

CANCER IN NORTH AMERICA, 1997 – 2001

VOLUME TWO: MORTALITY

INTRODUCTION

The North American Association of Central Cancer Registries, Inc. (NAACCR) annually produces this report on cancer in North America. The purpose of this report is to provide cancer incidence and mortality statistics for as much of the population of North America as possible and to promote uniform data standards for cancer registration, improvement of data quality, and promote the use of the cancer registry data. The report provides a means of accessing incidence and mortality data in a common format for most states and provinces of North America, as well as providing estimates of cancer incidence rates for the entire United States, based on a select set of registries with high quality data.

This monograph was produced by the Data Evaluation and Publication Committee, a standing committee of the NAACCR. The NAACCR bylaws charge the Data Evaluation and Publication Committee (DEPC) to gather data from member registries, review, evaluate, and compile the information for publication. The year 2004 marks the 14th release of the annual publication of *Cancer in North America (CINA)* series and the 8th monograph to include cancer mortality data. This monograph reflects the much-appreciated participation of NAACCR member registries in this monograph. 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 North America.

MONOGRAPH FORMAT

The *Cancer in North America (CINA)*, 1997-2001 monograph includes three volumes:

- Volume One contains cancer incidence data for individual member registries,
- Volume Two contains cancer mortality data for individual Canadian provinces and United States, and
- Volume Three contains cancer incidence data combined across registries that meet certain criteria for high quality data (NAACCR Combined Incidence Data).

CONTENTS OF VOLUME TWO

Volume Two presents mortality data for individual provinces in Canada and states in the United States for areas covered by NAACCR members. In order to meet the needs of users throughout North America and the world, this volume contains mortality data age-adjusted to several standards. The contents are as follows:

- Section I: Introduction and Technical Notes
- Section II: Registry Contact List
- Section III: Registry-specific Cancer Mortality by Race and Sex, Age-adjusted to the 2000 U.S. and World Population Standards
- Section IV: Registry-specific Cancer Mortality by Sex, Age-adjusted to the 1996 Canadian and World Population Standards
- Section V: Cancer Mortality for the United States and Canada
- Appendix: SEER Site Groups for Mortality Data Based on ICD-9 and ICD-10

TECHNICAL NOTES

Data Sources

Mortality. Mortality data for 1997 to 2001 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 1997 to 2001 were obtained from Statistics Canada's Canadian Mortality Data Base (CMDDB). The year 2000 and 2001 mortality data for Quebec was unavailable. The 1997-2001 data for Northwest Territories and Nunavut reflects current geographic boundaries.

Population Estimates – United States. Estimates of the population for the U.S., individual U.S. states, and all SEER areas for 1997 through 2001 were obtained from the SEER program, based on U.S. Bureau of Census population estimates for these years. These population estimates represent a modification of the annual time

series of population estimates produced by the Population Estimates Program of the Bureau of the Census with support from the NCI.

The population estimates incorporate bridged single-race estimates that are derived from the original multiple-race categories in the 2000 Census. These bridged estimates are consistent with the four race groups enumerated in the 1990 Census and were produced under a collaborative arrangement between the National Center for Health Statistics and the Census Bureau. The methodology implemented by the Census Bureau to develop these county estimates is comparable to that used to produce national and state 1990-2000 intercensal estimates and is described on the Census Bureau's website.¹

The NCI modifies the Census data for the population estimates for the State of Hawaii. The Epidemiology Program of the Hawaii Cancer Research Center has developed its own set of population estimates, based on sample survey data collected by the Hawaii Department of Health. This effort grew out of a concern that the native Hawaiian population has been vastly undercounted in previous censuses. The "Hawaii-adjustment" to the Bureau of the Census estimates has the net result of reducing the estimated white population and increasing the Asian and Pacific Islander population for the state. The Bureau of the Census estimates for the total population, black population, and American Indian and Alaska Native populations in Hawaii are unaffected. Please refer to the *SEER Cancer Statistics Review, 1975 -2000*² and its methodologies for specific documentation regarding modifications made by the NCI to the Census Bureau estimates.

The registry information page provided for each participating registry in Section III includes the estimated population of each registry by race and year, as well as the percent of the population in each race group for the 1997-2001 time period. Appendix D also summarizes this information for all registries.

Population Estimates – Canada. Statistics Canada provided the estimates of the Canadian population for all Canadian provinces and territories, adjusted for census under-coverage and non-permanent residents. The 1997-2001 populations for Northwest Territories and Nunavut reflect current geographic boundaries.

The registry information page provided for each participating registry in Section III includes the estimated population of each registry by year. The appendix also summarizes this information for all registries. Canadian data are not stratified by race.

Definitions

Cause of Death. Underlying cause of death was coded using the International Classification of Diseases (ICD). In the United States, ICD version 9 was used for deaths occurring from 1997 to 1999 and version 10 was used for deaths occurring in 2000 and 2001. In Canada, version 9 was used until 2000, and version 10 was used for 2001. Cancer deaths were defined as those coded 140.0 through 208.9 in ICD-9 and C00 through C97 in ICD-10. The SEER mortality recode scheme was used to classify cancer deaths into the groupings used in this volume (see Appendix).

