

# Section 7. Technical Appendix

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## SOURCES OF DATA

## Death and fetal-death statistics

Mortality statistics for 1988 are, as for all previous years except 1972, based on information from records of all deaths occurring in the United States. Fetal-death statistics for every year are based on all reports of fetal death received by the National Center for Health Statistics (NCHS).

The death-registration system and the fetal-death reporting system of the United States encompass the 50 States, the District of Columbia, New York City (which is independent of New York State for the purpose of death registration), Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Trust Territory of the Pacific Islands. In the statistical tabulations of this publication, *United States* refers only to the aggregate of the 50 States (including New York City) and the District of Columbia. Tabulations for Guam, Puerto Rico, and the Virgin Islands are shown separately in this volume. No data have ever been included for American Samoa or the Trust Territory of the Pacific Islands.

The Virgin Islands was admitted to the "registration area" for deaths in 1924; Puerto Rico, in 1932; and Guam, in 1970. Tabulations of death statistics for Puerto Rico and the Virgin Islands were regularly shown in the annual volumes of *Vital Statistics of the United States* from the year of their admission through 1971 except for the years 1967 through 1969, and tabulations for Guam were included for 1970 and 1971. Death statistics for Puerto Rico, the Virgin Islands, and Guam were not included in the 1972 volume but have been included in section 8 of the volumes for each of the years 1973-78 and in section 9 beginning with 1979. Information for 1972 for these three areas was published in the respective annual vital statistics reports of the Department of Health of the Commonwealth of Puerto Rico, the Department of Health of the Virgin Islands, and the Department of Public Health and Social Services of the Government of Guam.

Procedures used by NCHS to collect death statistics have changed over the years. Before 1971, tabulations of deaths and fetal deaths were based solely on information obtained by NCHS from copies of the original certificates. The information from these copies was edited, coded, and tabulated. For 1960-70, all mortality information taken from these records was transferred by NCHS to magnetic tape for computer processing.

Beginning with 1971, an increasing number of States have provided NCHS with computer tapes of data coded according to NCHS specifications and provided to NCHS through the Vital Statistics Cooperative Program. The year in which State-coded demographic data were first transmitted on computer tape to NCHS is shown below for each of the States, New York City, Puerto Rico, and the District of Columbia, all of which now furnish demographic or nonmedical data on tape.

1971	Florida	1977	Alaska Idaho Massachusetts New York City Ohio Puerto Rico
1972	Maine Missouri New Hampshire Rhode Island Vermont	1978	Indiana Utah Washington
1973	Colorado Michigan New York (except New York City)	1979	Connecticut Hawaii Mississippi New Jersey Pennsylvania Wyoming
1974	Illinois Iowa Kansas Montana Nebraska Oregon South Carolina	1980	Arkansas New Mexico South Dakota
1975	Louisiana Maryland North Carolina Oklahoma Tennessee Virginia Wisconsin	1982	North Dakota
1976	Alabama Kentucky Minnesota Nevada Texas West Virginia	1985	Arizona California Delaware Georgia District of Columbia

For the Virgin Islands and Guam, mortality statistics for 1988 are based on information obtained directly by NCHS from copies of the original certificates received from the registration offices.

In 1974, States began coding medical (cause-of-death) data on computer tapes according to NCHS specifications. The

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year in which State-coded medical data were first transmitted to NCHS is shown below for the 27 States now furnishing such data. Some States coded medical items for other States, under contract.

1974	1983
Iowa	Minnesota
Michigan	
1975	1984
Louisiana	Maryland
Nebraska	New York State (except
North Carolina	New York City)
Virginia	Vermont
Wisconsin	
1980	1986
Colorado	California
Kansas	Florida
Massachusetts	Texas
Mississippi	1988
New Hampshire	Alaska
Pennsylvania	Delaware
South Carolina	Idaho
1981	North Dakota
Maine	Wyoming

For 1988 and previous years except 1972, NCHS coded the medical information from copies of the original certificates received from the registration offices for all deaths occurring in those States that were not furnishing NCHS with medical data coded according to NCHS specifications. For 1981 and 1982, it was necessary to change these procedures because of a backlog in coding and processing that resulted from personnel and budgetary restrictions. To produce the mortality files on a timely basis with reduced resources, NCHS used State-coded underlying cause-of-death information supplied by 19 States for 50 percent of the records; for the other 50 percent of the records for these States as well as for 100 percent of the records for the remaining 21 registration areas, NCHS coded the medical information.

Mortality statistics for 1972 were based on information obtained from a 50-percent sample of death records instead of from all records as in other years. The sample resulted from personnel and budgetary restrictions. Sampling variation associated with the 50-percent sample is described below in the section "Estimates of errors arising from 50-percent sample for 1972."

Fetal-death data are obtained directly from copies of original reports of fetal deaths received by NCHS, except New York State (excluding New York City), which submitted State-coded data in 1988. Fetal-death data are not published by NCHS for the Virgin Islands and Guam.

### Standard certificates and reports

The U.S. Standard Certificate of Death and the U.S. Standard Report of Fetal Death, issued by the Public Health Service, have served for many years as the principal means of attaining uniformity in the content of documents used to collect information on these events. They have been modified in each State to the extent required by the particular needs of the State or by special provisions of the State vital statistics law. However, the certificates or reports of most States conform closely in content and arrangement to the standards.

The first issue of the U.S. Standard Certificate of Death appeared in 1900. Since then, it has been revised periodically by the national vital statistics agency through consultation with State health officers and registrars; Federal agencies concerned with vital statistics; national, State, and county medical societies; and others working in such fields as public health, social welfare, demography, and insurance. This revision procedure has assured careful evaluation of each item in terms of its current and future usefulness for legal, medical and health, demographic, and research purposes. New items have been added when necessary, and old items have been modified to ensure better reporting, or in some cases have been dropped when their usefulness appeared to be limited.

New revisions of the U.S. Standard Certificate of Death and the U.S. Standard Report of Fetal Death were recommended for State use beginning on January 1, 1978. The U.S. Standard Certificate of Death and the U.S. Standard Report of Fetal Death are shown in figures 7-A and 7-B. The certificate of death shown in figure 7-A is for use by a physician, a medical examiner, or a coroner. Two other forms of the U.S. Standard Certificate of Death are available; they are similar to the one shown, except that the section on certification is designed for the physician's signature on one, and for the medical examiner's or coroner's signature on the other.

Among the changes in the new revision were the additions of an item asking, "If Hosp. or Inst., Indicate DOA, OP/Emer. Rm., Inpatient" and an item asking, "Was Decedent Ever in U.S. Armed Forces?" The latter item was previously on the certificate but was deleted from 1968 through 1977. An item on whether autopsy findings were considered for determining cause of death was dropped.

### HISTORY

The first death statistics published by the Federal Government concerned events in 1850 and were based on statistics collected during the decennial census of that year. In 1880 a national "registration area" was created for deaths. Originally consisting of two States (Massachusetts and New Jersey), the District of Columbia, and several large cities having efficient systems for death registrations, the death-registration area continued to expand until 1933, when it included the entire United States for the first time. Tables that show data for death-registration States include the District of Columbia for all years; registration cities in nonregistration States are not included. For more details on the history of the death-registration area, see the Technical Appendix in *Vital Statistics of the United*

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FIGURE 7-A.

(PHYSICIAN, MEDICAL EXAMINER OR CORONER)  
U.S. STANDARD  
**CERTIFICATE OF DEATH**

Form Approved  
OMB No. 68R 1901

LOCAL FILE NUMBER \_\_\_\_\_ STATE FILE NUMBER \_\_\_\_\_

TYPE OR PRINT IN PERMANENT INK FOR INSTRUCTIONS SEE HANDBOOK	1. DECEDENT—NAME FIRST MIDDLE LAST		2. SEX		3. DATE OF DEATH (Mo., Day, Yr.)		
	4. RACE—(e.g., White, Black, American Indian, etc.) (Specify)		5. AGE—Last Birthday (Yrs.)		6. DATE OF BIRTH (Mo., Day, Yr.)		
<b>DECEASED</b>	7a. CITY, TOWN OR LOCATION OF DEATH		7b. HOSPITAL OR OTHER INSTITUTION—Name (If not in either, give street and number)		7c. IF HOSP. OR INST. Indicate DOA, OP/Emer. Rm., Inpatient (Specify)		
	8. STATE OF BIRTH (If not in U.S., name country)		9. CITIZEN OF WHAT COUNTRY		10. MARRIED, NEVER MARRIED, WIDOWED, DIVORCED (Specify)		
IF DEATH OCCURRED IN INSTITUTION, SEE HANDBOOK REGARDING COMPLETION OF RESIDENCE ITEMS.	11. SOCIAL SECURITY NUMBER		12. USUAL OCCUPATION (Give kind of work done during most of working life, even if retired)		13. KIND OF BUSINESS OR INDUSTRY		
	14. RESIDENCE—STATE		15. COUNTY		16. CITY, TOWN OR LOCATION		
<b>PARENTS</b>	17a. FATHER—NAME FIRST MIDDLE LAST		17b. MOTHER—MAIDEN NAME FIRST MIDDLE LAST		17c. INSIDE CITY LIMITS (Specify Yes or No)		
	18. INFORMANT—NAME (Type or Print)		19. MAILING ADDRESS		20. STREET OR R.F.D. NO. CITY OR TOWN STATE ZIP		
<b>DISPOSITION</b>	21. BURIAL, CREMATION, REMOVAL, OTHER (Specify)		22. CEMETERY OR CREMATORY—NAME		23. LOCATION CITY OR TOWN STATE		
	24. FUNERAL SERVICE LICENSEE Or Person Acting As Such (Signature)		25. NAME OF FACILITY		26. ADDRESS OF FACILITY		
<b>CERTIFIER</b>	27a. To the best of my knowledge, death occurred at the time, date and place and due to the cause(s) stated.		27b. On the basis of examination and/or investigation, in my opinion death occurred at the time, date and place and due to the cause(s) stated.				
	28. DATE SIGNED (Mo., Day, Yr.)		29. HOUR OF DEATH		30. M		
	31. NAME OF ATTENDING PHYSICIAN IF OTHER THAN CERTIFIER (Type or Print)		32. DATE SIGNED (Mo., Day, Yr.)		33. HOUR OF DEATH		
	34. NAME AND ADDRESS OF CERTIFIER (PHYSICIAN, MEDICAL EXAMINER OR CORONER) (Type or Print)		35. DATE SIGNED (Mo., Day, Yr.)		36. PRONOUNCED DEAD (Mo., Day, Yr.)		
CONDITIONS IF ANY WHICH GAVE RISE TO IMMEDIATE CAUSE STATING THE UNDERLYING CAUSE LAST	37. REGISTRAR		38. DATE RECEIVED BY REGISTRAR (Mo., Day, Yr.)				
	39. IMMEDIATE CAUSE (ENTER ONLY ONE CAUSE PER LINE FOR (a), (b), AND (c).)				Interval between onset and death		
<b>CAUSE OF DEATH</b>	PART I (a) DUE TO, OR AS A CONSEQUENCE OF:				Interval between onset and death		
	PART II OTHER SIGNIFICANT CONDITIONS—Conditions contributing to death but not related to cause given in PART I (a)		26. AUTOPSY (Specify Yes or No)		27. WAS CASE REFERRED TO MEDICAL EXAMINER OR CORONER (Specify Yes or No)		
28a. ACC., SUICIDE, HOM., UNDET., OR PENDING INVEST. (Specify)		28b. DATE OF INJURY (Mo., Day, Yr.)		28c. HOUR OF INJURY		28d. DESCRIBE HOW INJURY OCCURRED.	
28e. INJURY AT WORK (Specify Yes or No)		28f. PLACE OF INJURY—At home, farm, street, factory, office building, etc. (Specify)		28g. LOCATION		28h. STREET OR R.F.D. No. CITY OR TOWN STATE	

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States, 1979, Volume II, Mortality, Part A, Section 7, pages 3–4, and the section “History and Organization of the Vital Statistics System,” chapter 1, *Vital Statistics of the United States, 1950*, Volume I, pages 2–19.

Statistics on fetal deaths were first published for the birth-registration area in 1918, and then every year beginning with 1922.

**CLASSIFICATION OF DATA**

The principal value of vital statistics data is realized through the presentation of rates, which are computed by relating the

vital events of a class to the population of a similarly defined class. Vital statistics and population statistics must therefore be classified according to similarly defined systems and tabulated in comparable groups. Even when the variables common to both, such as geographic area, age, sex, and race, have been similarly classified and tabulated, differences between the enumeration method of obtaining population data and the registration method of obtaining vital statistics data may result in significant discrepancies.

The general rules used in the classification of geographic and personal items for deaths and fetal deaths for 1988 are set forth in two NCHS instruction manuals (1,2).

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FIGURE 7-B.

