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Autopsy Patterns in 2003

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
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Data on Mortality

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

Hyattsville, Maryland
March 2007
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Abstract

Objectives

This report presents information on autopsy data in 2003 and compares data for 1993 and 2003.

Methods

Death certificates are completed by funeral directors, attending physicians, medical examiners, and coroners. The original records are filed in the state registration offices. Statistical information is compiled into a national database through the Vital Statistics Cooperative Program of the Centers for Disease Control and Prevention's National Center for Health Statistics. This report focuses on the autopsy item on the death certificate and presents descriptive tabulations.

Results

In 2003, autopsies were performed for 7.7 percent of deaths occurring in 47 states and the District of Columbia. This was less than in 1994, when the data was last available in this database. Decedents with particular characteristics were more likely to be autopsied than others. For example, almost one-third of infant deaths, more than one-half of decedents aged 15–24 years, and almost none of the decedents aged 85 years and over were autopsied.

Keywords: autopsy • vital statistics • National Mortality Followback Survey

Autopsy Patterns in 2003

by Donna L. Hoyert, Ph.D.; Hsiang-Ching Kung, Ph.D.; and Jiaquan Xu, M.D., Division of Vital Statistics

Introduction

Autopsy serves a number of purposes (1–4); however, the prevalence of its use has varied over time in the United States (1–6). Data from the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) was a source of information on the use of autopsy for 1955, 1958, 1972–94, and again in 2003. This report presents 2003 information on autopsy trends and provides some comparison with data for 1993.

Background

The prevalence of autopsies increased during the first half of the 20th century (2). According to the literature, physicians and other hospital staff valued autopsies, and hospitals took great pride in having high autopsy rates around the midcentury (1–2). Reinforcing the demand for autopsies among hospitals and physicians, accreditation standards for hospitals and state laws about medico-legal investigations encouraged the performance of autopsies (2,4).

The Joint Commission on Accreditation of Hospitals (JCAH) standards required that hospitals autopsy 20 to 25 percent of deaths (3). Each of the states and some smaller jurisdictions had laws and regulations that specified when a death should be subject to a medico-legal investigation that may include autopsy. Although state laws varied in specific requirements, deaths that typically required investigation were those due to unusual or suspicious circumstances, violence (accident, suicide, or homicide), those due to natural disease processes when the death occurred suddenly and without warning, when the decedent was not being treated by a physician, or the death was unattended (7,8). This resulted in a relatively substantial percentage of deaths falling potentially under the jurisdiction of medical examiners or coroners who might use autopsy as one of the tools in their investigation. Of all the cases referred to a medical examiner or coroner including those for which the medical examiner or coroner decides not to investigate, 26 percent are autopsied, according to the 1993 National Mortality Followback Survey (NMFS). For those cases for which the medical examiner or coroner accepts jurisdiction and does further investigation, local medical examiner or coroner offices indicate that an autopsy is performed for more than one-half of the accepted cases (9,10).

This report was prepared in the Division of Vital Statistics (DVS) under the general direction of Charles J. Rothwell, Director of DVS and Robert N. Anderson, Chief, Mortality Statistics Branch (MSB). Hsiang-Ching Kung and Jiaquan Xu of MSB provided content related to autopsy data in the National Mortality Followback Survey. Registration Methods staff and staff of the Data Acquisition and Evaluation Branch provided consultation to state vital statistics offices regarding collection of the death certificate data on which this report is based. Drs. Greg G. Davis and Marcus Nashelsky provided suggestions. This report was edited by Demarius V. Miller, Office of Information Services, Information Design and Publishing Staff; typeset by Jacqueline M. Davis and graphics produced by John Jeter, both of CoCHIS/NCHM/Division of Creative Services.

During the second half of the 20th century, autopsies were done less often. According to the National Vital Statistics System data (Table 1), the percentage of deaths autopsied was less in 1955 (17.8 percent) than in 1958 (19.1 percent), the same in 1958 and 1972, and has since decreased. Other studies identified decreasing trends earlier than 1972 (2,3,5). Many factors have been attributed to the decline in the autopsy rate (2–6). One of the notable events was when JCAH dropped the 20 to 25 percent standard for accreditation in 1971. The intention was to eliminate uniform standards for hospitals in different situations; however, a more nuanced standard was not introduced. State laws regarding investigations of deaths have changed little over time and thus have not contributed to declines. Investigation protocols for sudden and unexplained infant deaths may have increased the demand for autopsies among a select group of deaths.

The capability to track autopsy trends was hampered by the removal of the autopsy item from NCHS data in 1995 (11,12). This capacity was restored with the reinstatement of the autopsy item in 2003.

Methods

Data presented in this report are based on information from death certificates filed in the 50 states and the District of Columbia that are subsequently compiled into national data by NCHS. Physicians, medical examiners, and coroners are responsible for completing the medical portion of the death certificate. Funeral directors are responsible for completing legal and demographic information on death certificates and ensuring that the death certificates are filed with local or state governments.

The autopsy data presented in this report are based on the item on the death certificate that asks ‘‘Was an autopsy performed?’’ Certifiers (i.e., physicians, medical examiners, and coroners) are instructed to respond yes if a partial or complete autopsy was performed. Otherwise, they are instructed to answer no. Because the death certificate often is completed, signed, and sent forward before an autopsy is completed, the item measures expectation of autopsy at the time that the death certificate is completed in some cases.

Table 2 shows data by place of occurrence and for all states to show the levels of reporting, whereas other tables are by place of residence. For the other tables, data for Minnesota, New Mexico, and Pennsylvania are excluded because of the lack of information on autopsy for these states. Autopsy patterns in 2003 were compared with those a decade earlier (1993). For the purpose of comparison, the same states were excluded in the 1993 data as in 2003.

This report presents the number and percentage of deaths for which autopsies are reported. Comparisons made in the text among percentages, unless otherwise specified, are statistically significant at the 0.05 level. Lack of comment in the text about any two percentages does not mean that the difference was tested and found not to be significant at this level. See the ‘‘Technical Notes’’ for further details.

There is some information on the quality of the autopsy item. Item nonresponse traditionally is relatively high. Item completion remained the same or improved for 16 states and the District of Columbia comparing 1993 and 2003 data but deteriorated for the others, substantially for some. Although it would be much clearer if the certifier always indicated yes or no, it has been assumed that leaving the item blank is equivalent to specifying no. The substantially higher percentage of deaths reported to be autopsied in states with more complete reporting than in states with more than 20 percent not stated suggests that the autopsy item is left blank for some deaths that may have been autopsied. This challenges the assumption that no response is equivalent to a negative response. In addition, Hanzlick and Parrish (13) found that a substantial fraction of death certificates in a small, nonrandom sample of deaths known to be autopsied did not state that an autopsy was done. In contrast, about 7 percent more autopsies were stated on the death certificate than in the medical examiner or coroner reports in the 1993 NMFS (see ‘‘Technical Notes’’ for further details) (14). For those cases with medical examiner or coroner documentation that an autopsy had been done, the death certificate also indicated that an autopsy had been done for 97 percent (Table A). These different results may indicate that autopsies as indicated on the death certificate for deaths that are referred to a medical examiner are slightly overstated on death certificates, whereas deaths from natural causes and not involving medical examiners are understated. Because records with characteristics common to the NMFS subsample represent about one-half of the deaths now autopsied, overall, the autopsy item may underestimate the percentage of deaths that are autopsied by between 10 to 20 percent.

Results

For 2003, all states requested information on the death certificate as to whether autopsies were performed; 47 states and the District of Columbia provided NCHS with data for this field. In 2003, autopsies were reported as performed on 173,745 decedents, or 7.7 percent of the deaths that occurred in 2003 in the 47 states and the District of Columbia (Table 1).

The percentage of deaths autopsied varied by geography (Table 2), with the highest levels in the West and lowest levels in the South. Colorado and the District of Columbia reported the highest levels (12.9 and 23.4 percent, respectively). Of the more than 3,000

Table A. Percentage of responses on the death certificate item on autopsy in agreement with corresponding National Mortality Followback item: United States, 1993

Response about autopsy on National Mortality Followback Survey	Percent
Total	83.6
Autopsy performed	96.8
Autopsy not performed	82.1
Autopsy performance not stated	0.5

counties, 20 percent or more of all deaths occurring in a county were autopsied in 30 counties.

The percentage autopsied varied by the decedent's demographic characteristics. By race (Table 3), the percentage autopsied was lower for the white population (6.8 percent) than for other groups (Asian or Pacific Islander (API) 9.6 percent, black 12.8 percent, and American Indian or Alaska Native (AIAN) 15.1 percent). By Hispanic origin (Table 4), Hispanic decedents were autopsied more often than the non-Hispanic decedents on the whole (15.7 versus 7.2). Male decedents were autopsied more often than female decedents (10.6 and 4.8, respectively) (Tables 3 and 4). Autopsy patterns depended upon age (Tables 3 and 4). The percentage autopsied was substantial for younger ages, particularly among decedents aged 15–24 years, 54.9 percent, and dropped precipitously with older age.

The percentage of deaths autopsied was associated with the place where death was pronounced (Table 5). More than 20 percent of deaths pronounced in hospital emergency rooms, dead on arrival at hospitals, and in other specified locations (e.g., prison, physician's office, highway where traffic accident occurred, ship, orphanage, group home, at work) were autopsied. Decedents pronounced at nursing homes and hospice facilities were particularly unlikely to be autopsied (0.6 and 0.8 percent, respectively).

Certain circumstances of death were associated with the percentage of deaths autopsied. For all ages, the causes for which the highest percentage of deaths were autopsied (Tables B and 6) were: Assault (homicide) (91.8 percent); Legal intervention (81.7 percent); Events of undetermined intent (76.7 percent); certain unintentional injuries (e.g., Accidental poisoning and exposure to noxious substances at 72.5 percent and Accidental drowning and submersion 63.7 percent); and Pregnancy, childbirth, and the puerperium (60.3 percent). The causes for which the highest percentage of infant deaths were autopsied (Tables C and 7) were: Assault (homicide) (92.3 percent); Sudden infant death syndrome (92.2 percent); Other symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified (85.8 percent); certain circulatory problems (e.g., Pericarditis, endocarditis, and myocarditis, 88.5 percent); and Other external causes and their sequelae (83.1 percent).

