CANCER IN NORTH AMERICA, 1993-1997
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 and evaluate them, and compile them for publication. The year 2000 marks the tenth release of the publication of *Cancer in North America*. This monograph represents the largest registry participation with cancer incidence total coverage in Canada and 44 states, the District of Columbia, and five metropolitan areas in the United States. Nine registries submitted their incidence data for the first time. It is the fourth monograph to include cancer mortality data and they are presented for the jurisdictional areas of all central registries in the United States and Canada. We hope this effort continues to improve the completeness, timely reporting, and quality of the data collected by member registries; to promote the use of their cancer registry data; and to provides cancer incidence statistics that are inclusive of all racial/ethnic groups and geographic coverage of entire North America.

MONOGRAPH FORMAT

Cancer in North America (CINA), 1993-1997 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 either through the Internet (on the NAACCR web site at ***http://www.naaccr.org***) for downloading or on 3.5-inch diskette by request. README text files are also available on the web site and diskette. The README files provide record layouts, instructions, and general information about the data files. A separate README file has been prepared as supporting documentation and 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 2000* consented to have their data reproduced in this electronic format.

The data in Volume Two of this year's monograph pertain to cancer mortality from 1993 through 1997. 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 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 states, the District of Columbia, and five metropolitan areas in the Surveillance, Epidemiology and End Results (SEER) program are included in Volume Two, Mortality. 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, territory, or SEER area).

The cancer mortality tables for the 56 U.S. central registry areas show the total five-year mortality counts by cancer site, sex and race (when applicable) and the average annual mortality rates. Mortality rates for

the entire United States (50 states and the District of Columbia combined) are also provided. The rates are age-adjusted to the 1970 U.S. population and to the World standard for all races, whites, and blacks.

Tables for the United States as a whole are presented following the state tables. This section also includes tables of mortality rates for major cancer sites presented for all races, whites and blacks by U.S. regions and individual states. These summary tables facilitate regional comparisons. Rates and counts, however, are not presented when fewer than six deaths were reported for the specified cancer site.

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) as are the total five-year mortality counts by cancer site and sex and the average annual mortality rates for each Canadian province and territory. Tables of combined mortality data for Canada (10 provinces and two territories) are shown at the end of Section II. The rates are age-adjusted to the 1991 Canadian population and to the World standard for all races. This section also includes sex-specific mortality rates for selected major cancer sites by individual province/territory to facilitate comparisons among them. Rates and counts are not presented when fewer than six deaths were reported for the specified cancer site.

When comparing mortality rates between the Canadian and U.S. registries, one must use the rates that are age-adjusted to the World standard.

TECHNICAL NOTES

Data Sources

Mortality. Mortality data for 1993 to 1997 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 were obtained from Statistics Canada.

Population Estimates. Estimates of population for the entire U.S., individual U.S. states, and all SEER areas for 1993 through 1997 were obtained from the SEER program, based on U.S. Bureau of Census 1999 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 groups (see Appendix)[1] . Cancer deaths from non-residents of the area, and deaths of unknown sex or age were omitted from all calculations.

Mortality Rates. Rates were calculated per 100,000 population and age-adjusted by the direct method to the 1970 U.S. and the World[2] standards for the U.S. registries, and the 1991 Canadian (Cdn) and the World

---

[1]Ries LAG, Kosary CL, Hankey BF, Miller BA, Harras A, Edwards BK (eds). *SEER Cancer Statistics Review 1973-1994.* Bethesda, MD: National Cancer Institute, NIH Pub. No. 97-2789, 1997.

[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.

standards for Canadian registries. As noted above, comparisons among all registries in North America (U.S. and Canada) must use the rates that are age-adjusted to the World standard. The mortality rates are five-year person-year averages for the period 1993 through 1997. 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. Data are presented for all races, and for whites and blacks when the number of deaths was sufficiently large to produce stable rates. Mortality data for specific race groups (whites or blacks) are presented only for those areas in the U.S. with an annual population base of 200,000 or more residents in the race group. 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.

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.

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

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, and it should not be used for rates based on five or fewer 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. 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. 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 control, prevention, and research and other organizations and individuals interested in cancer registration or cancer control activities.