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U.S. STANDARD  
**REPORT OF FETAL DEATH**

STATE FILE NUMBER

TYPE OR PRINT IN PERMANENT INK SEE HANDBOOK FOR INSTRUCTIONS	1a. HOSPITAL—NAME (If not in hospital, give street and number)				1b. CITY, TOWN OR LOCATION OF DELIVERY		1c. COUNTY OF DELIVERY		
	2a. DATE OF DELIVERY (Month, Day, Year)		2b. HOUR OF DELIVERY		3. SEX OF FETUS		4. WEIGHT OF FETUS		
<b>MOTHER</b>	5a. MOTHER—MAIDEN NAME FIRST MIDDLE LAST			5b. AGE (At time of this delivery)		6a. RESIDENCE—STATE		6b. COUNTY	
	6c. CITY, TOWN OR LOCATION		6d. STREET AND NUMBER		6e. INSIDE CITY LIMITS (Specify yes or no)		6f. PREGNANCY HISTORY (Complete each section)		
	7. RACE—(e.g., White, Black, American Indian, etc.) (Specify)		8. EDUCATION (Specify only highest grade completed) (Elementary or Secondary (0-12)      College (1-4 or 5+))		9. DATE LAST NORMAL MENSES BEGAN (Month, Day, Year)		10. IS MOTHER MARRIED? (Specify yes or no)		
	11a. Now living Number		11b. Now dead Number		11d. Before 20 weeks Number		11e. After 20 weeks Number (Do not include this fetus)		
12a. MONTH OF PREGNANCY PRENATAL CARE BEGAN (First, second, etc. (Specify))		12b. PRENATAL VISITS—Total number (If none, so state)		13a. THIS BIRTH—Single, twin, triplet, etc. (Specify)		13b. IF NOT SINGLE BIRTH—Born first, second, third, etc. (Specify)		11c. DATE OF LAST LIVE BIRTH (Month, Year)	
14a. FATHER—NAME FIRST MIDDLE LAST		14b. AGE (At time of this delivery)		14c. RACE—(e.g., White, Black, American Indian, etc.) (Specify)		14d. EDUCATION (Specify only highest grade completed) Elementary or Secondary (0-12)      College (1-4 or 5+)		11f. DATE OF LAST OTHER TERMINATION (as indicated in d or e above) (Month, Year)	
<b>CAUSE OF FETAL DEATH</b>	15. IMMEDIATE CAUSE (ENTER ONLY ONE CAUSE PER LINE FOR (a), (b), AND (c).) Specify Fetal or Maternal								
	PART I Fetal or maternal condition directly causing fetal death. (a) DUE TO, OR AS A CONSEQUENCE OF: Specify Fetal or Maternal								
	Fetal and/or maternal conditions, if any giving rise to the immediate cause (a), stating the underlying cause last. (b) DUE TO, OR AS A CONSEQUENCE OF: Specify Fetal or Maternal								
PART II OTHER SIGNIFICANT CONDITIONS OF FETUS OR MOTHER: Conditions contributing to fetal death but not related to cause given in (a)									
16. FETUS DIED BEFORE LABOR, DURING LABOR OR DELIVERY, UNKNOWN (Specify)				17. PHYSICIAN'S ESTIMATE OF GESTATION Weeks		18. AUTOPSY (Specify yes or no)			
19. COMPLICATIONS OF PREGNANCY (Describe or write "none")				20. COMPLICATIONS OF LABOR AND/OR DELIVERY (Describe or write "none")					
21. CONCURRENT ILLNESSES OR CONDITIONS AFFECTING THE PREGNANCY (Describe or write "none")				22. CONGENITAL MALFORMATIONS OR ANOMALIES OF FETUS (Describe or write "none")					
23. NAME OF PHYSICIAN OR ATTENDANT (Type or print)				24. NAME OF PERSON COMPLETING REPORT (Type or print)				TITLE	

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A discussion of the classification of certain important items is presented below.

**Classification by occurrence and residence**

Tabulations for the United States and specified geographic areas in this volume are by place of residence unless stated as by place of occurrence. Before 1970, resident mortality statistics for the United States included all deaths occurring in the United States, with deaths of "nonresidents of the United States" assigned to place of death. "Deaths of nonresidents of the United States" refers to deaths that occur in the United States of nonresident aliens, nationals residing abroad, and residents of Puerto Rico, the Virgin Islands, Guam, and other territories of the United States. Beginning with 1970, deaths of

nonresidents of the United States are not included in tables by place of residence.

Tables by place of occurrence, on the other hand, include deaths of both residents and nonresidents of the United States. Consequently, for each year beginning with 1970, the total number of deaths in the United States by place of occurrence was somewhat greater than the total by place of residence. For 1988 this difference amounted to 3,197 deaths. Mortality statistics by place of occurrence are shown in tables 1-11, 1-19, 1-20, 1-29, 1-30, 3-1, 3-8, 8-1, and 8-7.

Before 1970, except for 1964 and 1965, deaths of nonresidents of the United States occurring in the United States were treated as deaths of residents of the exact place of occurrence, which in most instances was an urban area. In 1964 and 1965, deaths of nonresidents of the United States occurring in the

United States were allocated as deaths of residents of the balance of the county in which they occurred.

*Residence error*—Results of a 1960 study showed that the classification of residence information on the death certificates corresponded closely to the residence classification of the census records for the decedents whose records were matched (3).

A comparison of the results of this study of deaths with those for a previous matched record study of births (4) showed that the quality of residence data had considerably improved between 1950 and 1960. Both studies found that events in urban areas were overstated by the NCHS classification in comparison with the U.S. Bureau of the Census classification. The magnitude of the difference was substantially less for deaths in 1960 than it was for births in 1950.

The improvement is attributed to an item added in 1956 to the U.S. Standard Certificates of Birth and of Death, asking if residence was inside or outside city limits. This new item aided in properly allocating the residence of persons living near cities but outside the corporate limits.

### Geographic classification

The rules followed in the classification of geographic areas for deaths and fetal deaths are contained in the two instruction manuals referred to previously (1,2). The geographic codes assigned by the National Center for Health Statistics during data reduction of source information on birth, death, and fetal-death records are given in another instruction manual (5). Beginning with 1982 data, the geographic codes were modified to reflect results of the 1980 census. For 1970–81, codes are based on results of the 1970 census.

*Standard metropolitan statistical areas*—The standard metropolitan statistical areas (SMSA's) used in this volume are those established by the U.S. Office of Management and Budget (6) from final 1980 census population counts and used by the U.S. Bureau of the Census, except in the New England States.

Except in the New England States, an SMSA is a county or a group of contiguous counties containing a city of 50,000 inhabitants or more or an urbanized area of 50,000 with a total metropolitan population of at least 100,000. In addition to the county or counties containing such a city or urbanized area, contiguous counties are included in an SMSA if, according to specified criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city or urbanized area (7).

In the New England States the U.S. Office of Management and Budget uses towns and cities rather than counties as geographic components of SMSA's. The National Center for Health Statistics cannot, however, use the SMSA classification for these States because its data are not coded to identify all towns. Instead, NCHS uses New England County Metropolitan Areas (NECMA's): Made up of county units, these areas are established by the U.S. Office of Management and Budget (7,8).

*Metropolitan and nonmetropolitan counties*—Independent cities and counties included in SMSA's or in NECMA's are

included in data for metropolitan counties; all other counties are classified as nonmetropolitan.

*Population-size groups*—Vital statistics data for cities and certain other urban places in 1988 are classified according to the population enumerated in the 1980 Census of Population. Data are available for individual cities and other urban places of 10,000 or more population. Data for the remaining areas not separately identified are shown in the tables under the heading "balance of area" or "balance of county." For the years 1970–81, classification of areas was determined by the population enumerated in the 1970 Census of Population. Beginning with 1982 data, as a result of changes in the enumerated population between 1970 and 1980, some urban places identified in previous reports are no longer included, and a number of other urban places have been added.

Urban places other than incorporated cities for which vital statistics data are shown in this volume include the following:

- Each town in New England, New York, and Wisconsin and each township in Michigan, New Jersey, and Pennsylvania that had no incorporated municipality as a subdivision and had either 25,000 inhabitants or more or a population of 10,000 to 25,000 and a density of 1,000 persons or more per square mile.
- Each county in States other than those indicated above that had no incorporated municipality within its boundary and had a density of 1,000 persons or more per square mile. (Arlington County, Virginia, is the only county classified as urban under this rule.)
- Each place in Hawaii with 10,000 or more population, as there are no incorporated cities in the State.

Before 1964, places were classified as "urban" or "rural." The Technical Appendixes for earlier years discuss the previous classification system.

### State or country of birth

Mortality statistics by State or country of birth (table 1-33) became available beginning with 1979. State or country of birth of a decedent is assigned to 1 of the 50 States or the District of Columbia; or to Puerto Rico, the Virgin Islands, or Guam—if specified on the death certificate. The place of birth is also tabulated for Canada, Cuba, Mexico, and for the Remainder of the World. Deaths for which information on State or country of birth was unknown, not stated, or not classifiable accounted for a small proportion of all deaths in 1988, about 0.6 percent.

Early mortality reports published by the U.S. Bureau of the Census contained tables showing nativity of parents as well as nativity of decedent. Publication of these tables was discontinued in 1933. Mortality data showing nativity of decedent were again published in annual reports for 1939–41 and for 1950.

### Age

The age recorded on the death record is the age at last birthday. With respect to the computation of death rates, the

age classification used by the U.S. Bureau of the Census is also based on the age of the person in completed years.

For computation of age-specific and age-adjusted death rates, deaths with age not stated are excluded. For life table computation, deaths with age not stated are distributed proportionately.

## Race

For vital statistics in the United States in 1988, deaths are classified by race—white, black, American Indian, Chinese, Hawaiian, Japanese, Filipino, Other Asian or Pacific Islander, and Other. Mortality data for Filipino and Other Asian or Pacific Islander were shown for the first time in 1979.

The white category includes, in addition to persons reported as white, those reported as Mexican, Puerto Rican, Cuban, and all other Caucasians. The American Indian category includes American, Alaskan, Canadian, Eskimo, and Aleut. If the racial entry on the death certificate indicates a mixture of Hawaiian and any other race, the entry is coded to Hawaiian. If the race is given as a mixture of white and any other race, the entry is coded to the appropriate other race. If a mixture of races other than white is given (except Hawaiian), the entry is coded to the first race listed. This procedure for coding the first race listed has been in use since 1969. Before 1969, if the entry for race was a mixture of black and any other race except Hawaiian, the entry was coded to black.

Most of the tables in this volume, however, do not show data for this detailed classification by race. In about half of all the tables the divisions are white, all other (including black), and black separately. In other tables by race, where the main purpose is to isolate the major groups, the classifications are simply white and all other.

*Race not stated*—For 1988 the number of death records for which race was unknown, not stated, or not classifiable was 4,094, or 0.2 percent of the total deaths. Death records with race entry not stated are assigned to a racial designation as follows: If the preceding record is coded white, the code assignment is made to white; if the code is other than white, the assignment is made to black. Before 1964 all records with race not stated were assigned to white except records of residents of New Jersey for 1962–64.

*New Jersey, 1962–64*—New Jersey omitted the race item from its certificates of live birth, death, and fetal death in use in the beginning of 1962. The item was restored during the latter part of 1962. However, the certificate revision without the race item was used for most of 1962 as well as 1963. Therefore figures by race for 1962 and 1963 exclude New Jersey. For 1964, 6.8 percent of the death records in use for residents of New Jersey did not contain the race item.

Adjustments made in vital statistics to take into account the omission of the race item in New Jersey for part of the certificates filed during 1962 through 1964 are described in the Technical Appendix of *Vital Statistics of the United States* for each of those data years.

## Hispanic origin

Mortality statistics for the Hispanic-origin population are based on information for those States and the District of Columbia that included items on the death certificate to identify Hispanic or ethnic origin of decedents. Data for 1988 were obtained from the District of Columbia and the following 29 States: Alabama, Arizona, Arkansas, California, Colorado, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Maine, Mississippi, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York (including New York City), North Carolina, North Dakota, Ohio, Oregon, Rhode Island, Tennessee, Texas, Utah, Washington, and Wyoming.

Hispanic mortality data were published for the first time in 1984. Generally, the reporting States used items similar to one of two basic formats recommended by NCHS. The first format is open-ended to obtain the specific origin or descent of the decedent (for example, Italian, Mexican, Puerto Rican, English, and Cuban). The second format is directed specifically toward the Hispanic population and asks whether the decedent is of Spanish origin. If so, the specific origin—for example, Mexican, Puerto Rican, or Cuban—is to be indicated.

For 1988, mortality data in tables 1-34 and 2-18 are based on deaths to residents of all 29 reporting States and the District of Columbia. In tables 1-35, 1-40, and 1-41, general mortality data for the Hispanic-origin population are based on deaths to residents of 26 reporting States and the District of Columbia whose data were at least 90 percent complete on a place-of-occurrence basis and considered to be sufficiently comparable to be used for analysis. The 26 States are as follows: Alabama, Arizona, Arkansas, California, Colorado, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Maine, Mississippi, Montana, Nebraska, New Jersey, New York (including New York City), North Carolina, North Dakota, Ohio, Oregon, Rhode Island, Texas, Utah, Washington, and Wyoming. Excluded from these tables are data for New Mexico, because the format for the Hispanic item on the New Mexico death certificate departs sufficiently from that of other areas to result in noncomparable data. In addition, in tables 1-34 and 2-18 for New Mexico, no deaths are shown for the category "not stated" origin. Because of the way in which the item on the death certificate for New Mexico is worded, it was not possible to determine whether a blank entry represented a response of "non-Hispanic origin" or of "unknown origin." Accordingly, blank entries were coded to "non-Hispanic." Data for two other States—Nevada and Tennessee—are excluded from tables 1-35, 1-40, and 1-41 because of the large proportion of deaths (in excess of 10 percent) occurring in these States for which Hispanic origin was not stated or was unknown.

In tables 2-19, 2-20, 2-21, and 2-22, the reporting area is based on deaths to residents of 23 reporting States and the District of Columbia whose mortality data for all ages and whose live birth data were at least 90 percent complete on a place-of-occurrence basis and considered to be sufficiently comparable to be used for analysis. The 23 States are as follows: Alabama, Arizona, Arkansas, California, Colorado, Georgia,

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Hawaii, Illinois, Indiana, Kansas, Kentucky, Maine, Mississippi, Montana, Nebraska, New Jersey, New York (including New York City), North Carolina, North Dakota, Ohio, Texas, Utah, and Washington. Data for New Mexico, Nevada, and Tennessee were excluded for the reasons stated above. Oregon and Rhode Island were excluded because their live birth certificates did not include an item to identify Hispanic or ethnic origin. Wyoming was excluded because of the large proportion of live births (in excess of 10 percent) for which Hispanic origin was not stated or was unknown.

The 26 reporting States and the District of Columbia for which general mortality data are shown in this report accounted for about 82 percent of the Hispanic population in the United States in 1980. This included about 91 percent of the Mexican population, 79 percent of the Puerto Rican population, 35 percent of the Cuban population, and 72 percent of the "Other Hispanic" population (9). The 23 reporting States and the District of Columbia for which Hispanic infant mortality data are shown in this report accounted for about 81 percent of the Hispanic population, including about 90 percent of the Mexican population, 79 percent of the Puerto Rican population, 35 percent of the Cuban population, and 71 percent of the "Other Hispanic" population. Accordingly, caution should be exercised in generalizing mortality patterns from the reporting area to the Hispanic-origin population (especially Cubans) of the entire United States. For qualifications regarding infant mortality of the Hispanic-origin population, see "Infant deaths."

### Marital status

Mortality statistics by marital status (table 1-32) were published in 1979 for the first time since 1961. (Previously they had been published in the annual volumes for the years 1949-51 and 1959-61.) Several reports analyzing mortality by marital status have been published, including the special study based on 1959-61 data (10). Reference to earlier reports is given in the appendix of part B of the 1959-61 special study.