Among the many changes in ICD-10 were increases in classification detail, the shift to an alphanumeric classification system, and a number of changes in the coding rules by which a single cause of death is selected from among the multiple causes reported by physicians as causing or contributing to the death. The change from ICD-9 to ICD-10 caused discontinuities in trends for many causes of death, including cancer. The extent of these discontinuities has been measured by comparability studies in which death records are double coded using both the Ninth and Tenth Revisions, and the results compared. Overall, approximately 0.7% more deaths are assigned to cancer when ICD-10 is used than when ICD-9 is used. For some cancers, the differences are larger. Accordingly, the death rate for all cancers combined is higher when ICD-10 is used than when ICD-9 is used. This general rule does not hold for specific cancer sites, whose rates may be higher or lower using ICD-10. However, as discontinuities are small, changes in death rates across the years of the (ICD-9/ICD-10) boundary are still interpretable, especially for major cancer sites.

Cancer deaths among non-residents and deaths of unknown sex or age were omitted from all calculations.

¹ National Center for Health Statistics. U.S. Census Populations with Bridged Race Categories (On-line). Available: <http://www.cdc.gov/nchs/about/major/dvs/popbridge/popbridge.htm>.

² Available: <http://seer.cancer.gov/popdata/>

Rates. Rates were calculated per 100,000 population and age-adjusted by the direct method to the 2000 U.S., the 1996 Canadian (Cdn.) and the World population standards.³ The incidence and mortality rates in this monograph are annual averages for the period 1997 through 2001. (Note: The rates for Quebec are averaged over the three years of data available.) The age distributions of the three population standards are presented below:

AGE GROUP	2000 U.S.	1996 CDN.	WORLD
00 years	13,818	12,342	24,000
01-04 years	55,317	53,893	96,000
05-09 years	72,533	67,985	100,000
10-14 years	73,032	67,716	90,000
15-19 years	72,169	67,841	90,000
20-24 years	66,478	67,761	80,000
25-29 years	64,529	72,914	80,000
30-34 years	71,044	87,030	60,000
35-39 years	80,762	88,510	60,000
40-44 years	81,851	80,055	60,000
45-49 years	72,118	71,847	60,000
50-54 years	62,716	55,812	50,000
55-59 years	48,454	44,869	40,000
60-64 years	38,793	40,705	40,000
65-69 years	34,264	37,858	30,000
70-74 years	31,773	32,589	20,000
75-79 years	26,999	23,232	10,000
80-84 years	17,842	15,424	5,000
85+ years	15,508	11,617	5,000
Total	1,000,000	1,000,000	1,000,000

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

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

where w_j = the fraction of the standard population in age_j group (5-year age interval), n_j = number of cases or deaths in that age group, and p_j = person-years denominator.⁴ For many registries, the standard error of the rates are small, as the population covered is large. However, for registries that cover a small population, the standard error may be substantial.

³ http://www.naaccr.org/index.asp?Col_SectionKey=6&Col_ContentID=9

⁴ Breslow NE and Day NE. *Statistical Methods in Cancer Research, vol. II*, Lyon, France: IARC, 1987, p.59

Comparison of Rates. In addition to true regional variation in cancer risk, differences in cancer incidence or mortality rates between areas may be due to either differences in the demographic make-up of the population or differences in data quality. In making valid comparisons of cancer incidence rates among registries, it is important to review the data quality indicators for each registry before attributing rate differences to regional variation. In addition to data quality, it is important to consider differences in the racial composition of the populations being compared before conclusions are drawn about variations in regional rates. Interpretation without consideration of these factors may contribute to misleading or inaccurate conclusions.

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

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

where $z = 1.96$ for 95% confidence limits.⁵ 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 16 cases or deaths, and it should not be used for rates based on fewer than six cases or 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 ratios of the adjusted rates will vary according to the standard populations used.⁶

Cell Suppression. Counts and rates were suppressed (shown as a dash in the table “-”) in the tables if the race, gender and site-specific number of cases or deaths was less than six. These counts are included in the calculation of all sites combined. A dash is also used to indicate not applicable, as in the gender specific cancers. If the rate was less than 0.05 per 100,000 then the rate is listed as 0.0.

NAACCR MISSION

The North American Association of Central Cancer Registries, Inc. (NAACCR) is a professional organization that 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.

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 USA 62704-6495
(217) 698-0800
(217) 698-0188 (FAX)

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

⁵ Esteve J, Benhamou E, Raymond L. *Statistical Methods in Cancer Research, Volume V*. Lyon, France: IARC Publication No. 128, 1994

⁶ Esteve J, Benhamou E, Raymond L. *Statistical Methods in Cancer Research, Volume V*. Lyon, France: IARC Publication No. 128, 1994

Data Evaluation and Publication Committee Members, 2003-2004

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Royale Anne Hinds, North American Association of Central Cancer Registries, Inc.
Joellyn Hotes, North American Association of Central Cancer Registries, Inc.
Holly L. Howe, North American Association of Central Cancer Registries, Inc.
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Valerie Vesich, Commission on Cancer, ACOS
Ghislaine Villeneuve, Statistics Canada
Elizabeth Ward, Centers for Disease Control and Prevention
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William Wright, California
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