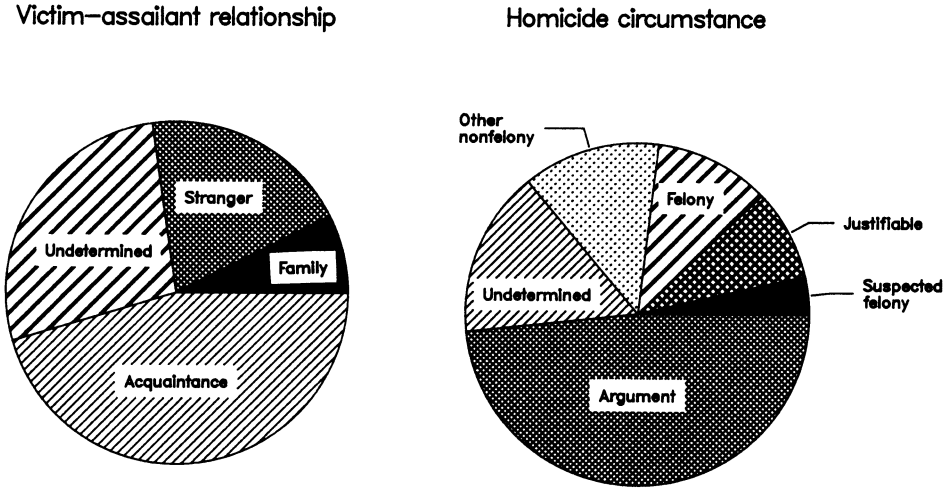
FIGURE 3. Homicide rates for black males, by age group and 5-year birth cohort, United States, 1965-1985



Source: National Center for Health Statistics

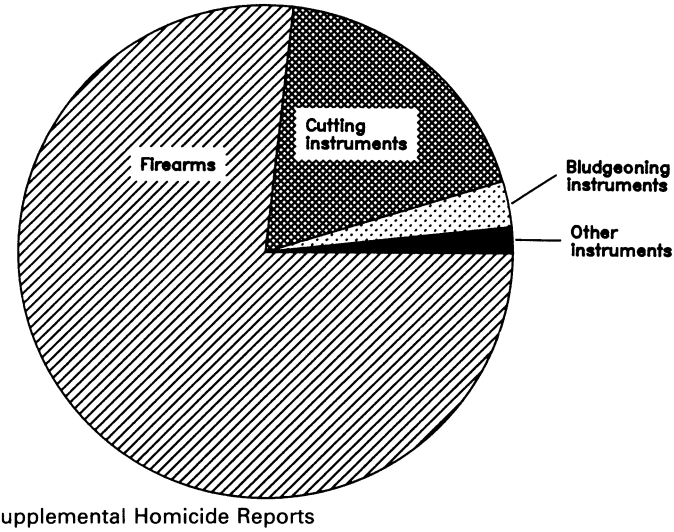
control of stress and of violent behavior (*8*). In 1980, specific, quantifiable health objectives were issued (*3*), including an objective for reducing the homicide rate among black males 15-24 years of age. Because the homicide rate for this group was so much higher than that for other race-sex groups in the same age category, the latter objective was considered especially critical.

FIGURE 4. Homicides among black males ages 15-24, by victim-assailant relationship and homicide circumstance, United States, 1976-1984



Source: FBI Supplemental Homicide Reports

FIGURE 5. Homicides among black males ages 15-24, by weapon used, United States, 1976-1984



Source: FBI Supplemental Homicide Reports

The risk group identified in the 1990 objective concerning homicides is so narrowly defined, however, that the objective does not reflect the tremendous morbidity and mortality caused by intentional interpersonal violence even among those at highest risk. For example, the objective addresses the homicide rate among black males 15-24 years of age, yet the homicide rate is actually higher among black males 25-34 and 35-44 years of age (*2*). Furthermore, although black males are at the highest risk of homicide, black females are also at very high risk, with rates exceeding those of white males. And although homicide *rates* are higher among black males, the total *number* of homicides is higher among white males. Finally, the rate of nonfatal injuries from intentional interpersonal violence is at least 100 times greater than the rate of homicide, resulting in almost 2 million injuries per year (*9*).