Mortality statistics by marital status are tabulated separately for never married, married, widowed, and divorced. Certificates in which the marriage is specified as being annulled are classified as never married. Where marital status is specified as separated or common-law marriage, it is classified as married. Of the 2,112,148 resident death certificates for residents 15 years of age and over in 1988, 12,603 certificates (0.6 percent) had marital status not stated.

### Place of death and status of decedent

Mortality statistics by place of death were published in 1979 for the first time since 1958 (tables 1-29 and 1-30). In addition, mortality data were also available for the first time in 1979 for the status of decedent when death occurred in a hospital or medical center (table 1-29). These data were obtained from the following two items that appear on the U.S. Standard Certificate of Death:

- Item 7c. Hospital or Other Institution—Name (If not in either, give street and number)

- Item 7d. If Hosp. or Inst. Indicate DOA, OP/Emer. Rm., Inpatient (Specify)

All of the States and the District of Columbia have item 7c (or its equivalent) on the death certificate. For all States and the District of Columbia in the Vital Statistics Cooperative Program, NCHS accepts the State definition, classification, or code for hospitals, medical centers, or other institutions.

Table 1-29 shows mortality data for the total of the following 44 States (including New York City) that have item 7d or its equivalent on their death certificates:

Alabama	Nebraska
Alaska	Nevada
Arizona	New Hampshire
Arkansas	New Jersey
Colorado	New Mexico
Connecticut	New York
Florida	North Carolina
Georgia	North Dakota
Hawaii	Ohio
Idaho	Oregon
Illinois	Pennsylvania
Indiana	Rhode Island
Iowa	South Carolina
Kansas	South Dakota
Kentucky	Tennessee
Louisiana	Utah
Maine	Vermont
Michigan	Virginia
Minnesota	Washington
Mississippi	West Virginia
Missouri	Wisconsin
Montana	Wyoming

Effective with data for 1980, the coding of place of death and status of decedent was changed. A new coding category was added: "Death on arrival—hospital, clinic, medical center name not given." Deaths coded to this category are tabulated in table 1-29 as "Dead on arrival" and in table 1-30 as "Not in hospital or medical center." Had the 1979 coding categories been used, these deaths would have been tabulated as "Place unknown."

### Mortality by month and date of death

Deaths by month have been regularly tabulated and published in the annual volume for each year beginning with data year 1900. For 1988, deaths by month are shown in tables 1-20, 1-21, 1-24, 1-31, 2-12, 2-13, 2-14, and 3-9.

Date of death was first published for data year 1972. In addition, unpublished data for selected causes by date of death for 1962 are available from NCHS.

Numbers of deaths by date of death in this volume are shown in table 1-31 for the total number of deaths and for the number of deaths for the following three causes, for which the greatest interest in date of occurrence of death has been expressed: Motor vehicle accidents, Suicide, and Homicide and legal intervention.



These data show the frequency distribution of deaths for the selected causes by day of week. They also make it possible to identify holidays with peak numbers of deaths from specified causes.

### Report of autopsy

Before 1972, the last year for which autopsy data were tabulated was 1958. Beginning in 1972, all registration areas requested information on the death certificate as to whether an autopsy was performed. For 1988, autopsies were reported on 251,095 death certificates, 11.6 percent of the total (table 1-28).

Information as to whether the autopsy findings were used in determining the cause of death was tabulated for 1972-73 for all but nine registration areas and from 1974-77 for all but eight registration areas. The item "autopsy findings used" was deleted from the 1978 U.S. Standard Certificate of Death.

For 10 of the cause-of-death categories shown in table 1-28, autopsies were reported as performed for 50 percent or more of all deaths (Shigellosis and amebiasis; Whooping cough; Meningococcal infection; Acute poliomyelitis; Pregnancy with abortive outcome; Other complications of pregnancy, childbirth, and the puerperium; Motor vehicle accidents; Suicide; Homicide and legal intervention; and All other external causes). There were two other categories for which 40 percent or more of the death certificates reported autopsies. Autopsies were reported for only 7.3 percent of the Major cardiovascular diseases.

### Cause of death

*Cause-of-death classification*—Since 1949, cause-of-death statistics have been based on the underlying cause of death, which is defined as "(a) the disease or injury which initiated the train of events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury" (11).

For each death the underlying cause is selected from an array of conditions reported in the medical certification section on the death certificate. This section provides a format for entering the causes of death in a sequential order. These conditions are translated into medical codes through use of the classification structure and the selection and modification rules contained in the applicable revision of the *International Classification of Diseases (ICD)* published by the World Health Organization (WHO). Selection rules provide guidance for systematically identifying the underlying cause of death. Modification rules are intended to improve the usefulness of mortality statistics by giving preference to certain classification categories over others and/or to consolidate two or more conditions on the certificate into a single classification category.

As a statistical datum, underlying cause of death is a simple, one-dimensional statistic; it is conceptually easy to understand and a well-accepted measure of mortality. It identifies the initiating cause of death and is therefore most useful to public health officials in developing measures to prevent the start of the chain of events leading to death. The rules for selecting the underlying cause of death are included in ICD as a means of standardizing classification, which

contributes toward comparability and uniformity in mortality medical statistics among countries.

*Tabulation lists*—Beginning with data year 1979, the cause-of-death statistics published by NCHS have been classified according to the Ninth Revision of the *International Classification of Diseases (ICD-9)* (11). In addition to specifying that ICD-9 be used, WHO also recommends how the data should be tabulated in order to promote international comparability. The recommended system for tabulating data in the Ninth Revision allows countries to construct their own mortality and morbidity tabulation lists from the rubrics of the WHO Basic Tabulation List as long as rubrics from the WHO mortality and morbidity lists, respectively, are included. This tabulation system for the Ninth Revision is more flexible than that of the Eighth Revision, in which specific lists were recommended for tabulating mortality and morbidity data.

The Basic Tabulation List (BTL) recommended under the Ninth Revision consists of 57 two-digit rubrics that add to the "all causes" total. Within each two-digit rubric, up to 9 three-digit rubrics numbered from 0 to 8 are identified, but these do not add to the total of the two-digit rubric. The two-digit BTL rubrics 01 through 46 provide for the tabulation of nonviolent deaths according to ICD categories 001-799. Rubrics relating to chapter 17 (nature-of-injury causes 47 through 56) are not used by NCHS for selecting underlying cause of death; rather, preference is given to rubrics E47 through E56. The 57th two-digit rubric VO is the Supplementary Classification of Factors Influencing Health Status and Contact with Health Services and is not appropriate for the tabulation of mortality data. The WHO Mortality List, a subset of the titles contained in the BTL, consists of 50 rubrics that are the minimum necessary for the national display of mortality data.

Five lists of causes have been developed for tabulation and publication of mortality data in this volume: The Each-Cause List, List of 282 Selected Causes of Death, List of 72 Selected Causes of Death, List of 61 Selected Causes of Infant Death, and List of 34 Selected Causes of Death. These lists were designed to be as comparable as possible with the NCHS lists more recently in use under the Eighth Revision. However, complete comparability could not always be achieved.

The Each-Cause List is made up of each three-digit category of the WHO Detailed List to which deaths may be validly assigned and most four-digit subcategories. The list is used for tabulation for the entire United States. The published Each-Cause table does not show the four-digit subcategories provided for Motor vehicle accidents (E810-E825); however, these subcategories, which identify persons injured, are shown in the accident tables of this report (section 5). Special fifth-digit subcategories are also used in the accident tables to identify place of accident when deaths from nontransport accidents are shown. These are not shown in the Each-Cause table.

The List of 282 Selected Causes of Death is constructed from BTL rubrics 01-46 and E47-E56. Each of the 56 BTL two-digit titles can be obtained either directly or by combining titles in the List. The three-digit level of the BTL is modified more extensively. Where more detail was desired, categories not shown in the three-digit rubrics were added to the List of

282 Selected Causes of Death. Where less detail was needed, the three-digit rubrics were combined. Moreover, each of the 50 rubrics of the WHO Mortality List can be obtained from the List of 282 Selected Causes of Death.

The List of 72 Selected Causes of Death was constructed by combining titles in the List of 282 Selected Causes of Death. It is used in tables published for the United States and each State, and for standard metropolitan statistical areas.

The List of 61 Selected Causes of Infant Death shows more detailed titles for Congenital anomalies and Certain conditions originating in the perinatal period than any other list except the Each-Cause List.

The List of 34 Selected Causes of Death was created by combining titles in the List of 72 Selected Causes. A table using this list is published for detailed geographic areas.

Beginning with data for 1987, changes were made in these lists to accommodate the introduction in the United States of new category numbers \*042–\*044 for Human immunodeficiency virus infection. The changes are described in the Technical Appendix From *Vital Statistics of the United States, 1987*.

*Effect of list revisions*—The International Lists, or adaptations of them, in use in this country since 1900, have been revised approximately every 10 years so that the disease classifications may be consistent with advances in medical science and with changes in diagnostic practice. Each revision of the International Lists have produced some break in comparability of cause-of-death statistics. Cause-of-death statistics beginning with 1979 are classified by NCHS according to the ICD-9 (11). For a discussion of each of the classifications used with death statistics since 1900, see the Technical Appendix From *Vital Statistics of the United States, 1979*, Volume II, Mortality, Part A, Section 7, pages 9–14.

A dual coding study was undertaken comparing the Ninth and the Eighth Revisions to measure the extent of discontinuity in cause-of-death statistics resulting from introducing the new Revision. A study for the List of 72 Selected Causes of Death and the List of 10 Selected Causes of Infant Death has been published (12). The List of 10 Selected Causes of Infant Death is a basic NCHS tabulation list not used in this volume but used for provisional data in the *Monthly Vital Statistics Report*, another NCHS publication. Comparability studies were also undertaken between the Eighth and Seventh, Seventh and Sixth, and Sixth and Fifth Revisions. For additional information about these studies, see the 1979 Technical Appendix.

*Significant coding changes under the Ninth Revision*—Since the implementation of ICD-9 in the United States, effective with mortality data for 1979, several coding changes have been introduced. The more important changes are discussed below. In early 1983, a change was made in the coding of acquired immunodeficiency syndrome (AIDS) and human immunodeficiency virus (HIV) infection, which affected data from 1981 to 1986. Also effective with data year 1981 was a coding change for poliomyelitis. For data year 1982, a change was made in the definition of child (which affects the classification of deaths to a number of categories, including Child battering and other maltreatment), and in guidelines for coding deaths to the category Child battering and other maltreatment (ICD No. E967). During the calendar year 1985, detailed instructions

for coding motor vehicle accidents involving all-terrain vehicles (ATV's) were implemented to ensure consistency in coding these accidents. Effective with data year 1986, "primary" and "invasive" tumors, unspecified, were classified as "malignant"; these neoplasms had previously been classified to Neoplasms of unspecified nature (ICD-9 No. 239).

Beginning with data for 1987, NCHS introduced new category numbers \*042–\*044 for classifying and coding Human immunodeficiency virus (HIV) infection, formerly referred to as human T-cell lymphotropic virus-III/lymphadenopathy-associated virus (HTLV-III/LAV) infection. The asterisk before the category numbers indicates that these codes are not part of the Ninth Revision. Also changed effective with data year 1987 were coding rules for the conditions "dehydration" and "disseminated intravascular coagulopathy." Detailed discussion of these changes may be found in the Technical Appendix for previous volumes.

*Coding in 1988*—The rules and instructions used in coding the 1988 mortality medical data remained essentially the same as those used for the 1987 data except for minor content changes to the classification for Human immunodeficiency virus (HIV) infection that had initially been implemented for United States mortality data beginning in data year 1987. The basic structure of the HIV classification, the codes and category titles within the classification, and the manner in which the codes may be used remained unchanged for data year 1988.

The 1988 modifications to the HIV classification included the addition of the following four clinical conditions to the "Includes only" notes under several categories: isosporosis (007.2) under \*042.0; diarrhea—noninfectious (558) and infectious (009)—under \*043.3; and lymphoid interstitial pneumonitis (516.8) under \*043.3. In addition, several other terms were considered synonymous with HIV infection, and the following was added under the category \*043.0:

enlarged lymph nodes (785.6) swollen glands (785.6)	}	Due to HIV infection
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Deaths classified to categories \*042–\*044 for 1988 are shown in Tables 1-36, 1-37, 1-38, 1-39, 1-40, 1-41, 2-22, and 2-23, and are also shown in the Each-Cause List in Table 1-23. Deaths classified to these categories are not shown separately in other tables showing cause-of-death data.

*Medical certification*—The use of a standard classification list, although essential for State, regional, and international comparison, does not assure strict comparability of the tabulated figures. A high degree of comparability between areas could be attained only if all records of cause of death were reported with equal accuracy and completeness. The medical certification of cause of death can be made only by a qualified person, usually a physician, a medical examiner, or a coroner. Therefore, the reliability and accuracy of cause-of-death statistics are, to a large extent, governed by the ability of the certifier to make the proper diagnosis and by the care with which he or she records this information on the death certificate.

A number of studies have been undertaken on the quality of medical certification on the death certificate. In general, these have been for relatively small samples and for limited geographic areas. A bibliography prepared by NCHS (13),

covering 128 references over a period of 23 years, indicates that no definitive conclusions have been reached about the quality of medical certification on the death certificate. No country has a well-defined program for systematically assessing the quality of medical certifications reported on death certificates or for measuring the error effects on the levels and trends of cause-of-death statistics.

One index of the quality of reporting causes of death is the proportion of death certificates coded to the Ninth Revision Chapter XVI Symptoms, signs, and ill-defined conditions (ICD-9 Nos. 780–799). Although there are deaths for which it is not possible to determine the cause, this proportion indicates the care and consideration given to the certification by the medical certifier. It may also be used as a rough measure of the specificity of the medical diagnoses made by the certifier in various areas. In 1988, 1.4 percent of all reported deaths in the United States were assigned to ill-defined or unknown causes, a slight decrease from 1.5 in 1987. However, in 1988 this percentage varied among the States from 0.4 percent to 4.1 percent. Although the percent for the United States for all ages combined has generally remained stable since 1979, declines have occurred for persons in age groups 55–64 years and 65–74 years, whereas increases have occurred for persons in age groups under 45 years. However, between 1987 and 1988, the percent decreased for almost all age groups.

