CANCER IN NORTH AMERICA, 1994-1998

VOLUME TWO: MORTALITY

PURPOSE

The Data Evaluation and Publication Committee, a standing committee of the North American Association of Central Cancer Registries (NAACCR), produced this monograph. The NAACCR bylaws charge the Data Evaluation and Publication Committee to gather data from member registries, review, evaluate, and compile them for publication. This year marks the eleventh release of the publication of *Cancer in North America (CINA)* and the fifth monograph to include cancer mortality data. The monograph reflects the enthusiastic participation of NAACCR member registries, with cancer incidence coverage in Canada, 43 U.S. states, the District of Columbia, and five metropolitan areas in the United States (U.S.). Two U.S. state registries (Arkansas and Missouri) submitted their incidence data for the first time. We hope this effort continues to improve the completeness, the timeliness and the quality of data collected by member registries; to promote the use of their cancer registry data; and to provide cancer statistics that are inclusive of all racial/ethnic groups and geographic coverage of the United States and Canada.

MONOGRAPH FORMAT

The *Cancer in North America (CINA), 1994-1998* monograph includes two volumes: Volume One contains cancer incidence data and Volume Two contains cancer mortality data. An electronic copy of data from both volumes of the monograph is available through the Internet (on the NAACCR web site at ***http://www.naaccr.org***) for downloading. README text files are also available on the web site. The README files provide record layouts, instructions, and general information about the data files. A separate README file has been prepared as supporting documentation for each of the data files (incidence, mortality, data quality indicators, population counts, and registry descriptions and technical documentation for the incidence, mortality, and pediatric files). The electronic data files are not incorporated into a software program and thus they require the use of other statistical or database software packages for data analysis. All participants in the *Call for Data 2001* consented to have their data reproduced in this electronic format.

The data in Volume Two of this year's monograph include cancer mortality data for the years 1994 through 1998 for the U.S. and 1994 through 1997 for Canada. They are presented for the jurisdictional areas of all central registries in the United States and Canada. Volume Two has two major sections as described below.

VOLUME TWO, SECTION I: Introduction and Technical Notes

This section states the purpose of the monograph, describes the monograph format, and details the various data sources and data definitions. It also provides some background information on the NAACCR and lists member rosters of the Data Evaluation and Publication Committee and its subcommittees.

VOLUME TWO, SECTION II: Registry-specific Cancer Mortality by Sex and Race

In the United States, all 50 states, the District of Columbia, and five metropolitan areas in the Surveillance, Epidemiology and End Results (SEER) Program are included in this mortality volume. Age- and sex-specific population estimates for all races, whites, and blacks are reproduced in the monograph for each registry in the U.S. (i.e., state, or SEER area).

The cancer mortality tables for the 56 central registry areas in the U.S. show the total five-year mortality counts (1994-1998) and the average annual age-adjusted mortality rates by cancer site grouping, sex and race. There are four mortality tables for each U.S. central registry area: (i) mortality for all races with rates age-adjusted to 1970 U.S. population and to the World standard, (ii) mortality for all races with rates age-adjusted to 1991 Canadian population and the World standard, (iii) mortality for whites with rates age-adjusted to 1970 U.S. population and to the World standard, and (iv) mortality for blacks with rates age-adjusted to 1970 U.S. population and to the World standard. Mortality counts and rates for the entire United States (50 states and the District of Columbia combined) are also presented, using the same table format as those for individual states or metropolitan areas.

In addition, summary tables of sex-specific mortality rates age-adjusted to the 1970 U.S. population for selected major cancer sites are presented for all races, whites and blacks by U.S. regions and individual states. These summary tables facilitate regional and state comparisons.

For Canada, all 10 provinces and two territories are included in this mortality volume. Age- and sex-specific population estimates for all races combined are reproduced in the monograph for each Canadian registry (i.e., province or territory). There are two mortality tables for each Canadian province and territory which present the total four-year mortality counts (1994-1997) and the average annual age-adjusted mortality rates for all races by cancer site grouping and sex. Rates are age-adjusted to the 1970 U.S. population and the World standard in one table and age-adjusted to the 1991 Canadian population and the World standard in the other table. Mortality counts and rates for the entire Canada (10 provinces and two territories) are also shown using the same table format as those presented for individual provinces and territories. In addition, sex-specific mortality rates for selected major cancer sites by individual province/territory are included at the end of Section II to facilitate comparisons among them.

Rates and counts are suppressed in all tables when fewer than six deaths were reported for a specific cancer site.

For the first time this year, we present U.S. mortality rates for all races combined, age-adjusted to the 1991 Canadian population, in addition to the 1970 U.S. population and the World standard. Similarly, Canadian mortality rates for all races are age-adjusted to the 1970 U.S. population, in addition to the 1991 Canadian population and the World standard. These new tables are to facilitate comparisons of cancer mortality rates between Canada and the U.S., using any one of the three population standards.

TECHNICAL NOTES

Data Sources

Mortality. Mortality data for 1994 to 1998 for U.S. registries were obtained from the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC), as provided to NCI. For Canadian registries, the mortality data for 1994 to 1997 were obtained from Statistics Canada.

Population Estimates. Estimates of population for the U.S., individual U.S. states, and all SEER areas for 1994 through 1998 were obtained from the SEER program, based on U.S. Bureau of Census population estimates for these years. Statistics Canada provided the estimates of the Canadian population for all Canadian provinces and territories, adjusted for census under-coverage and non-permanent residents.