The overall pattern of decreasing homicide rates since the early 1970s for black males 15-24 years of age is paralleled by decreasing homicide rates for blacks in general. From 1970 to 1983, the homicide rate decreased in almost every age group for both black males and black females (*2*). At the same time, the homicide rate increased in almost every age group for both white males and white females, but particularly among young white males. The causes underlying these trends are not fully understood. Broad social conditions, such as poverty, education, and job opportunity, may indirectly affect the risk of homicide victimization (*10,11*). Changes from rural to urban settings, changes in family structure, increased mobility and migration, and other social, economic, and political changes have all been cited as potentially stressful factors that may influence the risk of homicide (*12*). Drug and alcohol abuse (*13,14*) and the ready accessibility of lethal weapons such as firearms (*15*) have also been proposed as risk factors for homicide.

In addition to large-scale social effects, fluctuations in age-specific mortality rates may be due to cohort effects—that is, effects due to exposures that are unique to individuals born within a specific period. The cohort of black males born during the period 1945-1954 had the highest homicide rates in the 15- to 24-year age group (Figure 3). The persons in this cohort entered adolescence during the 1960s, a time of rapid social change. The high *rate* of social change experienced by this cohort of blacks, rather than the social changes themselves, may have caused this population to have a higher risk of homicide than the other cohorts (*12*). Or, the larger size of the "baby-boomers" cohort may have led to an increased risk of homicide for this group because of the stress caused by increased competition and a decrease in the demand for labor (*16*). The greatest proportion of persons in the "baby-boomers" cohort, however, were entering the labor force during the late 1970s, a period in which homicide rates among blacks decreased markedly. More detailed analyses of cohorts should provide a better understanding of temporal trends and may provide important clues about the causes and prevention of homicide.

Although more research is needed to further identify and characterize risk factors for homicide, a number of potential interventions have been suggested: decreasing the cultural acceptance of violence; developing strategies to reduce firearm-associated injuries; teaching nonviolent conflict-resolution skills; improving the recognition, management, and treatment of victims of violence; and linking and coordinating the responses of police and representatives of health and social services to violence (*17*). In some areas, such interventions are already being implemented. A high priority for public health should be to evaluate these interventions in terms of their effectiveness in decreasing injuries and deaths from violence, their economic

efficiency, and their social acceptability. Interventions meeting these criteria should be considered for implementation on a broader scale.

If the present trend continues, the 1990 objective for reducing the rate of homicide among black males ages 15-24 will be met. New health objectives are now being developed for the year 2000. Young black males remain at the highest risk of homicide; thus, reducing the homicide rate in this group should continue to be a key health focus. However, the year 2000 objective concerning homicide should not be limited to one 10-year age group or to males only, but should address the entire problem of homicide among blacks. An appropriate objective might be to reduce the age-adjusted rate of homicide among black males to below 40/100,000 or to reduce the age-adjusted rate of homicide among all blacks to below 20/100,000. Such mortality indexes can be reliably calculated and monitored. More importantly, since the risk of homicide is markedly excessive for the entire black population (*18*), total homicide rates for blacks would be far more appropriate as indexes for the year 2000 homicide health objective.

Reducing the morbidity from interpersonal violence should also be a public health objective. Unfortunately, no adequate surveillance system exists for monitoring such an objective. An interpersonal injury surveillance system would enable investigators to describe the scope and nature of these injuries and to monitor this health problem over time. In addition, such a surveillance system would identify persons potentially at high risk of future injury or death from interpersonal violence and thus in need of referral to social services or other appropriate agencies. Community-based surveillance systems for interpersonal injury should be developed and evaluated. If particular systems are found to be practical and useful in the community, they should be expanded to allow for statewide surveillance of morbidity caused by interpersonal violence.

References

1. CDC. Homicide among young black males—United States, 1970-1982. MMWR 1985; 34:629-33.
2. CDC. Homicide surveillance: high-risk racial and ethnic groups—blacks and Hispanics, 1970 to 1983. Atlanta: CDC, November 1986.
3. US Department of Health and Human Services, Public Health Service. Promoting health/ preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
4. Cantor D, Cohen LE. Comparing measures of homicide trends: methodological and substantive differences in the vital statistics and Uniform Crime Report time series (1933-1975). Soc Sci Res 1980;9:121-45.
5. US Department of Health, Education, and Welfare, Public Health Service, National Office of Vital Statistics. Vital statistics of the United States, vol 46. Washington, DC: National Office of Vital Statistics, 1955.
6. US Department of Commerce, Bureau of the Census. Preliminary estimates of the population of the United States, by age, sex, and race: 1970 to 1981. Washington, DC: US Department of Commerce, 1982. (Current Population Reports, series P-25, no. 917.)
7. US Department of Commerce, Bureau of the Census. Estimates of the population of the United States, by age, sex, and race: 1980 to 1984. Washington, DC: US Department of Commerce, 1985. (Current Population Reports, series P-25, no. 965.)
8. US Department of Health, Education, and Welfare, Public Health Service. Healthy people: the Surgeon General's report on health promotion and disease prevention. Washington, DC: Public Health Service, 1979; DHEW (PHS) publication no. 79-55071.
9. US Department of Justice, Bureau of Justice Statistics. Criminal victimization in the United States, 1984: a National Crime Survey report (NCJ-100435). Washington, DC: US Department of Justice, 1986.