*Automated selection of underlying cause of death*—Beginning with data year 1968, NCHS began using a computer system for assigning the underlying cause of death. It has been used every year since. The system is called “Automated Classification of Medical Entities” (ACME).

The ACME system applies the same rules for selecting the underlying cause as would be applied manually by a nosologist; however, under this system, the computer consistently applies the same criteria, thus eliminating intercoder variation in this step of the process.

The ACME computer program requires the coding of all conditions shown on the medical certification. These codes are matched automatically against decision tables that consistently select the underlying cause of death for each record according to the international rules. The decision tables provide the comprehensive relationships between the conditions classified by ICD when applying the rules of selection and modification.

The decision tables were developed by NCHS staff on the basis of their experience in coding underlying causes of death under the earlier manual coding system and as a result of periodic independent validations. These tables are periodically updated to reflect additional new information on the relationship among medical conditions. For data year 1988 these tables were amended to incorporate minor changes to the previously mentioned classification for Human immunodeficiency virus infection (\*042–\*044) that had originally been implemented with data year 1987. Coding procedures for selecting the underlying cause of death by using the ACME computer program, as well as by using the ACME decision tables, are documented in NCHS instruction manuals (14–16).

*Cause-of-death ranking*—Cause-of-death ranking (except for infants) is based on the List of 72 Selected Causes of Death and the category Human immunodeficiency virus infection (HIV

infection) (\*042–\*044); cause-of-death ranking for infants is based on the List of 61 Selected Causes of Infant Death and HIV infection. HIV infection was added to the list of rankable causes effective with data year 1987.

The group titles Major cardiovascular diseases and Symptoms, signs, and ill-defined conditions from the List of 72 Selected Causes of Death are not ranked, and Certain conditions originating in the perinatal period and Symptoms, signs, and ill-defined conditions from the List of 61 Selected Causes of Infant Death are not ranked. In addition, category titles that begin with the words “Other” or “All other” are not ranked to determine the leading causes of death. When one of the titles that represents a subtotal is ranked (such as Tuberculosis), its component parts (in this case, Tuberculosis of respiratory system and Other tuberculosis) are not ranked.

### Maternal deaths

Maternal deaths are those for which the certifying physician has designated a maternal condition as the underlying cause of death. Maternal conditions are those assigned to Complications of pregnancy, childbirth, and the puerperium (ICD-9 Nos. 630–676). In the Ninth Revision, WHO for the first time defined a maternal death as follows:

A maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.

Under the Eighth Revision, maternal deaths were assigned to the category “Complications of pregnancy, childbirth, and the puerperium” (ICDA-8 Nos. 630–678). Although WHO did not define maternal mortality, there was an NCHS classification rule that limited a maternal death to a death within a year after termination of pregnancy from any “maternal cause,” that is, any cause within the range of ICDA-8 Nos. 630–678. This rule applied only if a duration of time for the condition was given. If no duration was specified and the underlying cause of death was a maternal condition, then the duration was assumed to be within a year and the death was coded by NCHS as a maternal death. The change from an under-1-year limitation on duration used in the Eighth Revision to an under-42-days limitation used in the Ninth Revision did not have much effect on the comparability of maternal mortality statistics. However, comparability was affected by the following classification change. Under the Ninth Revision, maternal causes have been expanded to include Indirect obstetric causes (ICD-9 Nos. 647–648). These causes include Infective and parasitic conditions as well as other current conditions in the mother that are classifiable elsewhere but that complicate pregnancy, childbirth, and the puerperium, such as Syphilis, Tuberculosis, Diabetes mellitus, Drug dependence, and Congenital cardiovascular disorders.

Maternal mortality rates are computed on the basis of the number of live births. The maternal mortality rate indicates the likelihood that a pregnant woman will die of maternal causes.

The number of live births used in the denominator is an approximation of the population of pregnant women who are at risk of a maternal death.

### Infant deaths

**Age**—Infant death is defined as a death under 1 year of age. The term excludes fetal deaths. Infant deaths are usually divided into two categories according to age, neonatal and postneonatal. Neonatal deaths are those that occur during the first 27 days of life; postneonatal deaths are those that occur between 28 days and 1 year of age. It has generally been believed that different factors influencing the child's survival predominate in these two periods: Factors associated with prenatal development, heredity, and the birth process were considered dominant in the neonatal period; environmental factors, such as nutrition, hygiene, and accidents, were considered more important in the postneonatal period. Recently, however, the distinction between these two periods has blurred due in part to advances in neonatology, which have enabled more very small premature infants to survive the neonatal period.

**Rates**—Infant mortality rates shown in section 2 and section 8 are the most commonly used index for measuring the risk of dying during the first year of life; they are calculated by dividing the number of infant deaths in a calendar year by the number of live births registered for the same period and are presented as rates per 1,000 or per 100,000 live births. Infant mortality rates use the number of live births in the denominator to approximate the population at risk of dying before the first birthday. This measure is an approximation because some live births will not have been exposed to full year's risk of dying and some of the infants who die during a year will have been born in the previous year. The error introduced in the infant mortality rate by this inexactness is usually small, especially when the birth rate is relatively constant from year to year (17,18). Other sources of error in the infant mortality rate have been attributed to differences in applying the definitions for infant death and fetal death when registering the event (19,20).

In contrast to infant mortality rates based on live births, infant death rates shown in Section 1 are based on the estimated population under 1 year of age. Infant death rates, which appear in tabulations of age-specific death rates, are calculated by dividing the number of infant deaths in a calendar year by the estimated midyear population of persons under 1 year of age and are presented as rates per 100,000 population in this age group. Patterns and trends in the infant death rate may differ somewhat from those of the more commonly used "infant mortality rate," mainly because of differences in the nature of the denominator and in the time reference period. Whereas the population denominator for the infant death rate is estimated using data on births, infant deaths, and migration for the 12-month period of July through June, the denominator for the infant mortality rate is a count of births occurring during the 12 months of January through December. The difference in the time reference period can result in different trends between the two indices during periods when birth rates are moving up or down markedly.

The infant death rate is also subject to greater imprecision than is the infant mortality rate because of problems of enumerating and estimating the population under 1 year of age (20).

**Race**—Infant mortality rates for specified races other than white or black may be understated, based on results of studies in which race on the birth and death certificates for the same infant were compared (21). In the computation of regular race-specific infant mortality rates, the race item for the numerator comes from the death certificate, and for the denominator, from the birth certificate. Understatement may arise because of possible inconsistencies in reporting race between the death and birth certificates. Differences exist in the nature of reporting and processing race on these two vital records. With respect to reporting, race of parents is reported on the birth certificate by the mother at the time of delivery; whereas on the death certificate, race of the deceased infant is reported by the funeral director based on observation or on information supplied by an informant, such as a parent. With respect to processing, race of infant at birth is coded using coding rules that take account of the race of each parent (see the Technical Appendix From *Vital Statistics of the United States, 1988*, Volume I, Natality, section titled "Race or national origin"); whereas race of infant decedent is coded directly from the race item as reported on the death certificate. There is a tendency for race of infant that was reported, for example, as American Indian or other specific race other than white at the time of birth to be reported as white at the time of death, resulting in understatement of infant mortality rates for smaller race groups.

Estimates are made below of the degree of reporting bias in race-specific infant mortality rates by comparing two rates that differ in terms of the source of information about race of the decedent (22,23). The two rates are as follows: the birth cohort rate, based on data from the national linked birth and infant death data set, and the period rate, based on mortality and natality data for the same year(s). For the birth cohort, the race is that which is reported at the time of birth for the deceased infant and is the standard against which the race that is reported at the time of death is compared.

The comparison of cohort and period rates is affected slightly by small differences in the events included in the numerators of the two rates. Thus, the numerator of the cohort rate is comprised of infant deaths to the cohort of infants born in a calendar year, whereas the numerator of the period rate is comprised of infant deaths that occur in the calendar year.

Based on a comparison of infant mortality rates from the linked data set for the birth cohorts of 1983–85 with rates from the annual files for the 1983–85 period, bias in the rates for the two major race groups—the white and the black populations—is small. In contrast, period rates for the smaller race groups are estimated to be understated by between 21 and 44 percent, shown in table A.

Because of these differences in race-specific infant mortality rates, one should use, if possible, data from the national linked birth and infant death data set to measure infant mortality for the smaller race groups.

**Hispanic origin**—Infant mortality rates for the Hispanic-origin population are based on numbers of resident infant deaths reported to be of Hispanic origin (see section "Hispanic

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**Table A. Infant mortality rates by race for period 1983–85 and for birth cohorts, 1983–85; and percent difference between period and birth cohort rates, by race: United States**  
 [Rates per 1,000 live births in specified group]

Race	Period 1983–85	Birth cohorts 1983–85	
		Rate	Percent difference <sup>1</sup>
All races	10.9	10.6	-2.67
White	9.5	9.0	-5.01
Black	18.6	18.4	-1.01
Indian	9.7	13.1	25.70
Chinese	5.7	7.2	21.01
Japanese	4.3	6.6	34.45
Filipino	4.7	8.3	43.15
Other Asian	6.9	8.9	23.15
Other nonwhite	6.7	11.8	43.59

<sup>1</sup>Percent difference = (1 - period rate/cohort rate) x 100

origin”) and numbers of resident live births by Hispanic origin of mother for the 23 reporting States and the District of Columbia. In computing infant mortality rates, deaths and live births of unknown origin are not distributed among the specified Hispanic and non-Hispanic groups. Because the percent of infant deaths of unknown origin for 1988 was 6.7 percent and the percent of live births of unknown origin was 2.8 percent, infant mortality rates by specified Hispanic origin and race for non-Hispanic origin are underestimated. In addition, infant mortality rates for specific Hispanic-origin groups are believed to include biases similar to those described above for specified races; however, precise estimates are not yet available.

Small numbers of infant deaths for specific Hispanic-origin groups can result in infant mortality rates subject to relatively large random variation (see section “Random variation in numbers of deaths, death rates, and mortality rates and ratios”).

*Tabulation list*—Causes of death for infants are tabulated according to a list of causes that is different from the list of causes for the population of all ages, except for the Each-Cause List. (See section “Cause-of-death classification.”)

*California*—Data on age at death for California, as shown in table 2-11, are biased in the categories 1–23 hours and 1 day because of processing errors that affected selected infants who died within 24 hours after birth, for each of the years 1985 through 1988. The degree of bias can be estimated by comparing the percents of infant deaths in these two age groups in the period before the error occurred, 1983–84, with the subsequent period, 1985–88, as follows:

Age of infant	1983–84	1985–88
	Percent distribution	
All infants	100.00	100.00
1-23 hours	27.72	19.58
1 day	5.49	10.51
All other ages	66.80	69.91

Beginning with 1985 data, California provided NCHS with computer tapes of precoded mortality data through the Vital

Statistics Cooperative Program (VSCP); whereas prior to 1985, data from the State of California were based on information coded by NCHS from copies of original death certificates. The effect of these errors on national data for the years 1985–88, shown in tables 2-2, 2-3, 2-12, and 2-16, is negligible. The problem has been identified and corrected for subsequent years.

**Fetal deaths**

In May 1950, the World Health Organization (WHO) recommended that the following definition of fetal death be adopted for international use:

Death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles (24).

The term “fetal death” was defined on an all-inclusive basis to end confusion arising from use of such terms as stillbirth, abortion, and miscarriage.

Shortly thereafter, this definition of fetal death was adopted by the National Center for Health Statistics (NCHS) as the nationally recommended standard. Currently all registration areas except Puerto Rico have definitions similar to the standard definition (25). Puerto Rico has no formal definition.

As another step toward increasing the comparability of data on fetal deaths for different countries, WHO recommended that for statistical purposes fetal deaths be classified as early, intermediate, and late. These groups are defined as follows:

- Less than 20 completed weeks of gestation (early fetal deaths) . . . . . Group I
- 20 completed weeks of gestation but less than 28 (intermediate fetal deaths) . . . . . Group II
- 28 completed weeks of gestation and over (late fetal deaths) . . . . . Group III
- Gestation period not classifiable in groups I, II, and III . . . . . Group IV

Note that in table 3-13, group IV consists of fetal deaths with gestation not stated but presumed to be 20 weeks or more.

Until 1939 the nationally recommended procedure for registration of a fetal death required the filing of both a live-birth and a death certificate. In 1939 a separate Standard Certificate of Stillbirth (fetal death) was created to replace the former procedure. This was revised in 1949, 1955, 1956, and 1968. In 1978 the Standard Certificate of Fetal Death was replaced by the Standard Report of Fetal Death (figure 7-B).

The 1977 revision of the *Model State Vital Statistics Act and Model State Vital Statistics Regulations* (26) recommended that spontaneous fetal deaths at a gestation of 20 weeks or more or

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a weight of 350 grams or more and all induced terminations of pregnancy regardless of gestational age be reported and further that they be reported on separate forms. These forms are to be considered legally required statistical reports rather than legal documents.

Beginning with 1970 fetal deaths, procedures were implemented to separate reports of spontaneous fetal deaths from those of induced terminations of pregnancy. These procedures were implemented because the health implications are different for spontaneous fetal deaths than for induced terminations of pregnancy. These procedures are still in use.

*Comparability and completeness of data*—Registration area requirements for reporting fetal deaths vary. Most of these areas require reporting of fetal death at gestations of 20 weeks or more. Table B shows the minimum period of gestation required by each State for fetal-death reporting. There is substantial evidence that not all fetal deaths for which reporting is required are reported (27).

Underreporting of fetal deaths is most likely to occur in the earlier part of the required reporting period for each State. Thus, for States requiring reporting of all periods of gestation, fetal deaths occurring at younger gestational ages are less completely reported. The reporting of fetal deaths at 20–23 weeks of gestation may be more complete for those States that report fetal deaths at all periods of gestation than for others.

To maximize the comparability of data by year and by State, most of the tables in section 3 are based on fetal deaths occurring at gestations of 20 weeks or more. These tables also include fetal deaths for which gestation is not stated for those States requiring reporting at 20 weeks or more only. Beginning with 1969, fetal deaths of not-stated gestation were excluded for States requiring reporting of all products of conception except those with a stated birth weight of 500 grams or more. In 1988 this rule was applied to the following States: Colorado, Georgia, Hawaii, New York (including New York City), Rhode Island, and Virginia. Each year there are some exceptions to this procedure.

The data in table 3-3 include only fetal deaths to residents of selected areas in the United States that reported all periods of gestation. The areas are Colorado, Georgia, Hawaii, New York (including New York City), Rhode Island, and Virginia; excluded are fetal deaths to residents of Maine.