Definitions

Cancer Sites. NCHS rules were used to define cancer deaths. Only the underlying cause of death was used in the calculation of mortality rates. The International Classification of Diseases, Ninth Revision (ICD-9)

codes 140.0 to 208.9 from mortality records were converted to the SEER cancer site groupings (see Appendix A)[1] . Cancer deaths from non-residents of the area, and deaths of unknown sex or age were omitted from all calculations.

Mortality Rates. Rates for all races were calculated per 100,000 population and age-adjusted by the direct method to the 1970 U.S., the 1991 Canadian (Cdn) and the World[2] standards for both U.S. and Canadian registries. Rates for U.S. whites and U.S. blacks were age-adjusted to 1970 U.S. population and the World standard only. The mortality rates were five-year person-year averages for the period 1994 through 1998 for the U.S. and four-year person-year averages for the period 1994 through 1997 for Canada. The age distributions of the three population standards are presented below:

AGE GROUP	WORLD	1970 U.S.	1991 CDN.
0-4	12,000	8,441.6	6,946.5
5-9	10,000	9,820.4	6,945.4
10-14	9,000	10,230.4	6,803.4
15-19	9,000	9,384.5	6,849.5
20-24	8,000	8,056.1	7,501.6
25-29	8,000	6,632.0	8,994.4
30-34	6,000	5,624.9	9,240.0
35-39	6,000	5,465.6	8,338.8
40-44	6,000	5,895.8	7,606.3
45-49	6,000	5,962.2	5,953.6
50-54	5,000	5,464.3	4,764.9
55-59	4,000	4,907.7	4,404.1
60-64	4,000	4,240.3	4,232.6
65-69	3,000	3,440.6	3,857.0
70-74	2,000	2,678.9	2,966.0
75-79	1,000	1,887.1	2,212.7
80-84	500	1,124.1	1,359.5
85+	500	743.5	1,023.7
Total	100,000	100,000.0	100,000.0

Race-specific Rates. Counts and rates are presented for all races, and for whites and blacks when the number of deaths was more than five. Cases of unknown race are included in the all races category only. Canadian data are presented for all races only, as are the data for Hawaii.

[1]Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, Edwards BK (eds). *SEER Cancer Statistics Review 1973-1997.* National Cancer Institute. Bethesda, MD, 2000.

[2]Waterhouse J, Muir C, Correa P, Powell J (eds). *Cancer Incidence in Five Continents, Volume III*. Lyon, France: International Agency for Research on Cancer, IARC Scientific Publications No. 15, 1976.

Standard Errors. Standard errors (S.E.) of the rates were calculated using the formula:

$$S.E. = \sqrt{\sum \frac{w_j^2 d_j}{p_j^2}}$$

where w_j = the fraction of the standard population in age_j category, d_j = number of deaths in that age category, and p_j = person-years denominator.[3] For many registries, the S.E. of the rates are small, as the population covered is large. However, for registries which cover a small population, the S.E. may be substantial.

Comparison of Rates. The standard errors of adjusted rates can be used to evaluate the statistical significance of rate differences among comparable populations in the various individual registries. For example, if the adjusted rates in two populations are R_1 and R_2 and their standard errors $S.E._1$ and $S.E._2$, an approximate confidence interval for the rate ratio can be calculated using the following formula:

$$(R_1/R_2)^{1 \pm z/x}$$

where $x = (R_1 - R_2) / \sqrt{(S.E._1^2 + S.E._2^2)}$ and z = 1.96 for 95% confidence limits.[4] If this interval does not include one, the two rates are statistically significantly different at a p value of 0.05. This test can be inaccurate for rates based on fewer than 10 deaths.

It should be emphasized that this kind of comparison of adjusted rates must be undertaken with caution as misleading conclusions may be drawn if the ratios of the age-specific rates in the two populations are not constant in all age groups. In these circumstances, the rate ratios will vary according to the standard population used.

Before comparing rates among the registries, it is important to consider whether the groups are comparable by race, (i.e., percent other races or percent unknown race and other demographic factors). Interpretation without consideration of these factors may contribute to misleading and inaccurate conclusions.

NAACCR BACKGROUND

Founded in 1987, the North American Association of Central Cancer Registries (NAACCR) is a professional association of cancer registries, programs, and organizations and of individuals interested in the development and application of cancer registration. In April 1994, the name of the organization was officially changed from the American Association of Central Cancer Registries (AACCR) to the North American Association of Central Cancer Registries by vote of the membership to include Canadian registries and others throughout North America. The NAACCR promotes the use of central cancer registry data in studies of defined populations and in cancer control programs in the United States and Canada. The NAACCR welcomes membership from all cancer registries interested in collaborative efforts to collect, analyze, and publish data in defined populations and to use registry information in identifying target populations for cancer control interventions and in conducting surveillance of cancer incidence and evaluation of cancer control programs. Membership is also desirable for national organizations involved in cancer surveillance, control and prevention, and research and other organizations and individuals interested in cancer registration or cancer control activities.

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[3]Breslow NE, Day NE. *Statistical Methods in Cancer Research, Vol. II.* Lyon, France: IARC, 1987, p. 59.

[4]Parkin DM, Muir CS, Whelan SL (eds). *Cancer Incidence in Five Continents, Volume VI.* Lyon, France: IARC, 1992, p. 869.

The mission of NAACCR includes: develops and promotes uniform data standards for cancer registration; provides education and training; certifies population-based registries; aggregates and publishes data from central cancer registries; and promotes the use of cancer surveillance data and systems for cancer control and epidemiologic research, public health programs, and patient care to reduce the burden of cancer in North America.

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