Researchers concerned with sudden infant deaths often group a number of categories to get a more complete group of sudden and unexplained infant deaths and more recent guidelines for investigations are targeting a broader range of sudden and unexplained infant deaths. For the cause-of-death categories used by Shapiro-Mendoza et al. (ICD-10 R95, R99, W75–W77, W81–W84, Y06–Y07) (15), the percentage of sudden and unexplained infant deaths that were autopsied was 86 percent.

Table B. Number of deaths and percentage autopsied for selected causes: 47 states and the District of Columbia, 2003

[The asterisks (*) preceding the cause-of-death codes indicate that they are not part of the *International Classification of Diseases, Tenth Revision* (ICD–10); see "Technical Notes"]

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)		Number	Percent
All causes		173,745	7.7
Leading causes			
Diseases of heart	(I00–I09,I11,I13,I20–I51)	39,510	6.2
Malignant neoplasms	(C00–C97)	6,543	1.3
Cerebrovascular diseases	(I60–I69)	2,943	2.0
Chronic lower respiratory diseases	(J40–J47)	2,337	2.0
Accidents (unintentional injuries)	(V01–X59,Y85–Y86)	44,148	43.7
Diabetes mellitus	(E10–E14)	1,868	2.7
Influenza and pneumonia	(J10–J18)	2,548	4.2
Alzheimer's disease	(G30)	443	0.8
Nephritis, nephrotic syndrome and nephrosis	(N00–N07,N17–N19,N25–N27)	654	1.7
Septicemia	(A40–A41)	1,278	4.1
Intentional self-harm (suicide)	(*U03,X60–X84,Y87.0)	15,178	51.8
Chronic liver disease and cirrhosis	(K70,K73–K74)	1,892	7.4
Essential (primary) hypertension and hypertensive renal disease	(I10,I12)	326	1.6
Parkinson's disease	(G20–G21)	172	1.1
Assault (homicide)	(*U01–*U02,X85–Y09,Y87.1)	15,388	91.8
Causes associated with autopsy			
Assault (homicide)	(*U01–*U02,X85–Y09,Y87.1)	15,388	91.8
Legal intervention	(Y35,Y89.0)	330	81.7
Events of undetermined intent	(Y10–Y34,Y87.2,Y89.9)	3,740	76.7
Accidental poisoning and exposure to noxioussubstances	(X40–X49)	12,857	72.5
Accidental drowning and submersion	(W65–W74)	2,000	63.7
Accidental discharge of firearms	(W32–W34)	415	60.7
Pregnancy, childbirth and the puerperium	(O00–O99)	311	60.3
Accidental exposure to smoke, fire and flames	(X00–X09)	1,859	59.3
Intentional self-harm (suicide) by other andunspecified means and their sequelae	(*U03,X60–X71,X75–X84,Y87.0)	7,495	55.2
Water, air and space, and other and unspecified transport accidents and their sequelae	(V90–V99,Y85)	1,004	54.6

Comparison with 1993

The percentage of deaths autopsied in the 47 states and the District of Columbia generally was lower in 2003 than 1993 regardless of geography, demographic characteristics, or other associated factors. The percentage of deaths autopsied was lower in 2003 than in 1993 in each of the regions and for most states (Table 2). However, the percentage was higher for five states (Mississippi, Rhode Island, Tennessee, Utah, and Vermont) and not statistically different for another eight states.

The autopsy levels were generally less in 2003 than 1993 by demographic characteristics. The percentage autopsied decreased by race, sex, and many age groups (Figures 1–3). The percentage

Table C. Number of infant deaths and percentage autopsied for selected causes: 47 states and the District of Columbia, 2003

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)		Number	Percent
All causes		8,093	30.6
Leading causes			
Congenital malformations, deformations and chromosomal abnormalities	(Q00–Q99)	1,232	23.3
Disorders related to short gestation and low birth weight, not elsewhere classified	(P07)	372	8.1
Sudden infant death syndrome	(R95)	1,889	92.2
Newborn affected by maternal complications of pregnancy	(P01)	122	7.7
Newborn affected by complications of placenta, cord and membranes	(P02)	129	12.7
Accidents (unintentional injuries)	(V01–X59)	701	77.5
Respiratory distress of newborn	(P22)	89	11.6
Bacterial sepsis of newborn	(P36)	138	18.7
Neonatal hemorrhage	(P50–P52,P54)	64	10.4
Diseases of the circulatory system	(I00–I99)	227	40.0
Causes associated with autopsy			
Assault (homicide)	(*U01,X85–Y09)	299	92.3
Sudden infant death syndrome	(R95)	1,889	92.2
Pericarditis, endocarditis and myocarditis	(I30,I33,I40)	23	88.5
Other accidental suffocation and strangulation	(W76–W77,W81–W84)	114	87.7
Other symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	(R00–R53,R55–R94,R96–R99)	957	85.8
Accidental suffocation and strangulation in bed	(W75)	345	85.0
Other external causes and their sequelae	(X60–X84,Y10–Y36)	59	83.1
Accidental drowning and submersion	(W65–W74)	45	80.4
Other and unspecified accidents	(W20–W31,W35–W64,W85–W99,X10–X39,X50–X59)	40	78.4
Acute bronchitis and acute bronchiolitis	(J20–J21)	40	76.9

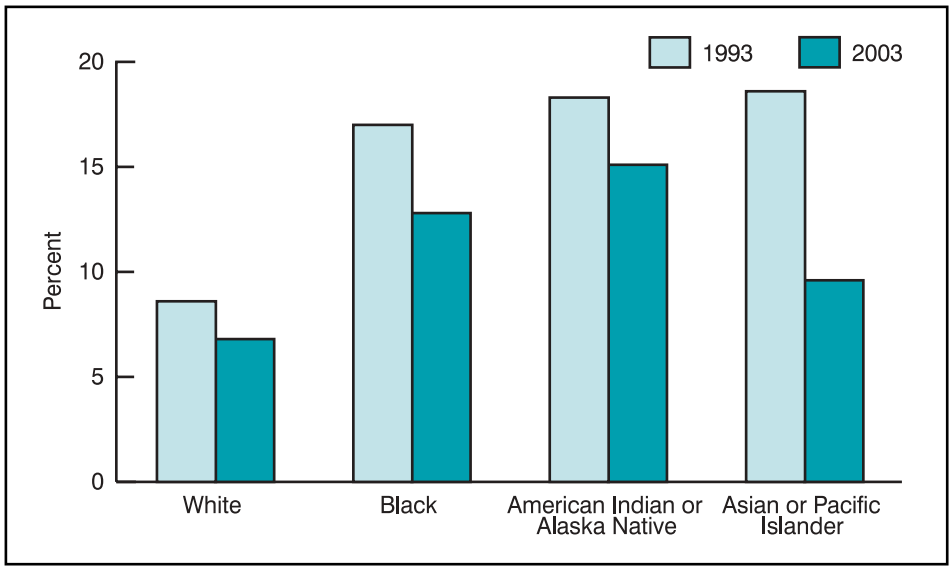

Figure 1. Percentage of deaths for which autopsies were reported, by race: 47 states and the District of Columbia, 1993 and 2003

autopsied increased for age groups 25–34 and 35–44 years of age and was not statistically different for age groups 1–4 and 45–54 years.

Age and Manner of Death Adjustment

Changes in the distribution of deaths by age and manner accounted for about 15 percent of the overall decrease in the percentage of deaths autopsied between 1993 and 2003 (Figure 4). If the age and manner of death distribution had been the same for the two time periods, the percentage autopsied would still be lower in 2003 than in 1993 for region, Hispanic origin, and race.

When the age and manner of death distribution was held constant, the differential in the percentage autopsied by region in 2003 was wider than if not held constant (Figure 4), whereas the differential for other characteristics were substantially smaller. Although smaller, the percentage autopsied still was different by sex, Hispanic origin, race, and place of death. However, the adjusted percentage autopsied for the AIAN population was about the same as the white population and less than that for the black or API populations. If the persons being pronounced dead at different locations had the same age and manner of death profile, those dying on arrival would still be far more likely to be autopsied than those in a nursing home, but the respective percentages would be 12.5 and 2.9 percent.

Conclusion

Information from death certificates is a major source of statistical data to identify public health problems, to monitor progress in public health, to allocate research funds, and to conduct scientific research. For these reasons, good reporting of the circumstances of death on death certificates is very important. Autopsy has long been a tool that potentially enhances the quality of cause-of-death information reported on the death certificate. An autopsy provides an additional source of information to take into consideration when deciding upon the cause of death. The autopsy results might confirm clinical findings, provide more complete information to describe cause of death,

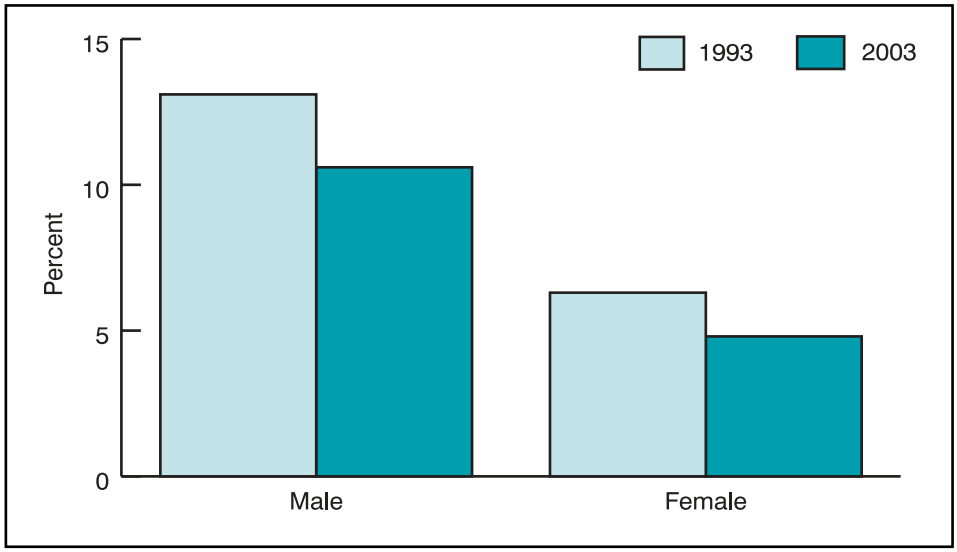

Figure 2. Percentage of deaths for which autopsies were reported, by sex: 47 states and the District of Columbia, 1993 and 2003