*Arkansas*—Since 1971, Arkansas has been using two reporting forms for fetal deaths: A confidential Spontaneous Abortion form that is not sent to the National Center for Health Statistics (NCHS) and a Fetal Death Certificate that is. During the period 1971 through 1980, it is believed that most spontaneous fetal deaths of less than 20 weeks' gestation were reported on the confidential form and, therefore, were not reported to NCHS. During the period 1981 through 1983, Arkansas specified that fetal deaths of less than 28 weeks' gestation or weighing less than 1,000 grams could be reported on the confidential form; beginning with 1984 data, the State specified that fetal deaths of 20 weeks' gestation or weighing 500 grams be reported on the Fetal Death Certificate. Because of these changes, the comparability of counts of early fetal deaths may be affected. In particular, counts of fetal deaths at 20 to 27 weeks for 1981–83 were not comparable between

Arkansas and other reporting areas or with Arkansas data for 1984–88. It is believed that reporting has improved but is still not comparable with data for 1980 and earlier years.

*Maine*—Maine uses two reporting forms for fetal deaths: A Report of Abortion (Spontaneous and Induced) and a Report of Fetal Death. Most spontaneous fetal deaths at less than 20 weeks' gestation are reported on the Report of Abortion, and, therefore, are excluded from fetal death counts in this volume.

*Missouri*—Beginning in 1984, Missouri changed its reporting requirements for spontaneous fetal deaths from "after 20 weeks" to "after 20 weeks or a weight of 350 grams or more."

*Wisconsin*—Beginning in 1986, Wisconsin changed its reporting requirements for spontaneous fetal deaths from "20 weeks" to "20 weeks or 350 grams."

*Period of gestation*—The period of gestation is the number of completed weeks elapsed between the first day of the last normal menstrual period (LMP) and the date of delivery. The first day of the LMP is used as the initial date because it can be more accurately determined than the date of conception, which usually occurs 2 weeks after the LMP. Data on period of gestation are computed from information on "date of delivery" and "date last normal menses began." If "date last normal menses began" is not on the record or the calculated gestation falls beyond a duration considered biologically plausible, "gestation in weeks" or "Physician's estimate of gestation" is used. When the period of gestation is reported in months on the report, it is allocated to gestational intervals in weeks, as follows:

- 1–3 months to under 16 weeks
- 4 months to 16–19 weeks
- 5 months to 20–23 weeks
- 6 months to 24–27 weeks
- 7 months to 28–31 weeks
- 8 months to 32–35 weeks
- 9 months to 40 weeks
- 10 months and over to 43 weeks and over

All areas reported LMP in 1988 except Delaware, New Mexico, Puerto Rico, and South Dakota.

*Birth weight*—Most of the 55 registration areas do not specify how weight should be given, that is, in pounds and ounces or in grams. In the tabulation and presentation of birth weight data, the metric system (grams) has been used to facilitate comparison with other data published in the United States and internationally. Birth weight specified in pounds and ounces is assigned the equivalent of the gram intervals, as follows:

- Less than 350 grams = 0 lb 12 oz or less
- 350–499 grams = 0 lb 13 oz – 1 lb 1 oz
- 500–999 grams = 1 lb 2 oz – 2 lb 3 oz
- 1,000–1,499 grams = 2 lb 4 oz – 3 lb 4 oz
- 1,500–1,999 grams = 3 lb 5 oz – 4 lb 6 oz
- 2,000–2,499 grams = 4 lb 7 oz – 5 lb 8 oz
- 2,500–2,999 grams = 5 lb 9 oz – 6 lb 9 oz
- 3,000–3,499 grams = 6 lb 10 oz – 7 lb 11 oz
- 3,500–3,999 grams = 7 lb 12 oz – 8 lb 13 oz

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Table B. Period of gestation at which fetal-death reporting is required: Each reporting area, 1988

Area	All periods of gestation	16 weeks	20 weeks	20 weeks or 350 grams	20 weeks or 400 grams	20 weeks or 500 grams	5 months	350 grams	500 grams
Alabama			X						
Alaska			X						
Arizona			<sup>1</sup> X						
Arkansas	X								
California			X						
Colorado	X								
Connecticut			X						
Delaware			X						
District of Columbia						X			
Florida			X						
Georgia	X								
Hawaii	X								
Idaho				X					
Illinois			X						
Indiana			X						
Iowa			X						
Kansas								X	
Kentucky				X					
Louisiana				X					
Maine	X								
Maryland			<sup>2</sup> X						
Massachusetts				X					
Michigan					X				
Minnesota			X						
Mississippi				X					
Missouri				X					
Montana			X						
Nebraska			X						
Nevada			X						
New Hampshire				X					
New Jersey			X						
New Mexico									X
New York									
New York excluding New York City	X								
New York City	X								
North Carolina			X						
North Dakota			X						
Ohio			X						
Oklahoma			X						
Oregon			<sup>3</sup> X						
Pennsylvania		X							
Rhode Island	X								
South Carolina				X					
South Dakota									X
Tennessee									<sup>4</sup> X
Texas			X						
Utah			X						
Vermont			<sup>5</sup> X						
Virginia	X								
Washington			X						
West Virginia			X						
Wisconsin				X					
Wyoming			X						

<sup>1</sup>If gestational age is unknown, weight of 350 grams or more.

<sup>2</sup>If gestational age is unknown, weight of 500 grams or more.

<sup>3</sup>If gestational age is unknown, weight of 400 grams or more, or crown-heel length of 28 centimeters or more.

<sup>4</sup>If weight is unknown, 22 completed weeks' gestation or more.

<sup>5</sup>If gestational age is unknown, weight of 400 or more grams, 15 or more ounces.



4,000–4,499 grams = 8 lb 14 oz – 9 lb 14 oz  
 4,500–4,999 grams = 9 lb 15 oz – 11 lb 0 oz  
 5,000 grams or more = 11 lb 1 oz or more

With the introduction of ICD-9, the birth-weight classification intervals for perinatal mortality statistics were shifted downward by 1 gram, as shown above. Previously, the intervals were, for example, 1,001–1,500; 1,501–2,000; and so forth.

**Race**—The race of the fetus is ordinarily classified based on the race of the parents. If the parents are of different races, the following rules apply: When only one parent is white, the fetus is assigned the other parent's race. When neither parent is white, the fetus is assigned the father's race, with one exception: If the mother is Hawaiian or part-Hawaiian, the fetus is classified as Hawaiian.

When the race of one parent is missing or ill defined, the race of the other determines that of the fetus. When the race of both parents is missing, the race of the fetus is allocated to the specific race of the fetus on the preceding record.

**Total-birth order**—Total-birth order refers to the sum of the live births and other terminations (including both spontaneous fetal deaths and induced terminations of pregnancy) that a woman has had, including the fetal death being recorded. For example, if a woman has previously given birth to two live babies and to one born dead, the next fetal death to occur is counted as number four in total-birth order.

In the 1978 revision of the Standard Report of Fetal Death, total-birth order is calculated from four items on pregnancy history: Number of previous live births, now living; number of previous live births, now dead; number of other terminations before 20 weeks; and number of other terminations after 20 weeks.

All registration areas use the two standard items pertaining to the number of previous live births. Most areas use the two standard items pertaining to the number of "other terminations" before and after 20 weeks' gestation, but some areas use other criteria. Total-birth order for all areas is calculated from the sum of available information. Thus, information on total-birth order may not be completely comparable among the registration areas.

**Marital status**—Table 3-4 shows fetal deaths and fetal-death ratios by mother's marital status. States excluded from this table are as follows: California, Connecticut, Maryland, Michigan, New York (including New York City), Ohio, Texas, and Vermont. Because live births comprise the denominator of the ratio, marital status must also be reported for mothers of live births. Marital status of the mother of the live birth is inferred for States that did not report it on the birth certificate.

There are no quantitative data on the characteristics of unmarried women who misreport their marital status or who fail to register fetal deaths. Underreporting may be greater for the unmarried group than for the married group.

**Age of mother**—The fetal-death report asks for the mother's "age (at time of delivery)," and the ages are edited in NCHS for upper and lower limits. When mothers are reported to be under 10 years of age or 50 years of age and over, the age of the mother is considered not stated and is assigned as follows: Age on all fetal-death records with age of mother not stated is allocated

according to the age appearing on the record previously processed for a mother of identical race and having the same total-birth order (total of live births and other terminations).

## Perinatal mortality

**Perinatal definitions**—Beginning with data year 1979, perinatal mortality data for the United States and each State have been published in section 4. The World Health Organization, in its ICD-9, recommends that "national perinatal statistics should include all fetuses and infants delivered weighing at least 500 grams (or when birth weight is unavailable, the corresponding gestational age (22 weeks) or body length (25 cm crown-heel)), whether alive or dead...." It further recommends that "countries should present, solely for international comparisons, 'standard perinatal statistics' in which both the numerator and denominator of all rates are restricted to fetuses and infants weighing 1,000 grams or more (or, where birth weight is unavailable, the corresponding gestational age (28 weeks) or body length (35 cm crown-heel))." Because birth weight and gestational age are not reported on the death certificate in the United States, NCHS was unable to recommend adopting these definitions. Three definitions of perinatal mortality are currently used by NCHS: Perinatal Definition I, generally used for international comparisons, which includes fetal deaths at 28 weeks' gestation or more and infant deaths of less than 7 days; Perinatal Definition II, which includes fetal deaths at 20 weeks' gestation or more and infant deaths of less than 28 days; and Perinatal Definition III, which includes fetal deaths at 20 weeks' gestation or more and infant deaths of less than 7 days.

Variations in fetal death reporting requirements and practices have implications for comparing perinatal rates among States. Because reporting is generally poorer near the lower limit of the reporting requirement, States that require reporting of all products of pregnancy regardless of gestation are likely to have more complete reporting of fetal deaths at 20 weeks or more than are other States. The larger number of fetal deaths reported by these "all periods" States may result in higher perinatal death rates than in States whose reporting is less complete. Accordingly, reporting completeness may account, in part, for differences among the State perinatal rates, particularly differences for Definitions II and III, which use data for fetal deaths at 20–27 weeks.

**Not stated**—Fetal deaths with gestational age not stated are presumed to be of 20 weeks' gestation or more if the State requires reporting of all fetal deaths at a gestational age of 20 weeks or more or the fetus weighed 500 grams or more in those States requiring reporting of all fetal deaths regardless of gestational age. For Definition I, fetal deaths at a gestation not stated but presumed to have been of 20 weeks or more are allocated to the category 28 weeks or more, according to the proportion of fetal deaths with stated gestational age that falls into that category. For Definitions II and III, fetal deaths at a presumed gestation of 20 weeks or more are included with those at a stated gestation of 20 weeks or more.



For all three definitions, following the distribution of gestation not stated described above, fetal deaths with not-stated sex are allocated within gestational age groups on the basis of the distribution of stated cases. The allocation of not-stated gestational age and sex for fetal deaths is made individually for each State, for metropolitan and nonmetropolitan areas, and separately for the United States as a whole. Accordingly, the sum of perinatal deaths for the areas according to Definition I may not equal the total number of perinatal deaths for the United States.

## QUALITY OF DATA

### Completeness of registration

All States have adopted laws that require the registration of births and deaths and the reporting of fetal deaths. It is believed that more than 99 percent of the births and deaths occurring in this country are registered.

Reporting requirements for fetal deaths vary somewhat from State to State (see "Comparability and completeness of data"). Overall reporting is not as complete for fetal deaths as for births and deaths, but it is believed to be relatively complete for fetal deaths at a gestation of 28 weeks or more. National statistical data on fetal deaths include only fetal deaths occurring at a stated or presumed gestation of 20 weeks or more.

### Massachusetts data

The 1964 statistics for deaths exclude approximately 6,000 events registered in Massachusetts, primarily to residents of that State. Microfilm copies of these records were not received by NCHS. Figures for the United States and the New England Division are also somewhat affected.

### Alabama data

The 1988 statistics for deaths show no deaths assigned to the City of Prattville in Autauga County. The death records that should have been assigned to this area were instead assigned to the Balance of County due to a processing error.

### Quality control procedures

*Demographic items on the death certificate*—As previously indicated, for 1988 the mortality data for these items were obtained from two sources: photocopies of the original certificates furnished by the Virgin Islands and Guam and records on data tape furnished by the 50 States, the District of Columbia, New York City, and Puerto Rico. For the Virgin Islands and Guam, which sent only copies of the original certificates, the demographic items were coded for 100 percent of the death certificates. The demographic coding for 100 percent of the certificates was independently verified.

As part of the quality control procedures for mortality data, each registration area goes through a calibration period, during which it must achieve the specified error tolerance level of 2 percent per item for 3 consecutive months, based on independent verification by NCHS of a 50-percent sample of that area's records. Once the area has achieved the required error

tolerance level, a sample of 70–80 records per month is used to monitor quality of coding. All areas providing data on computer tapes prior to 1988 have achieved the specified error tolerance; accordingly, the demographic items on about 70–80 records per area per month were independently verified by NCHS. The estimated average error rate for all demographic items in 1988 was 0.25 percent.

These verification procedures involve controlling for two types of error (coding and entering into the data record tape) at the same time, and the error rates are a combined measure of both types. It may be assumed that the entering errors are randomly distributed across all items on the record, but this assumption cannot be made as readily for coding errors. Although systematic errors in coding infrequent events may escape detection during sample verification, it is probable that some of these errors were detected during the initial period when 50 percent of the file was being verified, thus providing an opportunity to retrain the coders.

*Medical items on the death certificate*—As is true for demographic data, mortality medical data are subject to quality control procedures to control for errors of both coding and data entry. Each of the 27 registration areas that in 1988 furnished NCHS with coded medical information according to NCHS specifications first had to qualify for sample verification. During an initial calibration period, the area had to demonstrate that its staff could achieve a specified error tolerance level of less than 5 percent for coding all medical items. After the area had achieved the required error tolerance level, a sample of 70–80 records per month was used to monitor quality of medical coding. For these 27 States, the average coding error rate in 1988 was estimated at just over 4 percent.

For the remaining 23 States, the District of Columbia, New York City, Puerto Rico, the Virgin Islands, and Guam, NCHS coded the medical items for 100 percent of the death records. A 1-percent sample of the records was independently coded for quality control purposes. The estimated average error rate for these areas was about 3 percent.