10. Wolfgang ME, Zahn MA. Criminal homicide. In: Kadish SH, ed, Encyclopedia of crime and justice. New York: Free Press, 1979.
11. Flango VE, Sherbenou EL. Poverty, urbanization, and crime. Criminology 1976;14:331-46.
12. Dennis RE. Social stress and mortality among nonwhite males. Phylon 1977;38:315-28.
13. Goodman RA, Mercy JA, Loya F, *et al.* Alcohol use and interpersonal violence: alcohol detected in homicide victims. Am J Public Health 1986;76:144-9.
14. Goodman RA, Mercy JA, Rosenberg ML. Drug use and interpersonal violence: barbiturates detected in homicide victims. Am J Epidemiol 1986;124:851-5.
15. Kellermann AL, Reay DT. Protection or peril? an analysis of firearm-related deaths in the home. New Engl J Med 1986;315:1557-60.
16. Seiden RH, Freitas RP. Shifting patterns of deadly violence. Suicide and Life-Threatening Behavior 1980;10:195-209.
17. Rosenberg ML, Mercy JA. Homicide and assaultive violence. In: Source book for the Surgeon General's Workshop on Violence and Public Health. Leesburg, VA: National Center for Child Abuse and Neglect, 1985.
18. US Department of Health and Human Services, Public Health Service. Report of the Secretary's Task Force on Black and Minority Health: executive summary. Washington, DC: US Department of Health and Human Services, 1985.

SUICIDES AMONG PERSONS 15-24 YEARS OF AGE, 1970-1984

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Introduction

From 1900 to 1955, the suicide rate for 15- to 24-year-olds was stable at about half the rate for the total U.S. population; however, since then the suicide rate for this age group in the United States has increased dramatically. The rate began to increase markedly in the mid-1950s and had almost tripled by 1980. In 1978, for the first time in this century, the rate for this age group exceeded the rate for persons of all ages. Suicide was the fifth leading cause of death for persons ages 15-24 in 1960. In 1984, it moved from the third to the second leading cause of death for the same age group (*1*). Because of the prominence of suicide as a leading cause of death among young people and because of youth suicide rates, the U.S. Department of Health and Human Services established the following health objective in 1979:

> By 1990, the rate of suicide among people 15 to 24 should be below 11 per 100,000. (In 1978, the suicide rate for this age group was 12.4 per 100,000.) (*2*)*

This report assesses progress being made in achieving this health objective, and it provides the numbers, rates, trends, and characteristics of suicides among persons 15-24 years of age for the period 1970-1984.

Materials and Methods

Two types of data were used to produce this report: 1) numbers of suicides and 2) population data for calculating suicide rates per 100,000 population.

National mortality computer files compiled by the National Center for Health Statistics (NCHS) provided suicide data on persons 15-24 years of age for each year from 1970 through 1984. These files, which are produced as part of the National Vital Statistics system, reflect data recorded on death certificates and provided by all 50 states and the District of Columbia.

The death certificate category of "suicide" includes deaths from firearms and explosives (International Classification of Diseases, Adapted, Eighth Revision [ICDA-8], and International Classification of Diseases, Ninth Revision [ICD-9†], code E955§),

*After the 1990 health objectives for the nation were developed, the 1978 suicide rate for persons 15-24 years of age was adjusted by using updated population estimates based on the 1980 U.S. Census. The updated suicide rate for 1978 is 12.1 rather than 12.4.

†Suicides occurring between 1970 and 1978 were identified by cause-of-death codes from ICDA-8. Suicides occurring between 1979 and 1984 were identified by cause-of-death codes from ICD-9. The titles for cause-of-death categories of suicide used in this report are identical under both ICDA-8 and ICD-9 revisions, and the comparability ratio between the two is near unity (*3*).