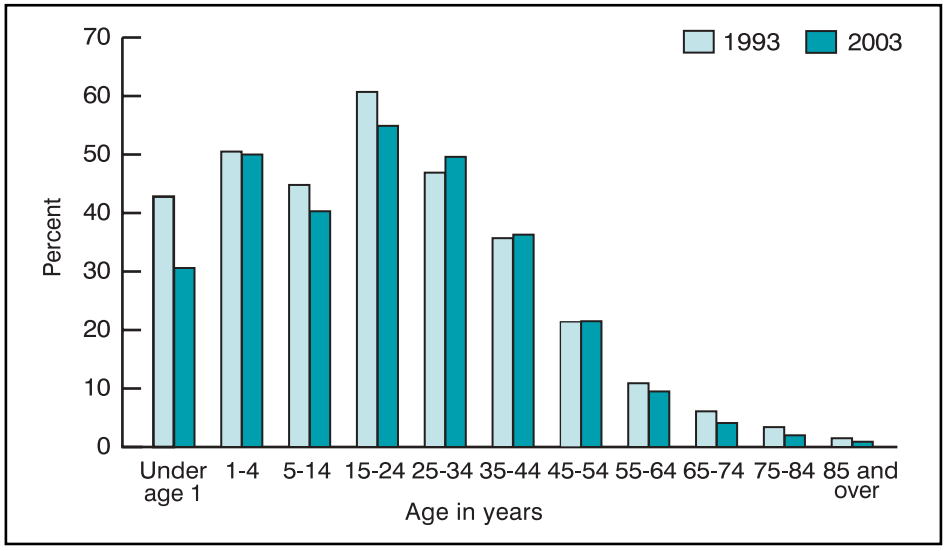

Figure 3. Percentage of deaths for which autopsies were reported, by age groups: 47 states and the District of Columbia, 1993 and 2003

or uncover conditions that were not recognized clinically and would not be reported among the causes of death without an autopsy (1).

Despite the continuing value of autopsies, their use has declined (1–3,5,6). This report provides more recent data on the prevalence of autopsies. As suspected (11), the percentage of deaths expected to be autopsied was less than when autopsy data were last available. The decreases occurred for most characteristics of decedents but not for all. The use of autopsies remained level or increased at some younger ages, and in a few states.

The changing profile of decedents (e.g., by age and manner of death) contributed somewhat to the overall decrease in use of autopsy and influenced differentials by other characteristics. A substantial portion of the differential in the use of autopsy by sex, Hispanic origin, race, and place of death reflect differences in the age and manner of death. For example, the disparity in the overall percentage autopsied between the white and AIAN population was eliminated, with differences in the age and manner of death held constant. This generally reflects that the AIAN population dies at younger ages and more often from external causes, especially accidents, than the white population. Because autopsies tend to be more common at younger ages and for homicide, suicide, accidents, and undetermined manner, these differences account for some of the variations in autopsy by race. The differential by region increased somewhat when holding age and manner of death constant. In part, this reflects that some regions' percentage of death autopsied were relatively low despite the age and manner of death distribution and vice versa.

Although the levels generally decreased, patterns remained similar to that reported in the literature (3–5) as well as in earlier vital statistics data. Autopsies were more common for younger and male decedents, for certain circumstances of death involving violence and differed by place of death. This suggests that autopsies were more likely to be done for those deaths that state laws specify should be investigated further as well as deaths that occur in hospitals but for which the contact with the hospital was brief (i.e., those dying as an outpatient or in an emergency room and those pronounced dead on arrival) rather than for a typical death (e.g., 65 years of age and over and pronounced dead at nursing home, residence, or as an inpatient). In contrast, persons pronounced at hospice facilities were unlikely to be autopsied. These deaths were expected and the cause(s) resulting in death were likely recognized, so there would be fewer questions that an autopsy might resolve. To some extent, deaths pronounced in nursing home and long-term care facilities would be similar to the hospice facility situation.

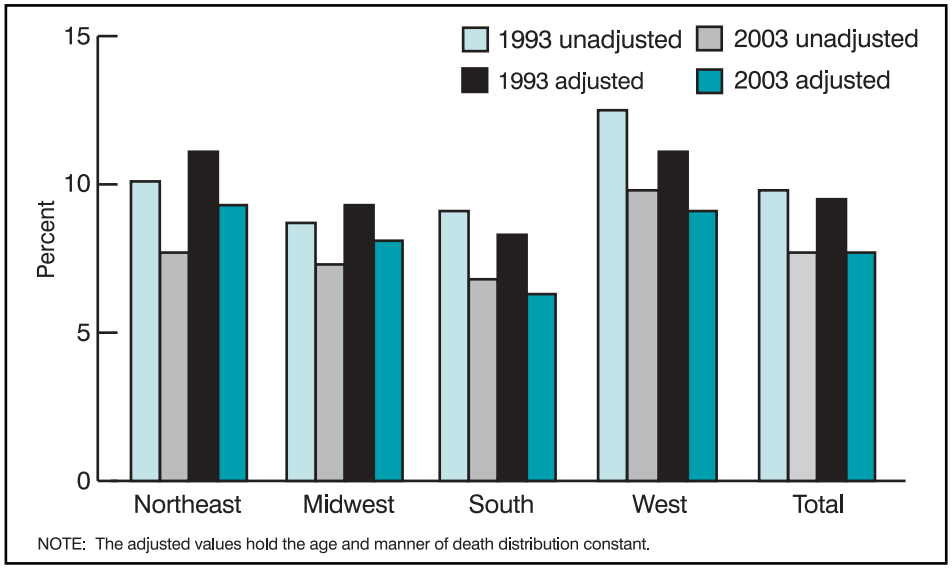

Figure 4. Percentage of deaths for which autopsies were reported, by region and adjusting for age and manner: 47 states and the District of Columbia, 1993 and 2003

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Table 1. Number and percentage of deaths for which autopsies were reported: United States, 1955, 1958, 1972–1994 and 47 states and the District of Columbia, 2003

[By residence]

Year	Number	Percent
2003	173,745	7.7
1994	213,879	9.4
1993	220,620	9.7
1992	224,071	10.3
1991	233,707	10.8
1990	239,591	11.2
1989	247,251	11.5
1988	251,095	11.6
1987	253,023	11.9
1986	257,890	12.2
1985	258,596	12.4
1984	259,187	12.7
1983	266,362	13.2
1982	272,431	13.8
1981	279,656	14.1
1980	291,702	14.7
1979	294,182	15.4
1978	303,134	15.7
1977	309,259	16.3
1976	318,830	16.7
1975	333,068	17.6
1974	355,515	18.4
1973	369,655	18.7
1972	375,820	19.1
1958	315,203	19.1
1955	271,797	17.8

NOTE: 2003 data based on 47 states and the District of Columbia.

Table 2. Number and percentage of deaths for which autopsies were reported, by state: United States and each state, 1993 and 2003

[By occurrence]

Area	1993		2003	
	Number	Percent	Number	Percent
United States[1]	220,620	9.7	174,461	7.1
Alabama	3,015	7.4	2,784	6.1
Alaska	672	28.4	290	9.4
Arizona	3,490	10.3	4,660	10.6
Arkansas	1,243	4.7	1,295	4.7
California	31,004	14.0	25,034	10.5
Colorado	3,516	14.5	3,843	12.9
Connecticut	2,555	8.8	1,822	6.2
Delaware	671	10.7	557	7.9
District of Columbia	2,018	22.6	1,573	23.4
Florida	16,587	11.3	3,465	2.1
Georgia	5,497	9.7	5,790	8.6
Hawaii	1,058	14.3	938	10.3
Idaho	529	6.5	502	4.9
Illinois	10,130	9.7	8,330	8.1
Indiana	4,022	7.6	2,675	4.7
Iowa	1,804	6.5	1,772	6.4
Kansas	1,735	7.6	1,869	7.8
Kentucky	2,456	6.8	2,284	5.7
Louisiana	4,009	10.1	3,533	8.2
Maine	582	5.0	512	4.1
Maryland	4,177	10.5	4,790	10.8
Massachusetts	5,207	9.2	3,153	5.6
Michigan	8,256	10.2	7,766	9.1
Minnesota	3,753	10.3	- - -	- - -
Mississippi	1,672	6.5	2,153	7.7
Missouri	3,829	6.9	3,068	5.4
Montana	627	8.5	521	6.2
Nebraska	1,181	7.8	1,080	6.9
Nevada	1,230	10.4	1,963	10.6
New Hampshire	564	6.4	561	5.8
New Jersey	5,482	7.7	4,604	6.4
New Mexico	1,577	13.5	- - -	- - -
New York	20,553	12.1	14,932	9.7
North Carolina	5,088	8.1	4,804	6.5
North Dakota	480	7.6	419	6.5
Ohio	9,359	9.1	8,724	8.0
Oklahoma	1,690	5.4	1,661	4.8
Oregon	1,934	7.0	1,371	4.4
Pennsylvania	10,112	8.0	12	0.0
Rhode Island	721	7.3	959	9.4
South Carolina	2,602	8.4	3,012	8.1
South Dakota	450	6.5	413	5.6
Tennessee	2,445	4.7	2,985	5.0
Texas	15,963	11.8	17,249	11.0
Utah	1,059	9.8	1,471	10.7
Vermont	495	9.9	614	12.1
Virginia	3,425	6.7	3,309	5.8
Washington	4,453	11.0	4,300	9.4
West Virginia	1,375	6.8	1,217	5.8
Wisconsin	3,977	9.0	3,578	7.8
Wyoming	291	8.7	244	6.1

- - - Data not available.