The ACME system for selecting the underlying cause of death through computer application contributes to the quality control of medical items on the death certificate. (See section "Automated selection of underlying cause of death.")

*Demographic items on the report of fetal death*—For 1988, all data on fetal deaths, except for New York State (excluding New York City), were coded under contract by the U.S. Bureau of the Census. Coding and entering of information on data tapes were verified on a 100-percent basis because of the relatively small number of records involved.

*Other control procedures*—After coding and entering on data tape are completed, record counts are balanced against control totals for each shipment of records from a registration area. Editing procedures ensure that records with inconsistent or impossible codes are modified. Inconsistent codes are those, for example, indicating a contradiction between cause of death and age or sex of the decedent. Records so identified during the computer editing process are either corrected by reference to the source record or adjusted by arbitrary code assignment (28). Further, conditions specified on a list of infrequent or rare causes of death are confirmed by the certifier or a State Health

Officer. All subsequent operations in tabulating and in preparing tables are verified during the computer processing or by statistical clerks.

### Estimates of errors arising from 50-percent sample for 1972

Death statistics for 1972 in this report (excluding fetal-death statistics) are based on a 50-percent sample of all deaths occurring in the 50 States and the District of Columbia. A description of the sample design and a table of the percent errors of the estimated numbers of deaths by size of estimate and total deaths in the area are shown in the Technical Appendix From *Vital Statistics of the United States, 1972*, Volume II, Mortality, Part A.

## COMPUTATION OF RATES AND OTHER MEASURES

### Population bases

The population bases from which death rates shown in this report are computed are prepared by the U.S. Bureau of the Census. Rates for 1940, 1950, 1960, 1970, and 1980 are based on the population enumerated as of April 1 in the censuses for those years. Rates for all other years use the estimated midyear (July 1) population. Death rates for the United States, individual States, and SMSA's are based on the total resident populations of the respective areas. Except as noted, these populations exclude the Armed Forces abroad but include the Armed Forces stationed in each area.

The resident populations of the birth- and death-registration States for 1900-32 and of the United States for 1900-88 are shown in table 7-1. In addition, the population including Armed Forces abroad is shown for the United States. Table C lists the sources for these populations.

*Population estimates for 1988*—The population of the United States estimated by age, race, and sex for 1988 is shown in table 7-2, and the population for each State by broad age groups follows in table 7-3. Population estimates for 1984-88 incorporate new estimation procedures for net migration and net undocumented immigration. The 1988 estimates are comparable with those for 1984-87 but are not strictly comparable with the postcensal estimates for 1981-83 shown in tables 7-2 and 7-3 of *Vital Statistics of the United States*, Volume II, for those years. Although the death rates and estimates of life expectancy for 1984-88 are not strictly comparable with those for previous years, the trends for the total population and most age-race-sex groups are not substantially affected. For additional details, see the Technical Appendix From *Vital Statistics of the United States, 1984*, Volume II, and the report of the U.S. Bureau of the Census (29). Population data by race are consistent with the modified (see below) 1980 population by race.

*Population for 1980*—The population of the United States by age, race, and sex and the population for each State by age are shown in tables 7-2 and 7-3, respectively, of *Vital Statistics of the United States, 1980*, Volume II. The figures by race have been modified as described below.

The racial counts in the 1980 census are affected by changes in reporting practices, particularly of the Hispanic population, and in coding and classifying. One particular change created a major inconsistency between the 1980 census data and historical data series, including censuses and vital statistics. About 40 percent of the Hispanic population counted in 1980, more than 5.8 million persons, did not mark one of the specified races listed on the census questionnaire but instead marked the "Other" category.

In the 1980 census, coding procedures were modified for persons who marked "Other" race and wrote in national origin designation of a Latin American country or a specific Hispanic-origin group in response to the racial question. These persons remained in the "Other" racial category in 1980 census data; in previous censuses and in vital statistics, such responses had almost always been coded into the "White" category.

To maintain comparability, the "Other" racial category in the 1980 census was reallocated to be consistent with previous procedures. Persons who marked the "Other" racial category and reported any Spanish origin on the Spanish origin question (5,840,648 persons) were distributed to white and black races in proportion to the distribution of persons of Hispanic origin who actually reported their race as "White" or "Black." This was done for each age-sex group.

As a result of this procedure, 5,705,155 persons (98 percent) were added to the white population and 135,493 persons (2 percent) to the black population. Persons who marked the "Other" racial category and reported that they were not of Spanish origin (916,338 persons) were distributed as follows: 20 percent in each age-sex group were added to the "Asian and Pacific Islander" category (183,268 persons), and 80 percent were added to the "White" category (733,070 persons). The count of American Indians, Eskimos, and Aleuts was not affected by these procedures. Unpublished tabulations of these modified census counts were obtained from the U.S. Bureau of the Census and used to compute the rates for this volume.

*Population estimates for 1971-79*—Death rates in this volume for 1971-79 used revised population estimates that are consistent with the 1980 census levels. The 1980 census enumerated approximately 5.5 million more persons than had previously been estimated for April 1, 1980 (30). These revised estimates for the United States by age, race, and sex are published by the U.S. Bureau of the Census in *Current Population Reports*, Series P-25, Number 917. Unpublished revised estimates for States were obtained from the U.S. Bureau of the Census. For Puerto Rico, the Virgin Islands, and Guam, revised estimates are published in *Current Population Reports*, Series P-25, Number 919.

*Population estimates for 1961-69*—Death rates in this volume for 1961-69 are based on revised estimates of the population and thus may differ slightly from rates published before 1976. The rates shown in tables 1-1 and 1-2, the life table values in table 6-5, and the population estimates in table 7-1 for each year in the period 1961-69 have been revised to reflect modified population bases, as published in the U.S. Bureau of the Census, *Current Population Reports*, Series P-25, Number 519. The data shown in table 1-10 for 1961-69 have not been revised.

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Table C. Sources for resident population and population including Armed Forces abroad: Birth- and death-registration States, 1900-1932, and United States, 1900-1988

Year	Source
United States	
1988 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 1045, 1990.
1986-87 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 1022, Mar. 1988.
1985 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 1000, Feb. 1987.
1984 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 985, Apr. 1986.
1983 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 965, Mar. 1985.
1982 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 949, May 1984.
1981 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 929, May 1983.
1980 -----	U.S. Bureau of the Census, <i>U.S. Census of Population: 1980, Number of Inhabitants</i> , PC80-1A1, United States Summary, 1983.
1971-79 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 917, July 1982.
1970 -----	U.S. Bureau of the Census, <i>U.S. Census of Population: 1970, Number of Inhabitants</i> Final Report, PC(1)-A1, United States Summary, 1971.
1961-69 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 519, April, 1974.
1960 -----	U.S. Bureau of the Census, <i>U.S. Census of Population: 1960, Number of Inhabitants</i> , PC(1)-A1, United States Summary, 1964.
1951-59 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 310, June 30, 1965.
1940-50 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 499, May 1973.
1930-39 -----	U.S. Bureau of the Census, <i>Current Population Reports</i> , Series P-25, No. 499, May 1973, and National Office of Vital Statistics, <i>Vital Statistics Rates in the United States, 1900-1940, 1947</i> .
1920-29 -----	National Office of Vital Statistics, <i>Vital Statistics Rates in the United States, 1900-1940, 1947</i> .
1917-19 -----	Same as for 1930-39
1900-16 -----	Same as for 1920-29

*Rates and ratios based on live births*—Infant and maternal mortality rates, and fetal death and perinatal mortality ratios, are computed on the basis of the number of live births. Fetal death and perinatal mortality rates are computed on the basis of the number of live births and fetal deaths. Counts of live births are published annually in *Vital Statistics of the United States*, Volume I, Natality.

*New Jersey*—As previously indicated, data by race are not available for New Jersey for 1962 and 1963. Therefore, for 1962 and 1963, NCHS estimated a population by age, race, and sex that excluded New Jersey for rates shown by race. The methodology used to estimate the revised population excluding New Jersey is discussed in the Technical Appendixes of the 1962 and 1963 volumes.

**Net census undercount**

Just as the underenumeration of deaths and the misreporting of demographic characteristics on the death certificate can introduce error into the annual rates, so can enumeration errors in the latest decennial census. This is because annual population estimates for the postcensal interval, which are used in the denominator for calculating death rates, are computed using the decennial census count as a base (29). Net census undercount is the result of miscounting and misreporting of demographic characteristics such as age. Age-specific death rates are affected by both the net census undercount and the misreporting of age on the death certificate (31). To the extent that the net undercount is substantial and that it varies among subgroups and geographic areas, it may have important consequences for vital statistics measures.

Although death rates based on a population adjusted for net census undercount may be more accurate than rates based on an unadjusted population, rates in this volume are not

adjusted; rather, they are computed using population estimates that preserve the age pattern of the net census undercount across the postcensal interval. Thus, it is important to consider the possible impact of net census undercount on death rates.

The U.S. Bureau of the Census has conducted extensive research on the completeness of coverage of the U.S. population (including underenumeration and misstatement of age, race, and sex) in the last four decennial censuses—1950, 1960, 1970, and 1980. From this work have come estimates of the national population that was not counted by age, race, and sex (32, 33). The reports for 1980 include estimates of net census undercount using alternative methodological assumptions for age, race, and sex subgroups of the national population (34). These studies indicate that, although coverage was improved over previous censuses, there was differential coverage in the 1980 census among the population subgroups; that is, some age, race, and sex groups were more completely counted than others.

Net census undercounts can affect levels of the observed vital rates, differences among groups, and levels and group differences shown by summary measures such as age-adjusted death rates and life expectancy.

*Levels and differentials*—If adjustments were made for net census undercount, the size of denominators of the death rates generally would increase and the rates, therefore, would decrease. The adjusted rates for 1980 can be computed by multiplying the reported rates by ratios of the census-level resident population to the resident population adjusted for the estimated net census undercount (table 7-4). A ratio of less than 1.0 indicates a net census undercount and, when applied, results in a corresponding decrease in the death rate. A ratio greater than 1.0—indicating a net census overcount—multiplied by the reported rate results in an increase in the death rate.

Coverage ratios for all ages show that, in general, females were more completely enumerated than males and the white population more completely than the population of all other races in the 1980 Census of Population. The black population was undercounted relative to the total population of all other races.

For the total population, underenumeration varied by age group, with the greatest differences found for persons aged 80–84 and 85 years and over. All other age groups were overcounted or undercounted by less than 3 percent.

Among the age-sex-race groups, coverage was lowest for black males aged 40–44 and 45–49 years. Underenumeration for these groups was 19 percent. In contrast, white females in these age groups were essentially completely enumerated. For black females and white males in these same age groups, the undercount ranged from 3 to 6 percent. For the under-1-year age group, the white population was overenumerated by 2 percent, whereas infants of other races were underenumerated by 9 percent.

If vital statistics measures were calculated with adjustments for net census undercounts for each population subgroup, the resulting rates would be differentially reduced from their original levels; that is, rates for those groups with the greatest estimated undercounts would show the greatest relative reductions due to these adjustments. Similar effects would be evident in the opposite direction for groups with overcounts. As a consequence, the ratio of mortality between the rates for males and females, and between the rates for the white population and the population of other races, or the black population, usually would be reduced.

Similarly, the differences between the death rates among subgroups of the population by cause of death would be affected by adjustments for net census undercounts. For example, for the age group 35–39 years in 1980, the ratio of the death rate for Homicide and legal intervention for black males to that for white males is 7.3, whereas the ratio of the death rates adjusted for net census undercount is 6.2. For Ischemic heart disease for males aged 40–44 years, the ratio of the death rate for the population of all other races to that for the white population is 1.2 using the unadjusted rates, but it is 1.1 when adjusted for estimated underenumeration.

*Summary measures*—The effect of net census undercount on age-adjusted death rates depends on the underenumeration of each age group and on the distribution of deaths by age. Thus, the age-adjusted death rate in 1980 for All causes would decrease from 585.8 to 579.3 per 100,000 population if the age-specific death rates were corrected for net census undercount.

For Diseases of the heart, the age-adjusted death rate for white males would decrease from 277.5 to 273.0 per 100,000 population, a decline of 1.3 percent. For black males the change, from an unadjusted rate of 327.3 to an adjusted rate of 308.3, would amount to 5.8 percent.

If death rates by age were adjusted, then the corresponding life expectancy at birth computed from these rates would change. The importance of adjustments varies by age; that is, when calculating life expectancy, the impact of an undercount or overcount is greatest at the younger ages. In general, the effect of correcting the death rates is to increase the estimate of

life expectancy at birth. Differential underenumeration among race-sex groups would lead to greater changes in life expectancy for some groups than for others. For white females who were completely enumerated in 1980, revised estimates of life expectancy would remain roughly constant; those for black males would show the greatest increase.

### Age-adjusted death rates

Age-adjusted death rates shown in this volume are computed using the distribution in 10-year age intervals of the enumerated population of the United States in 1940 as the standard population. Each figure represents the rate that would have existed had the age-specific rates of the particular year prevailed in a population whose age distribution was the same as that of the United States in 1940. The rates for the total population and for each race-sex group were adjusted using the same standard population. It is important not to compare age-adjusted death rates with crude rates. The standard 1940 population, on the basis of 1 million total population, is as follows:

Age	Number
All ages . . . . .	1,000,000
Under 1 year . . . . .	15,343
1-4 years . . . . .	64,718
5-14 years . . . . .	170,355
15-24 years . . . . .	181,677
25-34 years . . . . .	162,066
35-44 years . . . . .	139,237
45-54 years . . . . .	117,811
55-64 years . . . . .	80,294
65-74 years . . . . .	48,426
75-84 years . . . . .	17,303
85 years and over . . . . .	2,770

### Life Tables

U.S. abridged life tables are constructed by reference to a standard table (35). Life tables for the decennial period 1979–81 are used as the standard life tables in constructing the 1980–88 abridged life tables. With the availability of the 1979–81 standard life tables, revised life table values were computed for 1980–82; these appeared for the first time in *Vital Statistics of the United States, 1983*.

Life tables for the decennial period 1969–71 are used as the standard life tables in constructing the 1970–79 abridged life tables. Life table values for 1970–73 were first revised in *Vital Statistics of the United States, 1977*; before 1977, life table values for 1970–73 were constructed using the 1959–61 decennial life tables. In addition, life table values for 1951–59, 1961–69, and 1971–79 appearing in this volume are based on revised intercensal estimates of the populations for those years. As such, these life table values may differ from life table values for those years published in previous volumes.