§In 1984, all but seven of 17,120 suicides in category E955, "firearms and explosives," were due to firearms. For simplicity, suicides in category E955 are referred to as "firearm-related" deaths in this report.

deaths from hanging, strangulation, and suffocation (ICDA-8 and ICD-9, code E953), deaths from poisoning by solid or liquid substance (ICDA-8 and ICD-9, code E950), deaths from poisoning by gases (ICDA-8 and ICD-9, codes E951-E952), and deaths by other means (ICDA-8 and ICD-9, codes E954, E956, E957, E958, E959).

The following variables for each suicide were available for analysis: age group in years (15-19, 20-24, and 15-24); race (white, black, and all other races or white and the combined category of black and other races); sex; place of residence (geographic regions Northeast, North Central, South, and West, as defined by the U.S. census); and cause of death (as defined by the above ICD groupings).

Population data were obtained from the Bureau of the Census (*4,5*) and NCHS. Updated population estimates for the years 1970-1979, based on age, race, and sex information from the 1980 U.S. census, have recently become available and have been used in this report. In CDC's recently published Youth Suicide Surveillance Summary (*6*), rates that were not updated were used because only national rates were available when it was written. As a result, rates in this report differ from those in the Youth Suicide Surveillance Summary.

Results

The suicide rate for all persons ages 15-24 increased from 8.7 in 1970 to 12.5 in 1984, a 43.7% increase (Tables 1, 2; Figure 1). Throughout the 15-year study period, the rate for persons ages 20-24 was about twice that for persons ages 15-19. The rate of increase was greater for the 15- to 19-year-olds (55.2%) than for the 20- to 24-year-olds (28.9%) during that time.

Between 1978 (the index year for the 1990 objective) and 1984, the suicide rate for ages 15-24 increased slightly. Between 1979 and 1983, however, the rate decreased gradually, then upturned in 1984. For persons ages 15-19, suicide rates increased between 1978 and 1984. For persons ages 20-24, rates basically paralleled those for the 15- to 24-year age group, with rates decreasing gradually between 1978 and 1983, and increasing from 1983 to 1984.

For persons ages 15-24, the suicide rate during the 1970-1984 period was higher for males than for females, both for whites and for black and other races. The percentage change in suicide rates from 1970 to 1984 also was greater for males than for females (53.0% and 4.8%, respectively). Rates for both white males and males of black and other races increased from 1970 to 1984, but the percentage increase in the suicide rate for white males (60.6%) was almost five times larger than the percentage increase in the suicide rate for males of black and other races (13.3%). For females of all races, suicide rates were consistently lower than those for males throughout the period; the rate for white females increased by 11.9%, whereas the rate for black and other females declined by 29.3%.

White males had the greatest increase in suicide rates during the period in both age subgroups (69.9% for ages 15-19 and and 44.7% for ages 20-24). For persons ages 15-19, the 69.9% increase in rate for white males was almost twice the 35.2% increase in rate for black and other males. For persons ages 20-24, rates increased for white males by 44.7%, but decreased in all other race and sex groups. In all race and sex groups, suicide rates were higher for persons ages 20-24 than for persons ages 15-19, and rates for males were higher than rates for females.

In 1984, although suicide rates for persons ≥65 years of age were higher than rates for persons ages 15-24, the numbers of suicides in the two groups were close (5,026 for those ages 15-24 and 5,517 for those ages ≥65). The proportion of years of

TABLE 1. Number of suicides and suicide rates for persons 15-24 years of age, by sex, age group, and year, United States, 1970-1984