[1]Percentage for United States in 2003 includes the states that do not report the item. The percent is 7.7 excluding those three states.

Table 3. Number and percentage of deaths for which autopsies were reported, by 10-year age groups, race, and sex: 47 states and the District of Columbia, 2003

Race and sex	Total	Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over	Not stated
						Number							
All races	173,745	8,093	2,344	2,629	17,190	19,295	30,479	35,592	23,307	15,727	13,167	5,725	197
Male	118,026	4,776	1,340	1,617	13,244	14,357	21,209	24,875	16,022	10,135	7,643	2,648	160
Female	55,719	3,317	1,004	1,012	3,946	4,938	9,270	10,717	7,285	5,592	5,524	3,077	37
White	132,599	5,314	1,574	1,786	11,848	13,595	23,225	27,407	18,694	12,797	11,208	4,977	174
Male	90,359	3,197	902	1,102	8,974	10,067	16,381	19,400	12,988	8,336	6,546	2,327	139
Female	42,240	2,117	672	684	2,874	3,528	6,844	8,007	5,706	4,461	4,662	2,650	35
Black	35,597	2,431	676	719	4,589	4,952	6,364	7,166	4,008	2,487	1,596	590	19
Male	24,024	1,363	389	440	3,741	3,776	4,209	4,763	2,650	1,535	902	239	17
Female	11,573	1,068	287	279	848	1,176	2,155	2,403	1,358	952	694	351	2
American Indian or Alaska Native	1,770	128	32	35	284	261	368	359	156	89	45	11	2
Male	1,186	77	16	24	200	182	243	252	100	59	26	5	2
Female	584	51	16	11	84	79	125	107	56	30	19	6	–
Asian or Pacific Islander	3,779	220	62	89	469	487	522	660	449	354	318	147	2
Male	2,457	139	33	51	329	332	376	460	284	205	169	77	2
Female	1,322	81	29	38	140	155	146	200	165	149	149	70	–
						Percent							
All races	7.7	30.6	50.0	40.3	54.9	49.6	36.3	21.5	9.5	4.1	2.0	0.9	61.2
Male	10.6	31.8	50.4	41.6	57.7	53.3	40.0	24.0	10.9	4.7	2.4	1.3	62.0
Female	4.8	29.0	49.4	38.2	47.2	41.3	29.9	17.2	7.3	3.3	1.7	0.7	57.8
White	6.8	30.7	47.6	37.9	51.1	48.9	37.3	21.9	9.4	4.0	1.9	0.9	62.6
Male	9.6	32.4	48.5	39.3	53.2	51.6	40.7	24.3	10.9	4.6	2.3	1.2	63.5
Female	4.3	28.4	46.4	35.8	45.6	42.5	31.1	17.5	7.2	3.2	1.6	0.7	59.3
Black	12.8	30.3	58.9	48.5	67.3	52.0	33.5	20.2	9.8	4.9	2.7	1.3	*
Male	17.0	30.2	58.2	49.5	72.4	59.0	38.1	22.7	11.2	5.7	3.3	1.7	*
Female	8.5	30.4	59.8	47.0	51.3	37.7	27.2	16.7	7.9	4.0	2.2	1.1	*
American Indian or Alaska Native	15.1	43.1	39.0	32.4	52.8	47.7	34.5	22.1	8.5	4.3	2.1	*	*
Male	18.9	43.0	*	36.9	52.1	48.5	36.7	26.2	9.8	5.4	2.6	*	*
Female	10.8	43.2	*	*	54.5	45.9	30.9	16.1	6.9	3.1	*	*	*
Asian or Pacific Islander	9.6	26.8	39.7	39.4	60.2	49.1	31.8	19.6	9.5	4.8	3.0	1.7	*
Male	11.9	30.5	38.4	40.2	62.9	52.5	37.7	23.4	10.3	5.1	3.1	2.1	*
Female	7.1	22.1	41.4	38.4	54.7	43.2	22.8	14.3	8.3	4.4	2.9	1.5	*

– Quantity zero.

* Figure does not meet standards of reliability or precision.

Table 4. Number and percentage of deaths for which autopsies were reported, by 10-year age groups, Hispanic origin, and race for non-Hispanic population, and sex: 47 states and the District of Columbia, 2003

Race and sex	Total	Under 1 year	1–4 years	5–14 years	15–24 years	25–34 years	35–44 years	45–54 years	55–64 years	65–74 years	75–84 years	85 years and over	Not stated
						Number							
All origins	173,745	8,093	2,344	2,629	17,190	19,295	30,479	35,592	23,307	15,727	13,167	5,725	197
Male	118,026	4,776	1,340	1,617	13,244	14,357	21,209	24,875	16,022	10,135	7,643	2,648	160
Female	55,719	3,317	1,004	1,012	3,946	4,938	9,270	10,717	7,285	5,592	5,524	3,077	37
Hispanic	18,143	1,445	474	488	3,229	3,272	3,125	2,667	1,502	1,036	657	220	28
Male	13,529	860	264	306	2,657	2,708	2,415	2,029	1,087	673	399	107	24
Female	4,614	585	210	182	572	564	710	638	415	363	258	113	4
Non-Hispanic	154,617	6,600	1,864	2,134	13,882	15,941	27,190	32,723	21,652	14,613	12,459	5,478	81
Male	103,748	3,881	1,072	1,306	10,526	11,583	18,672	22,690	14,812	9,402	7,212	2,528	64
Female	50,869	2,719	792	828	3,356	4,358	8,518	10,033	6,840	5,211	5,247	2,950	17
Non-Hispanic white	114,290	3,903	1,114	1,313	8,660	10,355	20,053	24,677	17,137	11,734	10,526	4,750	68
Male	76,682	2,357	643	806	6,351	7,382	13,929	17,319	11,852	7,638	6,135	2,217	53
Female	37,608	1,546	471	507	2,309	2,973	6,124	7,358	5,285	4,096	4,391	2,533	15
Non-Hispanic black	35,023	2,381	661	707	4,511	4,877	6,282	7,067	3,928	2,447	1,576	576	10
Male	23,585	1,328	381	433	3,671	3,717	4,149	4,685	2,587	1,507	887	232	8
Female	11,438	1,053	280	274	840	1,160	2,133	2,382	1,341	940	689	344	2
						Percent							
All origins	7.7	30.6	50.0	40.3	54.9	49.6	36.3	21.5	9.5	4.1	2.0	0.9	61.2
Male	10.6	31.8	50.4	41.6	57.7	53.3	40.0	24.0	10.9	4.7	2.4	1.3	62.0
Female	4.8	29.0	49.4	38.2	47.2	41.3	29.9	17.2	7.3	3.3	1.7	0.7	57.8
Hispanic	15.7	28.4	49.5	43.5	63.0	55.5	38.5	22.4	10.7	5.3	2.6	1.2	62.2
Male	21.0	30.4	48.3	45.5	65.8	59.8	43.3	25.6	12.6	6.2	3.3	1.6	63.2
Female	9.0	25.9	51.2	40.4	52.6	41.3	28.0	16.1	7.6	4.2	2.0	0.9	*
Non-Hispanic	7.2	31.2	50.1	39.6	53.3	48.6	36.0	21.4	9.4	4.0	2.0	0.9	59.6
Male	9.9	32.3	51.0	40.8	56.0	52.0	39.6	23.8	10.8	4.6	2.4	1.2	57.7
Female	4.6	29.9	49.0	37.8	46.3	41.3	30.1	17.3	7.3	3.3	1.6	0.7	*
Non-Hispanic white	6.3	31.7	47.0	36.3	47.8	47.1	37.1	21.8	9.3	3.9	1.9	0.9	60.2
Male	8.7	33.3	48.7	37.6	49.3	49.2	40.2	24.2	10.8	4.4	2.3	1.2	58.2
Female	4.0	29.6	44.9	34.5	44.2	42.7	31.4	17.6	7.2	3.1	1.6	0.7	*
Non-Hispanic black	12.7	30.5	59.0	48.4	67.3	52.0	33.5	20.2	9.7	4.9	2.7	1.3	*
Male	16.9	30.3	58.4	49.3	72.5	59.0	38.0	22.6	11.1	5.6	3.3	1.7	*
Female	8.4	30.8	59.7	47.0	51.4	37.7	27.2	16.7	7.8	4.0	2.2	1.1	*

* Figure does not meet standards of reliability or precision.