Data Evaluation and Publication Committee Members, 1999-2000

Vivien W. Chen, Louisiana, *Chair*
Susan Carozza, Texas
John P. Fulton, Rhode Island
Robert Greenlee, American Cancer Society
Irene Hall, Centers for Disease Control & Prevention
Carol Kosary, National Cancer Institute
Yang Mao, Laboratory Centre for Disease Control, Health Canada

---

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

Kathleen McDavid, Centers for Disease Control & Prevention
Ghislaine Villeneuve, Statistics Canada
Richard S. Porter, Arizona
Steven Roffers, Georgia
David Roney, Information Management Services, Inc.
Andrew K. Stewart, American College of Surgeons
Nancy S. Weiss, Texas
Dee West, California
Xiao Cheng Wu, Louisiana
Holly L. Howe, *ex officio*, Executive Director, NAACCR
Joellyn Hotes, NAACCR Staff

Data Evaluation and Publication Subcommittees, 1999-2000

Comparative Analysis of Incidence Rates Subcommittee

Sue Carozza, Texas, *Chair*
Vivien W. Chen, Louisiana
John P. Fulton, Rhode Island
Robert Greenlee, American Cancer Society
Mary D. Hutton, Centers for Disease Control and Prevention
Judith B. Klotz, New Jersey
Lihua Liu, California
Brooke Steele, Centers for Disease Control and Prevention
Xiao Cheng Wu, Louisiana

Analysis of Data Quality Indicators Subcommittee

John P. Fulton, Rhode Island, Chair
Catherine N. Correa, Louisiana
Nancy Jackson, California
Chris Newton, Arizona
Lilia O'Connor, California
Pam Parrish, Illinois
Carin Perkins, California
Steven D. Roffers, Georgia
Gayle Clutter, Centers for Disease Control and Prevention

Canadian/U.S. Comparison of Cancer Statistics Subcommittee

Kathleen McDavid, Centers for Disease Control and Prevention, Co-Chair
Cyril Nair, Statistics Canada, Co-Chair
Vivien W. Chen, Louisiana
Glenn Copeland, Michigan Cancer Surveillance Program
John Fulton, Rhode Island
Rue-Nie Gao, Statistics Canada
Eric Holowaty, Ontario
Joellyn Hotes, NAACCR
Carol Kosary, National Cancer Institute
Judy Lee, Statistics Canada
Yang Mao, Laboratory Centre for Disease Control, Health Canada
Mary McBride, British Columbia Cancer Agency
Richard Porter, Arizona Cancer Registry
Brenda Smith, Arizona Cancer Registry
Jon Tonita, Saskatchewan Cancer Agency
Ghislaine Villeneuve, Canadian Cancer Registry

Lydia Voti, Florida Cancer Data System
Brad Wohler-Torres, Florida Cancer Data System

Public Use Data Sets Subcommittee

Holly L. Howe, NAACCR, *Chair*
Vivien W. Chen, Louisiana
John P. Fulton, Rhode Island
Carol Kosary, National Cancer Institute
Sarah Landis, American Cancer Society
Melinda Lehnherr, Illinois
Richard S. Porter, Arizona
David Roney, Information Management Services, Inc.
Hannah Weir, Centers for Disease Control & Prevention

Monograph Production Subcommittee

Vivien W. Chen, Louisiana, *Chair*
Catherine N. Correa, Louisiana
Joellyn Hotes, NAACCR
Holly L. Howe, NAACCR
Stephen Keith, Information Management Services, Inc.
Carol Kosary, National Cancer Institute
David Roney, Information Management Services, Inc.
Xiao Cheng Wu, Louisiana

Collaborative Research Working Group

Vivien W. Chen, Louisiana, *Chair*
Brenda Edwards, National Cancer Institute
Holly L. Howe, NAACCR
Betsy Kohler, New Jersey
Kathleen M. McKeen, Iowa
Lynn Ries, National Cancer Institute
Thomas C.Tucker, Kentucky
Hannah Weir, Centers for Disease Control and Prevention
Dee West, California
Phyllis Wingo, American Cancer Society

Cancer Staging Work Group

Steven D. Roffers, Georgia, *Chair as of February 1999*
Mohammed Ahmed, Louisiana
Patricia A. Andrews, Louisiana
Vivien W. Chen, Louisiana
Catherine N. Correa, Louisiana
Gayle Clutter, Centers for Disease Control & Prevention
Dan Curran, California
April Fritz, National Cancer Institute
Holly L. Howe, NAACCR
Jennifer Jackson, Louisiana
Nancy Jackson, California
Carin Perkins, California
Lynn Ries, National Cancer Institute
Xiao Cheng Wu, Louisiana

CINA Plus Online Subcommittee

Holly L. Howe, NAACCR, *Chair*
Vivien W. Chen, Louisiana
Eric Durbin, Kentucky
Kate Marie, Cancer Surveillance and Control Program/ Public Health Institute
Long On, Health Canada
Adam Probert, Health Canada
David Roney, Information Management Services, Inc.
Brian Serafini, Kentucky

Please address all comments and suggestions about the monograph to:

NAACCR
Attention: Data Evaluation and Publication Committee
2121 West White Oaks Drive, Suite C
Springfield, IL 62704-6495
(217) 698-0800
(217) 698-0188 (FAX)

For a copy, please contact NAACCR at the above address. The monograph can also be downloaded or viewed from the NAACCR web site (***http://www.naaccr.org***).

April 2000