Year	Sex	Age group (years) 15-19 No.	15-19 Rate*	20-24 No.	20-24 Rate	Total (ages 15-24 years) No.	Total (ages 15-24 years) Rate
1970	TOTAL	1,123	5.8	2,005	12.1	3,128	8.7
	Male	851	8.8	1,527	19.0	2,378	13.4
	Female	272	2.9	478	5.6	750	4.2
1971	TOTAL	1,279	6.5	2,200	12.4	3,479	9.3
	Male	979	9.8	1,630	18.8	2,609	14.0
	Female	300	3.1	570	6.3	870	4.6
1972	TOTAL	1,384	6.8	2,474	13.8	3,858	10.1
	Male	1,106	10.8	1,862	21.1	2,968	15.6
	Female	278	2.8	612	6.8	890	4.7
1973	TOTAL	1,427	6.9	2,671	14.6	4,098	10.5
	Male	1,113	10.6	2,164	23.8	3,277	16.8
	Female	314	3.1	507	5.5	821	4.2
1974	TOTAL	1,489	7.1	2,796	14.9	4,285	10.8
	Male	1,160	10.9	2,218	23.7	3,378	16.9
	Female	329	3.2	578	6.1	907	4.6
1975	TOTAL	1,594	7.5	3,142	16.3	4,736	11.7
	Male	1,289	12.0	2,498	25.9	3,787	18.6
	Female	305	2.9	644	6.7	949	4.7
1976	TOTAL	1,556	7.2	3,191	16.1	4,747	11.5
	Male	1,221	11.2	2,565	25.9	3,786	18.2
	Female	335	3.2	626	6.3	961	4.7
1977	TOTAL	1,871	8.7	3,694	18.2	5,565	13.3
	Male	1,521	14.0	2,971	29.2	4,492	21.3
	Female	350	3.3	723	7.1	1,073	5.2
1978	TOTAL	1,686	7.9	3,429	16.5	5,115	12.1
	Male	1,367	12.6	2,776	26.8	4,143	19.5
	Female	319	3.0	653	6.3	972	4.6
1979	TOTAL	1,788	8.4	3,458	16.4	5,246	12.4
	Male	1,452	13.4	2,793	26.5	4,245	19.8
	Female	336	3.2	665	6.3	1,001	4.8
1980	TOTAL	1,797	8.5	3,442	16.1	5,239	12.3
	Male	1,483	13.8	2,853	26.7	4,336	20.2
	Female	314	3.0	589	5.5	903	4.3
1981	TOTAL	1,770	8.6	3,391	15.7	5,161	12.3
	Male	1,413	13.6	2,788	25.8	4,201	19.8
	Female	357	3.5	603	5.6	960	4.6
1982	TOTAL	1,730	8.7	3,295	15.3	5,025	12.1
	Male	1,422	14.1	2,739	25.4	4,161	19.9
	Female	308	3.2	556	5.2	864	4.2
1983	TOTAL	1,677	8.7	3,168	14.8	4,845	11.9
	Male	1,370	14.0	2,611	24.3	3,981	19.4
	Female	307	3.2	557	5.2	864	4.3
1984	TOTAL	1,692	9.0	3,334	15.6	5,026	12.5
	Male	1,365	14.3	2,784	26.1	4,149	20.5
	Female	327	3.5	550	5.2	877	4.4

*Suicides per 100,000 population.

Sources: National Center for Health Statistics Annual Mortality Data Files: Bureau of Census Population Estimates. Updated population estimates for the years 1970-1979 based on age, race, and sex information from the 1980 U.S. Census were used in this report, whereas the Youth Suicide Surveillance Summary (*6*) used rates that were not updated. Therefore, the rates are different in these two reports.

potential life lost (YPLL) due to suicide increased among persons ages 15-24 between 1970 and 1983[¶] (from 30.1% to 34.5%), whereas the proportion of the U.S. population in this age group decreased slightly (from 17.6% to 17.4%). Although this age group is approximately 50% male, in 1983[¶], males accounted for approximately 82% of YPLL in this group.

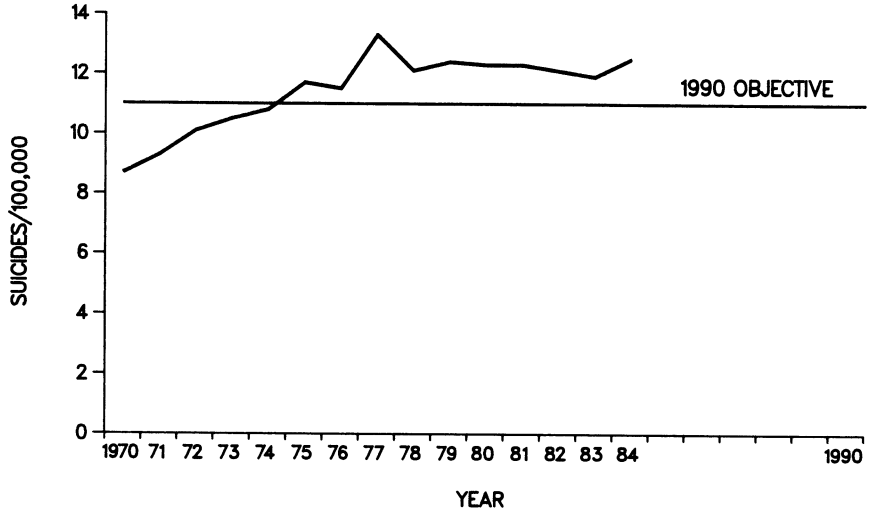
Geographic patterns in suicide rates show that the West had consistently higher rates for persons ages 15-24 than any other region**. During the period 1970 to 1984, rates in the West increased slightly (from 15.3 to 15.4). By the end of that period, rate

[¶]The latest year for which YPLL due to suicide was available for all age groups was 1983.
**NCHS regional population data based on updated denominator data from the 1980 census were unavailable. In this report, regional rates were calculated by using denominator data that were not updated.