The change in the population estimation methodology (see above section “Population bases”) results in life expectancies at certain 5-year age intervals for 1984–88 that are lower than those that would have resulted had they been based on the same methodology used to compute 1983 life expectancies.

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For additional details, see Technical Appendix for *Vital Statistics of the United States, 1984*, Volume II.

There has been an increasing interest in data on the average length of life ( $e_0$ ) for single calendar years before the initiation of the annual abridged life table series for selected race-sex groups in 1945. The figures in table 6-5 for the race and sex groups for the following years were estimated to meet these needs (36).

Years	Race and sex groups
1900-45. . . . .	Total
1900-47. . . . .	Male
1900-47. . . . .	Female
1900-50. . . . .	White
1900-44. . . . .	White, male
1900-44. . . . .	White, female
1900-50. . . . .	All other
1900-44. . . . .	All other, male
1900-44. . . . .	All other, female

The geographic areas covered in life tables before 1929-31 were limited to the death-registration areas. Life tables for 1900-1902 and 1909-11 were constructed using mortality data from the 1900 death-registration States—10 States and the District of Columbia—and for 1919-21 from the 1920 death-registration States—34 States and the District of Columbia. The tables for 1929-31 through 1958 cover the conterminous United States. Decennial life table values for the 3-year period 1959-61 were derived from data that include both Alaska and Hawaii for each year (table 6-4). Data for each year shown in table 6-5 include Alaska beginning in 1959 and Hawaii beginning in 1960. It is believed that the inclusion of these two States does not materially affect life table values.

**Random variation in numbers of deaths, death rates, and mortality rates and ratios**

*Deaths and population-based rates*—Except for 1972, the numbers of deaths reported for a community represent complete counts of such events. As such, they are not subject to sampling error, although they are subject to errors in the registration process. However, when the figures are used for analytical purposes, such as the comparison of rates over a time period or for different areas, the number of events that actually occurred may be considered as one of a large series of possible results that could have arisen under the same circumstances (37). The probable range of values may be estimated from the actual figures according to certain statistical assumptions.

In general, distributions of vital events may be assumed to follow the binomial distribution. Estimates of standard error and tests of significance under this assumption are described in most standard statistics texts. When the number of events is

large, the standard error, expressed as a percent of the number or rate, is usually small.

When the number of events is small (perhaps less than 100) and the probability of such an event is small, considerable caution must be observed in interpreting the conditions described by the figures. This is particularly true for infant mortality rates, cause-specific death rates, and death rates for counties. Events of a rare nature may be assumed to follow a Poisson probability distribution. For this distribution, a simple approximation may be used to estimate a confidence interval, as follows.

If  $N$  is the number of registered deaths in the population and  $R$  is the corresponding rate, the chance is 19 in 20 that

$$1. N - 2\sqrt{N} \text{ and } N + 2\sqrt{N}$$

covers the "true" number of events.

$$2. R - 2\frac{R}{\sqrt{N}} \text{ and } R + 2\frac{R}{\sqrt{N}}$$

covers the "true" rate.

If the rate  $R_1$  corresponding to  $N_1$  events is compared with the rate  $R_2$  corresponding to  $N_2$  events, the difference between the two rates may be regarded as statistically significant at the 0.05 level of significance, if it exceeds

$$2\sqrt{\frac{R_1^2}{N_1} + \frac{R_2^2}{N_2}}$$

For example, if the observed death rate for a community were 10.0 per 1,000 population and if this rate were based on 20 recorded deaths, then the chance is 19 in 20 that the "true" death rate for that community lies between 5.5 and 14.5 per 1,000 population. If the death rate for this community of 10.0 per 1,000 population were being compared with a rate of 20.0 per 1,000 population for a second community, which is based on 10 recorded deaths, then the difference between the rates for the two communities is 10.0. This difference is less than twice the standard error of the difference

$$2\sqrt{\frac{(10.0)^2}{20} + \frac{(20.0)^2}{10}}$$

of the two rates, which is computed to be 13.4. From this, it is concluded that the difference between the rates for the two communities is not statistically significant at the 0.05 level of significance.

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SYMBOLS USED IN TABLES

Data not available -----	----
Category not applicable-----	....
Quantity zero -----	-
Quantity more than zero but less than 0.05 -----	0.0
Quantity more than zero but less than 500 where numbers are rounded to thousands -----	Z
Figure does not meet standards of reliability or precision -----	*

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Table 7-1. Population of Birth- and Death-Registration States, 1900-1932, and United States, 1900-1988

[Population enumerated as of April 1 for 1940, 1950, 1960, 1970, and 1980 and estimated as of July 1 for all other years]

Year	United States <sup>1</sup>		Year	United States <sup>1</sup>		Birth-registration States		Death-registration States	
	Population including Armed Forces abroad	Population residing in area		Population including Armed Forces abroad	Population residing in area	Number of States <sup>2</sup>	Population residing in area	Number of States <sup>2</sup>	Population residing in area
1988	246,329,000	245,807,000	1943	136,739,000	134,245,000	...	...	...	...
1987	243,915,000	243,400,000	1942	134,860,000	133,820,000	...	...	...	...
1986	241,613,000	241,096,000	1941	133,402,000	133,121,000	...	...	...	...
1985	239,283,000	238,741,000	1940	131,820,000	131,669,275	...	...	...	...
1984	237,019,000	236,495,000	1939	131,028,000	130,879,718	...	...	...	...
1983	234,538,000	234,023,000	1938	129,969,000	129,824,939	...	...	...	...
1982	232,309,000	231,786,000	1937	128,961,000	128,824,829	...	...	...	...
1981	229,849,000	229,340,000	1936	128,181,000	128,053,180	...	...	...	...
1980	227,061,000	226,545,805	1935	127,362,000	127,250,232	...	...	...	...
1979	225,055,000	224,567,000	1934	126,485,000	126,373,773	...	...	...	...
1978	222,585,000	222,095,000	1933	125,690,000	125,578,763	...	...	...	...
1977	220,239,000	219,760,000	1932	124,949,000	124,840,471	47	118,903,899	47	118,903,899
1976	218,035,000	217,563,000	1931	124,149,000	124,039,648	46	117,455,229	47	118,148,987
1975	215,973,000	215,465,000	1930	123,076,741	123,076,741	46	116,544,946	47	117,238,278
1974	213,854,000	213,342,000	1929	122,169,939	121,769,939	46	115,317,450	46	115,317,450
1973	211,909,000	211,357,000	1928	---	120,501,115	44	113,636,160	44	113,636,160
1972	209,896,000	209,284,000	1927	---	119,038,062	40	104,320,830	42	107,084,532
1971	207,661,000	206,827,000	1926	---	117,999,225	35	90,400,590	41	103,822,683
1970	204,270,000	203,211,926	1925	---	115,831,963	33	88,294,564	40	102,031,555
1969	202,677,000	201,385,000	1924	---	114,113,463	33	87,000,295	39	99,318,098
1968	200,706,000	199,399,000	1923	---	111,949,945	30	81,072,123	38	96,788,197
1967	198,712,000	197,457,000	1922	---	110,054,778	30	79,560,746	37	92,702,901
1966	196,560,000	195,576,000	1921	---	108,541,489	27	70,807,090	34	87,814,447
1965	194,303,000	193,526,000	1920	---	106,466,420	23	63,597,307	34	86,079,263
1964	191,889,000	191,141,000	1919	105,063,000	104,512,110	22	61,212,076	33	83,157,982
1963	189,242,000	188,483,000	1918	104,550,000	103,202,801	20	55,153,782	30	79,008,412
1962	186,538,000	185,771,000	1917	103,414,000	103,265,913	20	55,197,952	27	70,234,775
1961	183,691,000	182,992,000	1916	---	101,965,984	11	32,944,013	26	66,971,177
1960	179,933,000	179,323,175	1915	---	100,549,013	10	31,096,697	24	61,894,847
1959	177,264,000	176,513,000	1914	---	99,117,567	...	...	24	60,963,309
1958	174,141,000	173,320,000	1913	---	97,226,814	...	...	23	58,156,740
1957	171,274,000	170,371,000	1912	---	95,931,300	...	...	22	54,847,700
1956	168,221,000	167,306,000	1911	---	93,867,814	...	...	22	53,929,644
1955	165,275,000	164,308,000	1910	---	92,406,536	...	...	20	47,470,437
1954	162,391,000	161,164,000	1909	---	90,491,525	...	...	18	44,223,513
1953	159,585,000	158,242,000	1908	---	88,708,976	...	...	17	38,634,759
1952	156,954,000	155,687,000	1907	---	87,000,271	...	...	15	34,552,837
1951	154,287,000	153,310,000	1906	---	85,436,556	...	...	15	33,782,288
1950	151,132,000	150,697,361	1905	---	83,819,666	...	...	10	21,767,980
1949	149,168,000	148,665,000	1904	---	82,164,974	...	...	10	21,332,076
1948	146,631,000	146,093,000	1903	---	80,632,152	...	...	10	20,943,222
1947	144,126,000	143,446,000	1902	---	79,160,196	...	...	10	20,582,907
1946	141,389,000	140,054,000	1901	---	77,585,128	...	...	10	20,237,453
1945	139,928,000	132,481,000	1900	---	76,094,134	...	...	10	19,965,446
1944	138,397,000	132,885,000							

<sup>1</sup> Alaska included beginning 1959 and Hawaii, 1960.

<sup>2</sup> The District of Columbia is not included in "Number of States," but it is represented in all data shown for each year.

SOURCE: Published and unpublished data from the U.S. Bureau of the Census; see text.



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**Table 7-2. Estimated Population of the United States, by 5-Year Age Groups, Race, and Sex: July 1, 1988**

[Figures include Armed Forces stationed in the United States and exclude those stationed outside the United States. Due to rounding to the nearest thousand, detailed figures may not add to totals]

Age	All races			White			All other					
	Both sexes	Male	Female	Both sexes	Male	Female	Total			Black		
							Both sexes	Male	Female	Both sexes	Male	Female
<b>All ages .....</b>	<b>245,807,000</b>	<b>119,738,000</b>	<b>126,069,000</b>	<b>207,377,000</b>	<b>101,389,000</b>	<b>105,988,000</b>	<b>38,430,000</b>	<b>18,348,000</b>	<b>20,081,000</b>	<b>30,202,000</b>	<b>14,325,000</b>	<b>15,877,000</b>
<b>Under 1 year .....</b>	<b>3,859,000</b>	<b>1,976,000</b>	<b>1,883,000</b>	<b>3,116,000</b>	<b>1,599,000</b>	<b>1,517,000</b>	<b>744,000</b>	<b>377,000</b>	<b>366,000</b>	<b>593,000</b>	<b>300,000</b>	<b>293,000</b>
<b>1-4 years .....</b>	<b>14,597,000</b>	<b>7,470,000</b>	<b>7,126,000</b>	<b>11,783,000</b>	<b>6,031,000</b>	<b>5,732,000</b>	<b>2,833,000</b>	<b>1,439,000</b>	<b>1,394,000</b>	<b>2,209,000</b>	<b>1,123,000</b>	<b>1,086,000</b>
<b>5-9 years .....</b>	<b>18,028,000</b>	<b>9,226,000</b>	<b>8,802,000</b>	<b>14,503,000</b>	<b>7,440,000</b>	<b>7,063,000</b>	<b>3,525,000</b>	<b>1,786,000</b>	<b>1,739,000</b>	<b>2,783,000</b>	<b>1,412,000</b>	<b>1,371,000</b>
<b>10-14 years .....</b>	<b>16,627,000</b>	<b>8,525,000</b>	<b>8,102,000</b>	<b>13,346,000</b>	<b>6,856,000</b>	<b>6,489,000</b>	<b>3,281,000</b>	<b>1,669,000</b>	<b>1,613,000</b>	<b>2,613,000</b>	<b>1,327,000</b>	<b>1,285,000</b>
<b>15-19 years .....</b>	<b>18,214,000</b>	<b>9,291,000</b>	<b>8,923,000</b>	<b>14,740,000</b>	<b>7,526,000</b>	<b>7,213,000</b>	<b>3,474,000</b>	<b>1,765,000</b>	<b>1,709,000</b>	<b>2,789,000</b>	<b>1,407,000</b>	<b>1,382,000</b>
<b>20-24 years .....</b>	<b>19,184,000</b>	<b>9,606,000</b>	<b>9,578,000</b>	<b>15,804,000</b>	<b>7,952,000</b>	<b>7,852,000</b>	<b>3,380,000</b>	<b>1,654,000</b>	<b>1,726,000</b>	<b>2,704,000</b>	<b>1,305,000</b>	<b>1,399,000</b>
<b>25-29 years .....</b>	<b>21,877,000</b>	<b>10,951,000</b>	<b>10,926,000</b>	<b>18,292,000</b>	<b>9,235,000</b>	<b>9,057,000</b>	<b>3,584,000</b>	<b>1,715,000</b>	<b>1,869,000</b>	<b>2,828,000</b>	<b>1,342,000</b>	<b>1,486,000</b>
<b>30-34 years .....</b>	<b>21,798,000</b>	<b>10,902,000</b>	<b>10,896,000</b>	<b>18,325,000</b>	<b>9,256,000</b>	<b>9,069,000</b>	<b>3,473,000</b>	<b>1,646,000</b>	<b>1,827,000</b>	<b>2,677,000</b>	<b>1,256,000</b>	<b>1,420,000</b>
<b>35-39 years .....</b>	<b>19,140,000</b>	<b>9,480,000</b>	<b>9,660,000</b>	<b>16,255,000</b>	<b>8,145,000</b>	<b>8,110,000</b>	<b>2,885,000</b>	<b>1,335,000</b>	<b>1,550,000</b>	<b>2,186,000</b>	<b>1,001,000</b>	<b>1,185,000</b>
<b>40-44 years .....</b>	<b>16,124,000</b>	<b>7,915,000</b>	<b>8,209,000</b>	<b>13,942,000</b>	<b>6,918,000</b>	<b>7,024,000</b>	<b>2,182,000</b>	<b>997,000</b>	<b>1,185,000</b>	<b>1,624,000</b>	<b>735,000</b>	<b>889,000</b>
<b>45-49 years .....</b>	<b>13,026,000</b>	<b>6,359,000</b>	<b>6,668,000</b>	<b>11,239,000</b>	<b>5,542,000</b>	<b>5,697,000</b>	<b>1,787,000</b>	<b>816,000</b>	<b>971,000</b>	<b>1,362,000</b>	<b>612,000</b>	<b>751,000</b>
<b>50-54 years .....</b>	<b>11,136,000</b>	<b>5,393,000</b>	<b>5,744,000</b>	<b>9,601,000</b>	<b>4,698,000</b>	<b>4,903,000</b>	<b>1,535,000</b>	<b>695,000</b>	<b>840,000</b>	<b>1,194,000</b>	<b>533,000</b>	<b>661,000</b>
<b>55-59 years .....</b>	<b>10,897,000</b>	<b>5,195,000</b>	<b>5,701,000</b>	<b>9,495,000</b>	<b>4,562,000</b>	<b>4,932,000</b>	<b>1,402,000</b>	<b>633,000</b>	<b>769,000</b>	<b>1,115,000</b>	<b>507,000</b>	<b>608,000</b>
<b>60-64 years .....</b>	<b>10,934,000</b>	<b>5,096,000</b>	<b>5,837,000</b>	<b>9,657,000</b>	<b>4,525,000</b>	<b>5,132,000</b>	<b>1,276,000</b>	<b>571,000</b>	<b>705,000</b>	<b>1,024,000</b>	<b>462,000</b>	<b>562,000</b>
<b>65-69 years .....</b>	<b>9,993,000</b>	<b>4,544,000</b>	<b>5,449,000</b>	<b>8,989,000</b>	<b>4,059,000</b>	<b>4,829,000</b>	<b>1,104,000</b>	<b>485,000</b>	<b>619,000</b>	<b>895,000</b>	<b>391,000</b>	<b>503,000</b>
<b>70-74 years .....</b>	<b>7,904,000</b>	<b>3,400,000</b>	<b>4,504,000</b>	<b>7,104,000</b>	<b>3,065,000</b>	<b>4,038,000</b>	<b>801,000</b>	<b>335,000</b>	<b>466,000</b>	<b>652,000</b>	<b>269,000</b>	<b>383,000</b>
<b>75-79 years .....</b>	<b>5,903,000</b>	<b>2,322,000</b>	<b>3,581,000</b>	<b>5,318,000</b>	<b>2,091,000</b>	<b>3,227,000</b>	<b>585,000</b>	<b>232,000</b>	<b>353,000</b>	<b>476,000</b>	<b>183,000</b>	<b>293,000</b>
<b>80-84 years .....</b>	<b>3,619,000</b>	<b>1,262,000</b>	<b>2,357,000</b>	<b>3,311,000</b>	<b>1,149,000</b>	<b>2,162,000</b>	<b>308,000</b>	<b>113,000</b>	<b>194,000</b>	<b>250,000</b>	<b>89,000</b>	<b>161,000</b>
<b>85 years and over .....</b>	<b>2,948,000</b>	<b>825,000</b>	<b>2,124,000</b>	<b>2,679,000</b>	<b>739,000</b>	<b>1,940,000</b>	<b>269,000</b>	<b>86,000</b>	<b>183,000</b>	<b>229,000</b>	<b>70,000</b>	<b>158,000</b>