Table 5. Number and percentage autopsied, by place of death: 47 states and the District of Columbia, 2003

Place	Number	Percent
Hospital:	85,895	8.0
Inpatient	42,874	4.9
Outpatient or emergency room	36,198	21.2
Dead on arrival	6,823	26.6
Nursing home or long-term care facility	2,787	0.6
Hospice facility	42	0.8
Residence	50,117	9.2
Other	34,185	23.8
Place unknown	719	9.5

Table 6. Number and percentage of deaths for which autopsies were reported by 113 selected causes and sex: 47 states and the District of Columbia, 2003

[The asterisks (*) preceding the cause-of-death codes indicate that they are not part of the *International Classification of Diseases, Tenth Revision* (ICD–10)]

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
All causes	173,745	118,026	55,719	7.7	10.6	4.8
Salmonella infections (A01–A02)	4	–	4	*	*	*
Shigellosis and amebiasis (A03,A06)	2	1	1	*	*	*
Certain other intestinal infections (A04,A07–A09)	104	51	53	3.7	5.1	2.9
Tuberculosis (A16–A19)	79	54	25	11.7	13.3	9.3
Respiratory tuberculosis (A16)	63	45	18	11.8	13.6	*
Other tuberculosis (A17–A19)	16	9	7	*	*	*
Whooping cough (A37)	2	–	2	*	*	*
Scarlet fever and erysipelas (A38,A46)	–	–	–	*	*	*
Meningococcal infection (A39)	70	35	35	47.3	50.7	44.3
Septicemia (A40–A41)	1,278	651	627	4.1	4.7	3.6
Syphilis (A50–A53)	6	6	–	*	*	*
Acute poliomyelitis (A80)	–	–	–	*	*	*
Arthropod-borne viral encephalitis (A83–A84,A85.2)	2	2	–	*	*	*
Measles (B05)	–	–	–	*	*	*
Viral hepatitis (B15–B19)	273	195	78	5.3	5.9	4.3
Human immunodeficiency virus (HIV) disease (B20–B24)	600	470	130	4.6	4.8	3.9
Malaria (B50–B54)	1	1	–	*	*	*
Other and unspecified infectious and parasitic diseases and their sequelae (A00,A05,A20–A36,A42–A44,A48–A49, A54–A79,A81–A82,A85.0–A85.1,A85.8,A86–B04,B06–B09, B25–B49,B55–B99)	622	358	264	9.0	9.7	8.2
Malignant neoplasms (C00–C97)	6,543	4,146	2,397	1.3	1.6	1.0
Malignant neoplasms of lip, oral cavity and pharynx (C00–C14)	104	91	13	1.4	1.8	*
Malignant neoplasm of esophagus (C15)	144	127	17	1.2	1.4	*
Malignant neoplasm of stomach (C16)	131	95	36	1.2	1.5	0.8
Malignant neoplasms of colon, rectum and anus (C18–C21)	500	301	199	1.0	1.2	0.8
Malignant neoplasms of liver and intrahepatic bile ducts (C22)	247	182	65	1.8	2.1	1.3
Malignant neoplasm of pancreas (C25)	292	174	118	1.0	1.2	0.8
Malignant neoplasm of larynx (C32)	65	55	10	1.8	2.0	*
Malignant neoplasms of trachea, bronchus and lung (C33–C34)	1,503	1,087	416	1.0	1.3	0.7
Malignant melanoma of skin (C43)	58	35	23	0.8	0.8	0.9
Malignant neoplasm of breast (C50)	271	3	268	0.7	*	0.7
Malignant neoplasm of cervix uteri (C53)	36	–	36	1.0	*	1.0
Malignant neoplasms of corpus uteri and uterus, part unspecified (C54–C55)	68	–	68	1.1	*	1.1
Malignant neoplasm of ovary (C56)	125	–	125	0.9	*	0.9
Malignant neoplasm of prostate (C61)	187	187	–	0.7	0.7	*
Malignant neoplasms of kidney and renal pelvis (C64–C65)	133	102	31	1.2	1.4	0.7
Malignant neoplasm of bladder (C67)	86	65	21	0.8	0.8	0.6
Malignant neoplasms of meninges, brain and other parts of central nervous system (C70–C72)	182	120	62	1.5	1.8	1.2
Malignant neoplasms of lymphoid, hematopoietic and related tissue (C81–C96)	1,099	704	395	2.7	3.2	2.1
Hodgkin's disease (C81)	61	35	26	5.0	5.3	4.7
Non–Hodgkin's lymphoma (C82–C85)	434	279	155	2.2	2.7	1.7
Leukemia (C91–C95)	604	390	214	3.0	3.5	2.5
Multiple myeloma and immunoproliferative neoplasms (C88,C90)	174	109	65	1.7	2.0	1.3
Other and unspecified malignant neoplasms of lymphoid, hematopoietic and related tissue (C96)	2	1	1	*	*	*
All other and unspecified malignant neoplasms (C17,C23–C24,C26–C31,C37–C41,C44–C49, C51–C52,C57–C60,C62–C63,C66,C68–C69,C73–C80,C97)	1,136	708	428	2.0	2.4	1.5
In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behavior (D00–D48)	405	200	205	3.3	3.3	3.3
Anemias (D50–D64)	229	129	100	5.4	7.6	4.0
Diabetes mellitus (E10–E14)	1,868	1,123	745	2.7	3.4	2.1
Nutritional deficiencies (E40–E64)	74	44	30	2.3	3.9	1.5
Malnutrition (E40–E46)	71	43	28	2.4	4.1	1.5
Other nutritional deficiencies (E50–E64)	3	1	2	*	*	*

See footnotes at end of table.

Table 6. Number and percentage of deaths for which autopsies were reported by 113 selected causes and sex: 47 states and the District of Columbia, 2003—Con.

[The asterisks (*) preceding the cause-of-death codes indicate that they are not part of the *International Classification of Diseases, Tenth Revision* (ICD–10)]

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Meningitis (G00,G03)	173	104	69	25.4	28.7	21.6
Parkinson's disease (G20–G21)	172	105	67	1.1	1.1	0.9
Alzheimer's disease (G30)	443	212	231	0.8	1.2	0.6
Major cardiovascular diseases (I00–I78)	45,064	30,711	14,353	5.4	7.8	3.2
Diseases of heart (I00–I09,I11,I13,I20–I51)	39,510	27,463	12,047	6.2	8.8	3.7
Acute rheumatic fever and chronic rheumatic heart diseases (I00–I09)	171	63	108	5.1	5.9	4.8
Hypertensive heart disease (I11)	4,388	2,835	1,553	16.1	23.5	10.2
Hypertensive heart and renal disease (I13)	175	103	72	5.9	8.1	4.2
Ischemic heart diseases (I20–I25)	25,654	18,956	6,698	5.7	8.3	3.1
Acute myocardial infarction (I21–I22)	6,987	5,143	1,844	4.4	6.2	2.5
Other acute ischemic heart diseases (I24)	156	110	46	5.2	7.1	3.1
Other forms of chronic ischemic heart disease (I20,I25)	18,511	13,703	4,808	6.5	9.5	3.4
Atherosclerotic cardiovascular disease, so described (I25.0)	7,628	5,594	2,034	12.3	16.8	7.1
All other forms of chronic ischemic heart disease (I20,I25.1–I25.9)	10,883	8,109	2,774	4.9	7.3	2.5
Other heart diseases (I26–I51)	9,122	5,506	3,616	5.9	8.0	4.1
Acute and subacute endocarditis (I33)	109	66	43	9.5	10.5	8.3
Diseases of pericardium and acute myocarditis (I30–I31,I40)	327	185	142	40.7	44.4	36.8
Heart failure (I50)	502	277	225	1.0	1.4	0.7
All other forms of heart disease (I26–I28,I34–I38,I42–I49,I51)	8,184	4,978	3,206	8.1	10.6	5.9
Essential (primary) hypertension and hypertensive renal disease (I10,I12)	326	187	139	1.6	2.4	1.1
Cerebrovascular diseases (I60–I69)	2,943	1,566	1,377	2.0	2.7	1.6
Atherosclerosis (I70)	187	116	71	1.5	2.5	0.9
Other diseases of circulatory system (I71–I78)	2,098	1,379	719	9.3	11.3	6.9
Aortic aneurysm and dissection (I71)	1,771	1,202	569	13.1	14.6	10.7
Other diseases of arteries, arterioles and capillaries (I72–I78)	327	177	150	3.6	4.5	2.9
Other disorders of circulatory system (I80–I99)	1,019	503	516	23.0	27.4	19.9
Influenza and pneumonia (J10–J18)	2,548	1,531	1,017	4.2	5.7	3.0
Influenza (J10–J11)	125	68	57	7.5	10.5	5.6
Pneumonia (J12–J18)	2,423	1,463	960	4.1	5.6	2.9
Other acute lower respiratory infections (J20–J22)	97	58	39	25.0	36.9	16.9
Acute bronchitis and bronchiolitis (J20–J21)	94	56	38	33.1	47.5	22.9
Unspecified acute lower respiratory infection (J22)	3	2	1	*	*	*
Chronic lower respiratory diseases (J40–J47)	2,337	1,376	961	2.0	2.4	1.6
Bronchitis, chronic and unspecified (J40–J42)	70	39	31	8.7	11.8	6.6
Emphysema (J43)	454	283	171	3.2	4.0	2.5
Asthma (J45–J46)	663	349	314	17.4	25.1	13.0
Other chronic lower respiratory diseases (J44,J47)	1,150	705	445	1.2	1.5	0.9
Pneumoconioses and chemical effects (J60–J66,J68)	61	57	4	6.7	6.6	*
Pneumonitis due to solids and liquids (J69)	192	116	76	1.2	1.5	1.0
Other diseases of respiratory system (J00–J06,J30– J39,J67,J70–J98)	1,311	779	532	5.6	6.9	4.4
Peptic ulcer (K25–K28)	413	260	153	11.2	14.7	8.0
Diseases of appendix (K35–K38)	99	61	38	24.1	25.1	22.6
Hernia (K40–K46)	178	94	84	12.0	15.3	9.7
Chronic liver disease and cirrhosis (K70,K73–K74)	1,892	1,332	560	7.4	8.0	6.3
Alcoholic liver disease (K70)	1,005	725	280	8.6	8.4	9.1
Other chronic liver disease and cirrhosis (K73–K74)	887	607	280	6.3	7.5	4.8
Cholelithiasis and other disorders of gallbladder (K80–K82)	167	83	84	6.1	6.7	5.6
Nephritis, nephrotic syndrome and nephrosis (N00–N07,N17–N19,N25–N27)	654	362	292	1.7	1.9	1.5
Acute and rapidly progressive nephritic and nephrotic syndrome (N00–N01,N04)	8	5	3	*	*	*
Chronic glomerulonephritis, nephritis and nephropathy not specified as acute or chronic, and renal sclerosis unspecified (N02–N03,N05–N07,N26)	29	18	11	5.8	*	*
Renal failure (N17–N19)	616	338	278	1.6	1.9	1.4
Other disorders of kidney (N25,N27)	1	1	–	*	*	*

See footnotes at end of table.

Table 6. Number and percentage of deaths for which autopsies were reported by 113 selected causes and sex: 47 states and the District of Columbia, 2003—Con.