TABLE 2. Percent change in suicide rates for persons 15-24 years of age, by age group, sex, and race, United States, 1970-1984

	Age group (years)		Total (ages 15-24 years)
	15-19	20-24	
Sex and race	% Change	% Change	% Change
Male	62.5	37.4	53.0
White	69.9	44.7	60.6
Black/Other	35.2	-5.2	13.3
Female	20.7	-7.1	4.8
White	35.7	-1.8	11.9
Black/Other	-20.7	-36.4	-29.3
TOTAL	55.2	28.9	43.7

FIGURE 1. Suicide rates for persons ages 15-24, by year, United States, 1970-1984



increases for the other three regions (Northeast, from 7.0 to 9.8; North Central, from 7.8 to 12.6; South, from 7.3 to 12.5) brought the rates for the rest of the country closer to rates in the West.

Throughout the study period, the suicide method used most frequently by persons ages 15-24 was firearms (Figure 2). Proportionately, suicides with the use of firearms increased from 47.2% of suicides among 15- to 24-year-olds in 1970 to 59.1% in 1984. In 1973, hanging, strangulation, and suffocation replaced poisoning by solid or liquid substances (primarily drug-related) as the second most common method reported, and that ranking has continued. In 1984, hanging, strangulation, and suffocation were used in 20.2% of the suicides among persons ages 15-24.

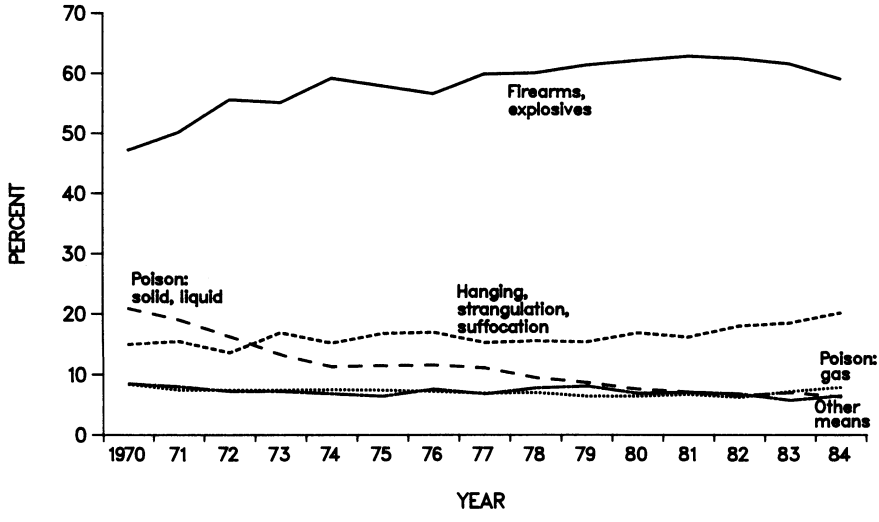
Among males 15-24, the suicide method used most frequently from 1970 through 1984 was firearms. The use of firearms by males increased from 51.9% of those who committed suicide in 1970 to 60.7% in 1984. Hanging, strangulation, and suffocation constituted the second most common method for males, increasing from 17.0% in 1970 to 21.6% in 1984. During the same period, suicides by drug ingestion declined from 14.1% in 1970 to 3.6% in 1984. The same pattern of increased use of firearms and decreased use of poison existed for males in both age subgroups.

Among females ages 15-24, the proportion of suicides committed with firearms increased from 32.3% in 1970 to 51.3% in 1984. Suicides by drug ingestion decreased for females in this age group from 42.4% to 19.4% during this period. The same pattern of increased use of firearms and decreased use of drugs existed for females in both age subgroups.

Discussion

At present, the high rate of youth suicide exceeds the proposed target rate in the 1990 health objective pertaining to suicide (Figure 1), and rates for 1984 reflect an upturn among persons ages 15-24. An accurate and reliable assessment of suicide rates is necessary for measuring progress toward the objective. Available data

FIGURE 2. Distribution of suicides among persons ages 15-24, by year and method used, United States, 1970-1984



sources have several limitations that hinder such assessment: 1) underreporting of suicides, 2) delay in the availability of national mortality data, and 3) absence of key information on death certificates.