SOURCE: U.S. Bureau of the Census: "Current Population Reports," Series P-25, No. 1045.

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**Table 7-3. Estimated Population, by Age, for the United States, Each Division and State, Puerto Rico, Virgin Islands, and Guam: July 1, 1988**

[Figures include Armed Forces stationed in each area, and exclude Armed Forces stationed outside the United States. Due to rounding to the nearest thousand, detailed figures may not add to totals]

Division and State	Total	Under 5 years	5-19 years	20-44 years	45-64 years	65 years and over
<b>United States<sup>1</sup></b>	<b>245,807,000</b>	<b>18,456,000</b>	<b>52,869,000</b>	<b>98,123,000</b>	<b>45,993,000</b>	<b>30,367,000</b>
<b>Geographic divisions:</b>						
New England	12,962,000	893,000	2,548,000	5,270,000	2,517,000	1,737,000
New England	37,631,000	2,595,000	7,563,000	14,567,000	7,777,000	5,130,000
Middle Atlantic	42,120,000	3,058,000	9,261,000	16,648,000	7,961,000	5,190,000
East North Central	17,759,000	1,306,000	3,829,000	6,950,000	3,253,000	2,422,000
West North Central	15,344,000	3,036,000	8,814,000	16,753,000	8,276,000	5,552,000
South Atlantic	26,886,000	1,087,000	3,534,000	5,988,000	2,826,000	1,909,000
East South Central	13,326,000	2,280,000	6,373,000	10,767,000	4,547,000	2,917,000
West South Central	19,326,000	1,138,000	3,101,000	5,448,000	2,204,000	1,436,000
Mountain	37,351,000	3,065,000	7,849,000	15,731,000	6,630,000	4,077,000
<b>New England:</b>						
Maine	1,205,000	84,000	258,000	477,000	226,000	161,000
New Hampshire	1,085,000	81,000	228,000	455,000	198,000	123,000
Vermont	557,000	40,000	120,000	235,000	97,000	66,000
Massachusetts	5,889,000	400,000	1,114,000	2,433,000	1,136,000	806,000
Rhode Island	999,000	66,000	194,000	395,000	191,000	146,000
Connecticut	3,239,000	222,000	634,000	1,275,000	669,000	435,000
<b>Middle Atlantic:</b>						
New York	17,909,000	1,275,000	3,618,000	6,995,000	3,694,000	2,328,000
New Jersey	7,721,000	529,000	1,533,000	3,006,000	1,644,000	1,009,000
Pennsylvania	12,001,000	791,000	2,412,000	4,566,000	2,439,000	1,793,000
<b>East North Central:</b>						
Ohio	10,855,000	774,000	2,383,000	4,212,000	2,113,000	1,372,000
Indiana	5,556,000	389,000	1,248,000	2,197,000	1,042,000	680,000
Illinois	11,614,000	859,000	2,492,000	4,626,000	2,214,000	1,421,000
Michigan	9,240,000	677,000	2,074,000	3,699,000	1,714,000	1,076,000
Wisconsin	4,855,000	357,000	1,064,000	1,914,000	878,000	641,000
<b>West North Central:</b>						
Minnesota	4,307,000	325,000	925,000	1,749,000	769,000	540,000
Iowa	2,834,000	191,000	609,000	1,095,000	517,000	423,000
Missouri	5,141,000	370,000	1,095,000	1,875,000	991,000	710,000
North Dakota	667,000	52,000	151,000	264,000	109,000	90,000
South Dakota	713,000	57,000	161,000	268,000	127,000	100,000
Nebraska	1,602,000	120,000	351,000	622,000	288,000	221,000
Kansas	2,495,000	191,000	537,000	977,000	452,000	338,000
<b>South Atlantic:</b>						
Delaware	660,000	48,000	138,000	266,000	131,000	77,000
Maryland	4,622,000	346,000	942,000	1,825,000	912,000	498,000
District of Columbia	617,000	47,000	107,000	268,000	116,000	77,000
Virginia	6,015,000	430,000	1,234,000	2,559,000	1,153,000	640,000
West Virginia	1,876,000	113,000	424,000	720,000	352,000	268,000
North Carolina	6,489,000	449,000	1,400,000	2,617,000	1,249,000	775,000
South Carolina	3,470,000	259,000	804,000	1,410,000	619,000	379,000
Georgia	6,342,000	496,000	1,487,000	2,581,000	1,141,000	637,000
Florida	12,335,000	848,000	2,276,000	4,407,000	2,601,000	2,201,000
<b>East South Central:</b>						
Kentucky	3,727,000	253,000	848,000	1,479,000	683,000	463,000
Tennessee	4,895,000	332,000	1,073,000	1,942,000	937,000	612,000
Alabama	4,102,000	296,000	950,000	1,589,000	754,000	513,000
Mississippi	2,620,000	206,000	663,000	978,000	452,000	321,000
<b>West South Central:</b>						
Arkansas	2,395,000	173,000	551,000	874,000	447,000	350,000
Louisiana	4,408,000	372,000	1,064,000	1,765,000	727,000	479,000
Oklahoma	3,242,000	247,000	735,000	1,265,000	572,000	422,000
Texas	16,841,000	1,488,000	4,023,000	6,863,000	2,801,000	1,666,000
<b>Mountain:</b>						
Montana	805,000	62,000	183,000	317,000	140,000	103,000
Idaho	1,003,000	81,000	255,000	392,000	157,000	118,000
Wyoming	479,000	39,000	116,000	217,000	62,000	45,000
Colorado	3,301,000	264,000	705,000	1,470,000	548,000	314,000
New Mexico	1,507,000	134,000	363,000	595,000	260,000	155,000
Arizona	3,489,000	299,000	758,000	1,361,000	623,000	447,000
Utah	1,690,000	177,000	509,000	646,000	216,000	141,000
Nevada	1,054,000	82,000	212,000	450,000	198,000	113,000
<b>Pacific:</b>						
Washington	4,648,000	348,000	981,000	1,988,000	780,000	551,000
Oregon	2,767,000	190,000	576,000	1,159,000	460,000	381,000
California	28,314,000	2,381,000	5,932,000	11,884,000	5,107,000	3,011,000
Alaska	524,000	57,000	127,000	240,000	80,000	20,000
Hawaii	1,098,000	89,000	233,000	460,000	203,000	114,000
<b>Puerto Rico</b>	<b>3,291,000</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>
<b>Virgin Islands</b>	<b>103,200</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>
<b>Guam</b>	<b>193,000</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>

<sup>1</sup> Excludes Puerto Rico, Virgin Islands, and Guam.

SOURCE: U.S. Bureau of the Census: "Current Population Reports," Series P-25, Nos. 1044 and 1049, and unpublished data.

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Table 7-4. Ratio of Census-Level Resident Population to Resident Population Adjusted for Estimated Net Census Undercount by Age, Sex, and Race: April 1, 1980

Age	All races			White			All other					
	Both sexes	Male	Female	Both sexes	Male	Female	Total			Black		
							Both sexes	Male	Female	Both sexes	Male	Female
All ages .....	0.9862	0.9763	0.9958	0.9916	0.9839	0.9990	0.9543	0.9309	0.9765	0.9392	0.9103	0.9669
Under 5 years .....	0.9806	0.8800	0.9812	0.9993	0.9988	0.9998	0.9024	0.8998	0.9051	0.9047	0.9018	0.9077
Under 1 year .....	1.0025	1.0019	1.0031	1.0246	1.0245	1.0246	.9112	.9057	.9169	.9205	.9149	.9282
1-4 years .....	.9747	.9741	.9754	.9926	.9920	.9932	.9000	.8982	.9019	.9004	.8982	.9027
5-14 years .....	.9917	.9916	.9919	.9981	.9982	.9980	.9626	.9614	.9638	.9603	.9591	.9623
5-9 years .....	.9852	.9846	.9859	.9957	.9955	.9960	.9393	.9370	.9416	.9393	.9370	.9424
10-14 years .....	.9978	.9982	.9974	1.0003	1.0008	.9998	.9658	.9658	.9659	.9608	.9607	.9618
15-24 years .....	.9921	.9848	.9999	.9940	.9871	1.0011	.9823	.9711	.9937	.9689	.9528	.9650
15-19 years .....	1.0011	.9988	1.0034	1.0003	.9976	1.0030	1.0051	1.0052	1.0055	.9980	.9958	1.0001
20-24 years .....	.9834	.9706	.9965	.9879	.9769	.9993	.9590	.9354	.9619	.9390	.9076	.9696
25-34 years .....	.9793	.9629	.9961	.9850	.9722	.9980	.9466	.9059	.9852	.9181	.8670	.9676
25-29 years .....	.9742	.9581	.9908	.9799	.9673	.9929	.9422	.9040	.9786	.9188	.8685	.9628
30-34 years .....	.9850	.9683	1.0020	.9905	.9778	1.0036	.9519	.9081	.9931	.9197	.8638	.9735
35-44 years .....	.9761	.9575	.9947	.9855	.9719	.9992	.9183	.8685	.9680	.8882	.8235	.9501
35-39 years .....	.9776	.9597	.9955	.9860	.9730	.9991	.9248	.8743	.9736	.8968	.8322	.9588
40-44 years .....	.9743	.9549	.9937	.9849	.9706	.9992	.9107	.8576	.9614	.8762	.8135	.9401
45-54 years .....	.9784	.9589	.9973	.9862	.9723	.9998	.9247	.8648	.9803	.8976	.8272	.9644
45-49 years .....	.9734	.9538	.9926	.9828	.9690	.9967	.9124	.8544	.9689	.8833	.8139	.9487
50-54 years .....	.9831	.9638	1.0017	.9894	.9755	1.0027	.9377	.8759	.9945	.9125	.8413	.9796
55-64 years .....	.9900	.9735	1.0049	.9926	.9783	1.0057	.9678	.9329	.9983	.9514	.9094	.9882
55-59 years .....	.9884	.9692	1.0060	.9921	.9755	1.0075	.9577	.9178	.9935	.9388	.8913	.9815
60-64 years .....	.9919	.9786	1.0037	.9932	.9815	1.0036	.9804	.9523	1.0041	.9669	.9324	.9962
65-74 years .....	1.0092	1.0044	1.0129	1.0055	1.0011	1.0087	1.0439	1.0357	1.0515	1.0372	1.0235	1.0473
65-69 years .....	1.0131	1.0051	1.0195	1.0086	1.0016	1.0141	1.0548	1.0391	1.0672	1.0494	1.0280	1.0651
70-74 years .....	1.0042	1.0034	1.0047	1.0016	1.0005	1.0021	1.0293	1.0309	1.0309	1.0207	1.0158	1.0243
75-84 years .....	.9851	.9937	.9800	.9844	.9918	.9804	.9917	1.0168	.9758	.9689	.9955	.9527
75-79 years .....	1.0014	1.0053	.9990	.9974	.9997	.9959	1.0428	1.0601	1.0313	1.0235	1.0405	1.0128
80-84 years .....	.9595	.9735	.9522	.9643	.9780	.9578	.9059	.9380	.8873	.8760	.9150	.8572
85 years and over .....	.9540	.9792	.9440	.9558	.9760	.9467	.9393	.9961	.9057	.9089	.9638	.8837

SOURCE: U.S. Bureau of the Census: "Current Population Reports," Series P-25, No. 985.