[The asterisks (*) preceding the cause-of-death codes indicate that they are not part of the *International Classification of Diseases, Tenth Revision* (ICD–10)]

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Infections of kidney . . . . . (N10–N12,N13.6,N15.1)	105	37	68	13.5	15.7	12.5
Hyperplasia of prostate . . . . . (N40)	20	20	–	4.4	4.4	*
Inflammatory diseases of female pelvic organs . . . . . (N70–N76)	29	...	29	25.7	...	25.7
Pregnancy, childbirth and the puerperium . . . . . (O00–O99)	311	...	311	60.3	...	60.3
Pregnancy with abortive outcome . . . . . (O00–O07)	24	...	24	63.2	...	63.2
Other complications of pregnancy, childbirth and the puerperium . . . . . (O10–O99)	287	...	287	60.0	...	60.0
Certain conditions originating in the perinatal period . . . . . (P00–P96)	1,740	1,026	714	12.9	13.3	12.2
Congenital malformations, deformations and chromosomal abnormalities . . . . . (Q00–Q99)	2,047	1,192	855	20.8	23.2	18.1
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified . . . . . (R00–R99)	9,736	6,052	3,684	34.7	45.8	24.8
All other diseases . . . . . .(Residual)	11,514	6,799	4,715	6.2	9.0	4.3
Accidents (unintentional injuries) . . . . . (V01–X59,Y85–Y86)	44,148	30,823	13,325	43.7	47.1	37.3
Transport accidents . . . . . (V01–V99,Y85)	19,546	13,838	5,708	43.4	44.3	41.2
Motor vehicle accidents . . . . . (V02–V04,V09.0,V09.2,V12–V14, V19.0–V19.2,V19.4–V19.6,V20–V79,V80.3–V80.5, V81.0–V81.1,V82.0–V82.1,V83–V86,V87.0–V87.8, V88.0–V88.8,V89.0,V89.2)	17,876	12,462	5,414	42.6	43.4	40.9
Other land transport accidents . . . . . (V01,V05–V06,V09.1, V09.3–V09.9,V10–V11,V15–V18,V19.3,V19.8–V19.9, V80.0–V80.2,V80.6–V80.9,V81.2–V81.9, V82.2–V82.9,V87.9,V88.9,V89.1,V89.3,V89.9)	666	520	146	52.5	53.2	50.2
Water, air and space, and other and unspecified transport accidents and their sequelae . . . . . (V90–V99,Y85)	1,004	856	148	54.6	57.1	43.7
Nontransport accidents . . . . . (W00–X59,Y86)	24,602	16,985	7,617	43.9	49.7	34.8
Falls . . . . . (W00–W19)	3,314	2,135	1,179	21.2	26.3	15.8
Accidental discharge of firearms . . . . . (W32–W34)	415	369	46	60.7	60.0	66.7
Accidental drowning and submersion . . . . . (W65–W74)	2,000	1,566	434	63.7	62.7	67.5
Accidental exposure to smoke, fire and flames . . . . . (X00–X09)	1,859	1,090	769	59.3	59.8	58.7
Accidental poisoning and exposure to noxious substances . . . . . (X40–X49)	12,857	8,734	4,123	72.5	73.0	71.3
Other and unspecified nontransport accidents and their sequelae . . . . . (W20–W31,W35–W64,W75–W99,X10–X39, X50–X59,Y86)	4,157	3,091	1,066	26.4	33.8	16.2
Intentional self-harm (suicide) . . . . . .(*U03,X60–X84,Y87.0)	15,178	11,780	3,398	51.8	50.3	57.7
Intentional self-harm (suicide) by discharge of firearms . . . . (X72–X74)	7,683	6,635	1,048	48.9	48.2	53.5
Intentional self-harm (suicide) by other and unspecified means and their sequelae . . . . . .(*U03,X60–X71,X75–X84,Y87.0)	7,495	5,145	2,350	55.2	53.3	59.8
Assault (homicide) . . . . . .(*U01–*U02,X85–Y09,Y87.1)	15,388	12,108	3,280	91.8	92.3	90.0
Assault (homicide) by discharge of firearms . . . . . .(*U01.4,X93–X95)	10,383	8,880	1,503	92.0	92.7	87.8
Assault (homicide) by other and unspecified means and their sequelae . . . . . (*U01.0–*U01.3,*U01.5–*U01.9,*U02,X85–X92, X96–Y09,Y87.1)	5,005	3,228	1,777	91.5	91.3	91.9
Legal intervention . . . . . (Y35,Y89.0)	330	317	13	81.7	81.5	*
Events of undetermined intent . . . . . (Y10–Y34,Y87.2,Y89.9)	3,740	2,420	1,320	76.7	76.2	77.5
Discharge of firearms, undetermined intent . . . . . (Y22–Y24)	165	128	37	76.0	73.6	86.1
Other and unspecified events of undetermined intent and their sequelae . . . . . .(Y10–Y21,Y25–Y34,Y87.2,Y89.9)	3,575	2,292	1,283	76.7	76.4	77.3
Operations of war and their sequelae . . . . . (Y36,Y89.1)	1	1	–	*	*	*
Complications of medical and surgical care . . . . . (Y40–Y84,Y88)	476	241	235	18.7	20.3	17.3

– Quantity zero.

* Figure does not meet standards of reliability or precision.

. . . Category not applicable.

Table 7. Number and percentage of infant deaths for which autopsies were reported, by 130 selected causes and sex: 47 states and the District of Columbia, 2003

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
All causes	8,093	4,776	3,317	30.6	31.8	29.0
Certain infectious and parasitic diseases (A00–B99)	169	86	83	35.7	34.4	37.2
Certain intestinal infectious diseases (A00–A08)	8	3	5	*	*	*
Diarrhea and gastroenteritis of infectious origin (A09)	1	1	–	*	*	*
Tuberculosis (A16–A19)	–	–	–	*	*	*
Tetanus (A33,A35)	–	–	–	*	*	*
Diphtheria (A36)	–	–	–	*	*	*
Whooping cough (A37)	2	–	2	*	*	*
Meningococcal infection (A39)	4	4	–	*	*	*
Septicemia (A40–A41)	81	46	35	30.6	30.9	30.2
Congenital syphilis (A50)	–	–	–	*	*	*
Gonococcal infection (A54)	–	–	–	*	*	*
Viral diseases (A80–B34)	60	24	36	53.6	50.0	56.3
Acute poliomyelitis (A80)	–	–	–	*	*	*
Varicella (chickenpox) (B01)	–	–	–	*	*	*
Measles (B05)	–	–	–	*	*	*
Human immunodeficiency virus (HIV) disease (B20–B24)	1	–	1	*	*	*
Mumps (B26)	–	–	–	*	*	*
Other and unspecified viral diseases (A81–B00,B02–B04, B06–B19,B25,B27–B34)	59	24	35	55.1	52.2	57.4
Candidiasis (B37)	4	2	2	*	*	*
Malaria (B50–B54)	–	–	–	*	*	*
Pneumocystosis (B59)	1	1	–	*	*	*
All other and unspecified infectious and parasitic diseases (A20–A32,A38,A42–A49,A51–A53,A55–A79,B35–B36, B38–B49,B55–B58,B60–B99)	8	5	3	*	*	*
Neoplasms (C00–D48)	35	15	20	27.3	*	31.3
Malignant neoplasms (C00–C97)	17	6	11	*	*	*
Hodgkin's disease and non-Hodgkin's lymphomas (C81–C85)	–	–	–	*	*	*
Leukemia (C91–C95)	6	1	5	*	*	*
Other and unspecified malignant neoplasms (C00–C80, C88–C90,C96–C97)	11	5	6	*	*	*
In situ neoplasms, benign neoplasms and neoplasms of uncertain or unknown behavior (D00–D48)	18	9	9	*	*	*
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism (D50–D89)	33	22	11	35.1	41.5	*
Anemias (D50–D64)	11	7	4	*	*	*
Hemorrhagic conditions and other diseases of blood and blood-forming organs (D65–D76)	17	12	5	*	*	*
Certain disorders involving the immune mechanism (D80–D89)	5	3	2	*	*	*
Endocrine, nutritional and metabolic diseases (E00–E88)	92	47	45	39.1	34.6	45.5
Short stature, not elsewhere classified (E34.3)	2	–	2	*	*	*
Nutritional deficiencies (E40–E64)	3	2	1	*	*	*
Cystic fibrosis (E84)	4	3	1	*	*	*
Volume depletion, disorders of fluid, electrolyte and acid-base balance (E86–E87)	20	10	10	26.7	*	*
All other endocrine, nutritional and metabolic diseases (E00–E32,E34.0–E34.2,E34.4–E34.9,E65–E83,E85,E88)	63	32	31	46.7	42.7	51.7
Diseases of the nervous system (G00–G98)	99	56	43	26.5	26.8	26.1
Meningitis (G00,G03)	24	14	10	32.4	*	*
Infantile spinal muscular atrophy, type I (Werdnig-Hoffman) (G12.0)	3	1	2	*	*	*
Infantile cerebral palsy (G80)	1	1	–	*	*	*
Anoxic brain damage, not elsewhere classified (G93.1)	26	16	10	60.5	*	*
Other diseases of nervous system (G04,G06–G11,G12.1–G12.9, G20–G72,G81–G92,G93.0,G93.2–G93.9,G95–G98)	45	24	21	19.5	18.6	20.6
Diseases of the ear and mastoid process (H60–H93)	4	3	1	*	*	*
Diseases of the circulatory system (I00–I99)	227	132	95	40.0	41.4	38.2
Pulmonary heart disease and diseases of pulmonary circulation (I26–I28)	37	22	15	29.4	30.6	*
Pericarditis, endocarditis and myocarditis (I30,I33,I40)	23	11	12	88.5	*	*
Cardiomyopathy (I42)	63	37	26	51.2	54.4	47.3

See footnotes at end of table.

Table 7. Number and percentage of infant deaths for which autopsies were reported, by 130 selected causes and sex: 47 states and the District of Columbia, 2003—Con.