Suicide as a cause of death is undoubtedly underreported on death certificates. In a survey of 200 medical examiners, more than half believed that the reported number of suicides is probably less than half the true number (*7*). The limited accuracy and reliability of suicide statistics can be partially attributed to the lack of a commonly accepted and applied definition of suicide. Personal biases, incomplete information, and social and family pressures probably contribute to the underreporting of suicide. Without standard criteria for making a decision, coroners and medical examiners may be more easily influenced by these factors.

Efforts to facilitate suicide classification are under way. Representatives from various organizations[††] are working to develop criteria that will aid in the collection and utilization of information necessary to make the determination of suicide more reliable and accurate.

The current system for collecting vital statistics from states and compiling them at the national level has a built-in time lag of 2-3 years. This system does not allow for up-to-date monitoring of national trends or for the detection of, and timely intervention in, discrete or localized increases in suicide rates. States or communities that analyze suicide rates within their own jurisdiction, however, may be able to detect a local increase in the incidence and to intervene more quickly and effectively when such an increase occurs.

Death certificates contain little information that helps explain the causes of suicide. They do not, for example, provide the decedent's socioeconomic status or describe how it may have recently changed, nor do they provide information on the decedent's history of mental illness, family history of mental illness or suicide, family structure, or history of drug or alcohol use.

Several important factors impede efforts by public health personnel and others to decrease suicide rates in accordance with the specific 1990 health objectives. Knowledge about risk factors for suicide is incomplete. If particular risk factors could be identified, prevention efforts could be directed toward the most vulnerable persons. Characterizing these persons would help health personnel improve the design of interventions, focus implementation efforts, and more precisely evaluate prevention activities.

Some risk factors, such as mental illness, hopelessness, prior suicide attempts, or a family history of suicide, have already been linked with an increased susceptibility to suicide (*8-11*). Because young persons are disproportionately represented among suicides, more research is needed to determine other possible risk factors specific to a young population, such as emotional stress, family structure, and drug or alcohol abuse. Another possible risk factor is exposure to suicides in one's social network. Apparent clusters of youth suicides have been reported in many areas of the United States. At this time, the number and specific circumstances surrounding such clusters are not clearly known (*12*). Research is also needed to determine why adolescent suicide rates appear to be higher in the West than in other regions of the country.

[††]American Academy of Forensic Sciences, American Association of Suicidology, Association of Vital Records and Health Statistics, International Association of Coroners and Medical Examiners, National Association of Counties, National Association of Medical Examiners, and CDC, including the National Center for Health Statistics.

The increase in youth suicide is primarily attributable to an increasing rate of suicides among males. From 1970 to 1984, suicide rates for males ages 15-24 increased by 53.0%, compared with a 4.8% increase for females in the same age group. In 1978, the index year for the 1990 objectives, the suicides of white males ages 20-24 accounted for almost half (47.8%) of all suicides in the target population, 15- to 24-year-olds. The suicide rate for white males ages 20-24 was almost twice the rate for white males ages 15-19. More analytic research is needed to explain the high rate of suicide among white males and to characterize their deaths more precisely so that appropriate interventions can be devised.

Although suicide rates for persons ages 15-24 increased between 1970 and 1984, the magnitude of the change in suicide rates may be decreasing. The rate increased by 3.3%, from 12.1 in 1978 to 12.5 in 1984. (Within age subgroups, there was a 13.9% increase for 15- to 19-year-olds, but a 5.5% decrease for 20- to 24-year-olds.) It is unclear what factors are responsible for rate increases, their magnitude, or their differences among the different age groups. It is also unclear why the 1984 suicide rate for 15- to 24-year-olds increased after several years of gradual decrease in suicide rate, and whether a new trend is developing. Further research is needed to explore these questions.

Efforts have been made to explain the high rate of suicide among adolescents, particularly among white males. One proposed explanation is that the larger size of the postwar "baby-boom" cohort may result in relative deprivation among members of the cohort, producing stresses that may, in turn, result in antisocial responses, such as suicide, crime, and substance abuse (*13,14*). Whereas it is plausible and consistent with existing data, that hypothesis still must be tested. The impact that alcohol and drug use, firearm availability, and joblessness may have on the youth suicide rate has also been suggested, but remains unverified (*14,15*). In addition, the different patterns of suicide rate in the age subgroups need to be studied, i.e., the increase in suicide rate for 15- to 19-year-olds and the decrease in rate for 20- to 24-year-olds.

A clear barrier to reducing the youth suicide rate is ignorance of what interventions work for what populations under what circumstances. To date, the most widespread prevention efforts have been made through suicide prevention centers or crisis intervention units. The various services available through these programs need to be assessed. These services include hot lines, walk-in counseling, groups for suicidal individuals and their families, and community-centered outreach programs. Educational programs on suicide are being developed for schools. Several factors hinder the evaluation of these programs. For example, program services may have a delayed effect, and suicide is a relatively rare event. Services may be limited to communities with a clearly perceived need for them. Indirect programs not aimed specifically at suicide prevention still may have an effect on the suicide rate. For example, efforts to raise the legal drinking age in many states may be accompanied by decreased suicide rates through the law's effect on alcohol use and abuse rates. The predominant use of handguns in suicides suggests that one approach to prevention might focus on limiting access to these weapons (*16*).

The 1990 health objective pertaining to suicide rates among people ages 15-24 addresses a serious public health issue; however, persons ages 25-34 may also be at increased risk (*17*). The identified risk group may need to be broadened. For the year 2000, the objective of a rate decrease to below 11.0/100,000 might be retained, but the target population may need to include all persons ages 15-34.

In addition to the tragic loss to family, friends, and community, the suicide of a young person results in the irretrievable loss of many years of productivity. Increased epidemiologic analysis is needed to identify the nature and importance of specific risk factors, characterize vulnerable individuals or groups, and assess current prevention strategies to assure progress in the understanding and prevention of youth suicide.

References

1. Rosenberg ML, Smith JC, Davidson LE, Conn JM. The emergence of youth suicide: an epidemiologic analysis and public health perspective. Annu Rev Public Health 1987;8:417-40.
2. US Department of Health and Human Services, Public Health Service. Promoting health/ preventing disease: objectives for the nation. Washington, DC: US Department of Health and Human Services, 1980.
3. National Center for Health Statistics. Estimates of selected comparability ratios based on a dual coding of 1976 death certificates by the Eighth and Ninth Revisions of the International Classification of Diseases. AJ Klebba and JH Scott. Monthly Vital Statistics Report, vol 28, no. 11 supplement (DHEW publication no. (PHS) 80-1120), February 29, 1980.
4. US Department of Commerce, Bureau of the Census. Preliminary estimates of the population of the United States, by age, sex, and race: 1970 to 1981. Washington, DC: US Department of Commerce, 1982. (Current Population Reports, series P-25, no. 917).
5. US Department of Commerce, Bureau of the Census. Estimates of the population of the United States, by age, sex, and race: 1980-1984. Washington, DC: US Department of Commerce, 1985. (Current Population Reports, series P-25, no. 965).
6. Centers for Disease Control. Youth suicide in the United States, 1970-1980. Atlanta: Centers for Disease Control, November 1986.
7. Jobes DA, Berman AL, Josselsen AR. Response biases and the impact of psychological autopsies on medical examiners' determination of mode of death. Presented at the 17th annual meeting of the American Association of Suicidology, Anchorage, May 1984.
8. Sudak HS, Ford AB, Rushforth NB, eds. Suicide in the young. Boston: John Wright, PSSG Inc, 1984.
9. Beck AT, Steer RA, Kovacs M, Garrison B. Hopelessness and eventual suicide: a 10-year prospective study of patients hospitalized with suicidal ideation. Am J Psychiatry 1985;142:559-63.
10. Kosky R. Childhood suicidal behavior. J Child Psychol Psychiat 1983;24:457-68.
11. Motto JA, Heilbron DC, Juster RP. Development of a clinical instrument to estimate suicide risk. Am J Psychiatry 1985;142:680-6.
12. Davidson L, Gould MS. Contagion and media. Presented at the National Conference on Risk Factors for Youth Suicide, May 8-9, 1986, Task Force on Youth Suicide. National Institutes of Health, Bethesda, Maryland.
13. Institute of Medicine, National Academy of Sciences, Division of Mental Health and Behavioral Medicine. Discussion summary from workshop on forecasting stress-related social problems, September 26-7, 1985.
14. Seiden RH, Freitas RP. Shifting patterns of deadly violence. Suicide and Life-Threatening Behavior 1980;10:195-209.
15. Weiss NS. Recent trends in violent deaths among young adults in the United States. Am J Epidemiol 1976;103:416-22.
16. Boyd JH, Moscicki EK. Firearms and youth suicide. Am J Public Health 1986;76:1240-2.
17. Centers for Disease Control. Suicide surveillance report, United States, 1970-1980. Atlanta: Centers for Disease Control, April 1985.

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