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Cardiac arrest (I46)	8	7	1	*	*	*
Cerebrovascular diseases (I60–I69)	27	16	11	27.3	*	*
All other diseases of circulatory system (I00–I25,I31,I34–I38, I44–I45,I47–I51,I70–I99)	69	39	30	39.0	38.2	40.0
Diseases of the respiratory system (J00–J98)	407	252	155	60.8	62.5	58.3
Acute upper respiratory infections (J00–J06)	11	6	5	*	*	*
Influenza and pneumonia (J10–J18)	220	132	88	71.4	72.1	70.4
Influenza (J10–J11)	15	9	6	*	*	*
Pneumonia (J12–J18)	205	123	82	73.7	74.1	73.2
Acute bronchitis and acute bronchiolitis (J20–J21)	40	27	13	76.9	81.8	*
Bronchitis, chronic and unspecified (J40–J42)	16	12	4	*	*	*
Asthma (J45–J46)	6	4	2	*	*	*
Pneumonitis due to solids and liquids (J69)	6	3	3	*	*	*
Other and unspecified diseases of respiratory system (J22,J30–J39,J43–J44,J47–J68,J70–J98)	108	68	40	42.0	44.7	38.1
Diseases of the digestive system (K00–K92)	142	89	53	27.3	27.6	26.6
Gastritis, duodenitis, and noninfective enteritis and colitis (K29,K50–K55)	64	40	24	22.3	22.2	22.4
Hernia of abdominal cavity and intestinal obstruction without hernia (K40–K46,K56)	23	12	11	36.5	*	*
All other and unspecified diseases of digestive system (K00–K28,K30–K38,K57–K92)	55	37	18	32.2	34.3	*
Diseases of the genitourinary system (N00–N95)	29	18	11	14.8	*	*
Renal failure and other disorders of kidney (N17–N19,N25,N27)	18	10	8	*	*	*
Other and unspecified diseases of genitourinary system (N00–N15,N20–N23,N26,N28–N95)	11	8	3	*	*	*
Certain conditions originating in the perinatal period (P00–P96)	1,705	1,005	700	12.7	13.2	12.1
Newborn affected by maternal factors and by complications of pregnancy, labor and delivery (P00–P04)	326	180	146	11.2	11.3	11.0
Newborn affected by maternal hypertensive disorders (P00.0)	10	7	3	*	*	*
Newborn affected by other maternal conditions which may be unrelated to present pregnancy (P00.1–P00.9)	20	10	10	25.3	*	*
Newborn affected by maternal complications of pregnancy (P01)	122	77	45	7.7	8.8	6.4
Newborn affected by incompetent cervix (P01.0)	21	11	10	5.0	*	*
Newborn affected by premature rupture of membranes (P01.1)	52	37	15	7.8	10.3	*
Newborn affected by multiple pregnancy (P01.5)	16	8	8	*	*	*
Newborn affected by other maternal complications of pregnancy (P01.2–P01.4,P01.6–P01.9)	33	21	12	15.3	15.1	*
Newborn affected by complications of placenta, cord and membranes (P02)	129	65	64	12.7	11.8	13.8
Newborn affected by complications involving placenta (P02.0–P02.3)	64	32	32	11.7	10.7	12.8
Newborn affected by complications involving cord (P02.4–P02.6)	9	2	7	*	*	*
Newborn affected by chorioamnionitis (P02.7)	56	31	25	13.1	13.4	12.7
Newborn affected by other and unspecified abnormalities of membranes (P02.8–P02.9)	–	–	–	*	*	*
Newborn affected by other complications of labor and delivery (P03)	22	7	15	14.9	*	*
Newborn affected by noxious influences transmitted via placenta or breast milk (P04)	23	14	9	59.0	*	*
Disorders related to length of gestation and fetal malnutrition (P05–P08)	382	233	149	8.2	8.8	7.4
Slow fetal growth and fetal malnutrition (P05)	10	7	3	*	*	*
Disorders related to short gestation and low birth weight, not elsewhere classified (P07)	372	226	146	8.1	8.7	7.3
Extremely low birth weight or extreme immaturity (P07.0,P07.2)	264	166	98	7.6	8.4	6.5
Other low birth weight or preterm (P07.1,P07.3)	108	60	48	9.8	9.7	9.8
Disorders related to long gestation and high birth weight (P08)	–	–	–	*	*	*
Birth trauma (P10–P15)	9	4	5	*	*	*
Intrauterine hypoxia and birth asphyxia (P20–P21)	117	70	47	22.2	24.7	19.3
Intrauterine hypoxia (P20)	33	23	10	32.4	41.1	*
Birth asphyxia (P21)	84	47	37	19.8	20.7	18.8

See footnotes at end of table.

Table 7. Number and percentage of infant deaths for which autopsies were reported, by 130 selected causes and sex: 47 states and the District of Columbia, 2003—Con.

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Respiratory distress of newborn (P22)	89	53	36	11.6	11.7	11.4
Other respiratory conditions originating in the perinatal period (P23–P28)	230	137	93	19.9	19.5	20.6
Congenital pneumonia (P23)	33	23	10	44.6	54.8	*
Neonatal aspiration syndromes (P24)	27	10	17	54.0	*	*
Interstitial emphysema and related conditions originating in the perinatal period (P25)	17	10	7	*	*	*
Pulmonary hemorrhage originating in the perinatal period (P26)	28	14	14	18.2	*	*
Chronic respiratory disease originating in the perinatal period (P27)	49	34	15	19.8	21.4	*
Atelectasis (P28.0–P28.1)	66	40	26	15.6	15.4	16.0
All other respiratory conditions originating in the perinatal period (P28.2–P28.9)	10	6	4	*	*	*
Infections specific to the perinatal period (P35–P39)	177	103	74	19.1	19.0	19.4
Bacterial sepsis of newborn (P36)	138	81	57	18.7	18.5	18.9
Omphalitis of newborn with or without mild hemorrhage (P38)	2	1	1	*	*	*
All other infections specific to the perinatal period (P35,P37,P39)	37	21	16	20.2	20.2	*
Hemorrhagic and hematological disorders of newborn (P50–P61)	86	54	32	12.1	12.7	11.2
Neonatal hemorrhage (P50–P52,P54)	64	39	25	10.4	10.8	9.7
Hemorrhagic disease of newborn (P53)	–	–	–	*	*	*
Hemolytic disease of newborn due to isoimmunization and other perinatal jaundice (P55–P59)	3	1	2	*	*	*
Hematological disorders (P60–P61)	19	14	5	*	*	*
Syndrome of infant of a diabetic mother and neonatal diabetes mellitus (P70.0–P70.2)	2	2	–	*	*	*
Necrotizing enterocolitis of newborn (P77)	58	36	22	15.2	16.3	13.7
Hydrops fetalis not due to hemolytic disease (P83.2)	67	42	25	37.0	42.4	30.5
Other perinatal conditions (P29,P70.3–P76,P78–P81, P83.0–P83.1,P83.3–P83.9,P90–P96)	162	91	71	13.7	13.6	13.9
Congenital malformations, deformations and chromosomal abnormalities (Q00–Q99)	1,232	714	518	23.3	25.1	21.2
Anencephaly and similar malformations (Q00)	15	5	10	*	*	*
Congenital hydrocephalus (Q03)	21	10	11	22.1	*	*
Spina bifida (Q05)	1	–	1	*	*	*
Other congenital malformations of nervous system (Q01–Q02,Q04, Q06–Q07)	60	33	27	20.0	20.9	19.0
Congenital malformations of heart (Q20–Q24)	458	266	192	33.9	34.9	32.7
Other congenital malformations of circulatory system (Q25–Q28)	62	31	31	27.3	25.2	29.8
Congenital malformations of respiratory system (Q30–Q34)	157	93	64	26.7	27.6	25.4
Congenital malformations of digestive system (Q35–Q45)	35	24	11	39.3	44.4	*
Congenital malformations of genitourinary system (Q50–Q64)	80	63	17	25.3	28.3	*
Congenital malformations and deformations of musculoskeletal system, limbs and integument (Q65–Q85)	123	79	44	24.2	27.3	20.1
Down's syndrome (Q90)	19	9	10	*	*	*
Edward's syndrome (Q91.0–Q91.3)	16	7	9	*	*	*
Patau's syndrome (Q91.4–Q91.7)	11	5	6	*	*	*
Other congenital malformations and deformations (Q10–Q18,Q86–Q89)	145	77	68	29.5	30.0	29.1
Other chromosomal abnormalities, not elsewhere classified (Q92–Q99)	29	12	17	15.4	*	*
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00–R99)	2,846	1,697	1,149	89.9	90.1	89.7
Sudden infant death syndrome (R95)	1,889	1,110	779	92.2	91.9	92.6
Other symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00–R53,R55–R94,R96–R99)	957	587	370	85.8	87.0	84.1
All other diseases (Residual)	4	4	–	*	*	*
External causes of mortality (*U01,V01–Y84)	1,069	636	433	81.4	83.4	78.6
Accidents (unintentional injuries) (V01–X59)	701	411	290	77.5	79.8	74.6
Transport accidents (V01–V99)	72	40	32	50.7	52.6	48.5
Motor vehicle accidents (V02–V04,V09.0,V09.2,V12–V14, V19.0–V19.2,V19.4–V19.6,V20–V79,V80.3–V80.5,V81.0–V81.1, V82.0–V82.1,V83–V86,V87.0–V87.8,V88.0–V88.8,V89.0,V89.2)	70	39	31	50.4	52.0	48.4

See footnotes at end of table.

Table 7. Number and percentage of infant deaths for which autopsies were reported, by 130 selected causes and sex: 47 states and the District of Columbia, 2003—Con.

Cause of death (based on the *International Classification of Diseases, Tenth Revision*, 1992)	Number			Percent		
	Both sexes	Male	Female	Both sexes	Male	Female
Other and unspecified transport accidents . . . . . (V01, V05–V06,V09.1,V09.3–V09.9,V10–V11,V15–V18,V19.3,V19.8, V19.9,V80.0–V80.2,V80.6–V80.9,V81.2–V81.9,V82.2–V82.9, V87.9,V88.9,V89.1,V89.3,V89.9,V90–V99)	2	1	1	*	*	*
Falls . . . . . (W00–W19)	–	–	–	*	*	*
Accidental discharge of firearms . . . . . (W32–W34)	12	7	5	*	*	*
Accidental drowning and submersion . . . . . (W65–W74)	45	26	19	80.4	76.5	*
Accidental suffocation and strangulation in bed . . . . . .(W75)	345	210	135	85.0	85.4	84.4
Other accidental suffocation and strangulation . . (W76–W77,W81–W84)	114	68	46	87.7	87.2	88.5
Accidental inhalation and ingestion of food or other objects causing obstruction of respiratory tract . . . . . (W78–W80)	41	21	20	71.9	72.4	71.4
Accidents caused by exposure to smoke, fire and flames . . . .(X00–X09)	15	6	9	*	*	*
Accidental poisoning and exposure to noxious substances . . .(X40–X49)	17	7	10	*	*	*
Other and unspecified accidents . . . . . (W20–W31,W35–W64, W85–W99,X10–X39,X50–X59)	40	26	14	78.4	92.9	*
Assault (homicide) . . . . . (*U01,X85–Y09)	299	181	118	92.3	93.8	90.1
Assault (homicide) by hanging, strangulation and suffocation . . . . (X91)	35	21	14	92.1	100.0	*
Assault (homicide) by discharge of firearms . . . . . (*U01.4,X93–X95)	8	7	1	*	*	*
Neglect, abandonment and other maltreatment syndromes . . .(Y06–Y07)	90	59	31	92.8	92.2	93.9
Assault (homicide) by other and unspecified means . . . (*U01.0–*U01.3, *U01.5–*U01.9,X85–X90,X92,X96–X99,Y00–Y05,Y08–Y09)	166	94	72	91.7	93.1	90.0
Complications of medical and surgical care . . . . . .(Y40–Y84)	10	6	4	*	*	*
Other external causes and their sequelae . . . . . (X60–X84,Y10–Y36)	59	38	21	83.1	80.9	87.5

– Quantity zero.

* Figure does not meet standards of reliability or precision.

Appendix

Technical Notes

Nature and sources of data

Data in this report are primarily based on information from all death certificates filed in the 50 states and the District of Columbia and are processed by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS). Mortality statistics are based on information coded by the states and provided to NCHS through the Vital Statistics Cooperative Program and from copies of the original certificates received by NCHS from the state registration offices. In 2003, all the states and the District of Columbia participated in this program and submitted part or all of the mortality data for 2003 in electronic data files to NCHS. Additional information on the data is available (16). See later section on the National Mortality Followback Survey for information on the source data for some of the information on the quality of autopsy data.

Cause-of-death classification

The mortality statistics presented in this report were compiled in accordance with the World Health Organization (WHO) regulations, which specify that member nations classify and code causes of death in accordance with the current revision of the *International Classification of Diseases* (ICD). The ICD provides the basic guidance used in virtually all countries to code and classify causes of death. Effective with deaths occurring in 1999, the United States began using the Tenth Revision of this classification (ICD-10) (16,17). These guidelines on cause-of-death classification incorporate circumstances and manner of death into its structure and refers to the categories in the classification as causes of death.

Tabulation lists for ICD-10 are published in the NCHS Instruction Manual, Part 9, ICD-10 Cause-of-Death Lists for Tabulating Mortality Statistics (Updated October 2002) (18). This report uses two tabulation lists: the List of 113 Selected Causes of Death for deaths of all ages, and the List of 130 Selected Causes of Infant Death for infants. These lists are also used to rank leading causes of death for the two population groups. More detail regarding ranking procedures can be found in ''Deaths: Leading Causes for 2003'' (19).

Race and Hispanic origin

In order to provide uniformity and comparability of race data during the transition period between single-race reporting and multiple-race reporting, before all or most of the data are available in the new multiple-race format, it was necessary to ''bridge'' the responses of those for whom more than one race was reported (multiple race) to one, single race. Additional details on race reporting and the bridging procedure are available (16).

Race and Hispanic origin are reported separately on the death certificate. Therefore, data shown by race include persons of Hispanic and non-Hispanic origin, and data for Hispanic origin include persons of any race. In this report, unless otherwise specified, deaths of Hispanic origin are included in the totals for each race group—white, black, American Indian or Alaska Native (AIAN), and Asian or Pacific Islander (API)—according to the decedent's race as reported on the death certificate. Data shown for Hispanic persons include all persons of Hispanic origin of any race.

Place death pronounced

Beginning with data for 2003, states are beginning to add a category for deaths occurring in licensed hospice facilities. Unknown place of death includes deaths thought to occur in hospitals but for which the decedent's status was unknown.

National Mortality Followback Survey

The National Mortality Followback Survey (NMFS) is a survey conducted to provide additional information related to the mortality experience of the United States beyond that obtained through the vital registration of deaths. The survey was composed of a sample of 22,957 death certificates for individuals aged 15 years or over who died in 1993 in 49 states and the District of Columbia. In the 1993 NMFS, additional information was collected from medical examiner or coroner offices if the death was due to homicide, suicide, accidents, pending and undetermined causes, a medical examiner or coroner certified the death, and the proxy respondent authorized release of the medical examiner or coroner records. Thus, additional information was not collected for deaths from natural causes. A total of 6,671 records were included in this subsample. Of these, 4,696 medical examiner or coroner reports were received (20).

Random variation

Mortality data are not subject to sampling error. Mortality data, even based on complete counts, may be affected by random variation. That is, the number of deaths that actually occurred may be considered as one of a large series of possible results that could have arisen under the same circumstances (21,22). When the number of deaths is small (perhaps less than 100), random variation tends to be relatively large. Therefore, considerable caution must be observed in interpreting statistics based on small numbers of deaths.

To quantify the random variation associated with mortality statistics, deaths, as infrequent events, can be viewed as deriving from a Poisson probability distribution. The Poisson distribution is simple conceptually and computationally, and provides reasonable, conservative variance estimates for mortality statistics when the probability of dying is relatively low (22). Confidence limits for numbers and percentages can be estimated from the actual number of vital events.

When the number of vital events is large, the distribution is assumed to follow a normal distribution (where the relative standard error is small). When the number of events is small and the probability of the event is small, the distribution is assumed to follow a

Poisson probability distribution. Considerable caution should be observed in interpreting the occurrence of infrequent events. An asterisk (*) will be shown for any percentage that is based on fewer than 20 deaths in the numerator.

Computing 95 percent confidence intervals for percentages—A 95-percent confidence interval can be computed for a percentage when the following conditions are met (23):

$$D \times p \geq 5 \text{ and } D \times q \geq 5$$

where

D = number of deaths in the denominator
p = percent divided by 100
$q = 1 - p$

For mortality data, these conditions will be met except for very rare events in small subgroups. If the conditions are not met, the variation in the percentage will be so large as to render the confidence intervals meaningless. When these conditions are met the 95 percent confidence interval can be computed using the normal approximation of the binomial. The 95 percent confidence intervals are computed by the following formulas:

$$\text{Lower limit} = p - [1.96 \times (\sqrt{p \times q / D})]$$

$$\text{Upper limit} = p + [1.96 \times (\sqrt{p \times q / D})]$$

where

p = percent divided by 100
$q = 1 - p$
D = number of deaths in the denominator

Example—Suppose that the percentage of deaths among females aged 15–24 in Arizona that were autopsied was 49.7 percent. This was based on 14,751 deaths in the numerator and 29,682 deaths in the denominator. First we test to make sure we can use the normal approximation of the binomial:

$29{,}682 \times 0.497 = 14{,}752$

$29{,}682 \times (1 - 0.497) = 29{,}682 \times 0.503 = 14{,}930$

Both 14,752 and 14,930 are greater than 5 so we can proceed. The 95 percent confidence interval would be:

$$\text{Lower limit} = 0.497 - [1.96 \times (\sqrt{0.497 \times 0.503 / 29{,}682})]$$
$$= 0.497 - 0.006$$
$$= 0.491 \text{ or } 49.1 \text{ percent}$$

$$\text{Upper limit} = 0.497 + [1.96 \times (\sqrt{0.497 \times 0.503 / 29{,}682})]$$
$$= 0.497 + 0.006$$
$$= 0.503 \text{ or } 50.3 \text{ percent}$$

This means that the chances are 95 out of 100 that the actual percentage of deaths of females aged 15–24 years that were autopsied in Arizona would be between 49.1 and 50.3 percent.

Testing differences between two percentages—When testing the difference between two percentages, both percentages must meet the following conditions:

$$D \times p \geq 5 \text{ and } D \times q \geq 5$$

where

D = number of deaths in the denominator
p = percent divided by 100
$q = 1 - p$

When both percentages meet these conditions, then the difference between the two percentages is considered statistically significant if it is greater than the statistic in the formula below. This statistic equals 1.96 times the standard error for the difference between two percentages.

$$1.96 \times \sqrt{\left[p \times (1-p) \times \left(\frac{1}{D_1} + \frac{1}{D_2}\right)\right]}$$

where

D_1 = number of deaths in the denominator of the first percentage
D_2 = number of deahts in the denominator of the second percentage

$$p = \frac{[(D_1 \times p_1) + (D_2 \times p_2)]}{(D_1 + D_2)}$$

p_1 = the first percentage
p_2 = the second percentage

Example—Is the percentage of deaths to females aged 15–24 years that were autopsied higher in New Mexico (50.2) than in Arizona (49.7)? Suppose that the number in the denominator was 13,714 in New Mexico and 29,682 in Arizona. The necessary conditions are met for both percentages (calculations not shown). The difference between the two percentages is 0.502 – 0.497 = 0.005. The statistic is then calculated as follows:

$$1.96 \times \sqrt{(0.499 \times 0.501) \times (0.000106609)}$$
$$= 1.96 \times \sqrt{0.000026652}$$
$$= 1.96 \times 0.005162563$$
$$= 0.010$$

The difference between the percentages (0.005) is less than this statistic (0.010). Therefore, the difference is not statistically significant at the 95 percent confidence level.

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