



# Section I

## Introduction and Technical Notes





# **CANCER IN NORTH AMERICA, 1999 - 2003**

## **VOLUME TWO: MORTALITY**

### **INTRODUCTION**

The North American Association of Central Cancer Registries, Inc. (NAACCR) annually produces a statistical monograph on cancer in North America to provide cancer incidence and mortality statistics for the United States and Canada.

The year 2006 marks the 16<sup>th</sup> release of the annual publication of Cancer in North America (CINA) series, the 10<sup>th</sup> monograph to include cancer mortality data, and the second to include cancer incidence data for Latino populations.

This 2006 monograph would not be possible without substantial effort by individual registries to collect timely, complete, and accurate data. NAACCR bylaws charges its standing committee, the Data Use and Research Committee (DURC), to gather data from member registries and review, evaluate, and compile the information for publication. It is the collective goal of NAACCR and its members to provide cancer statistics that are inclusive of all racial/ethnic groups in the United States and of all geographic areas in the United States and Canada.

### **MONOGRAPH FORMAT**

The *Cancer in North America (CINA) 1999-2003* monograph includes four volumes:

- Volume One presents population-based cancer incidence data for individual central cancer registries within Canada and the United States who have agreed to participate in the CINA monograph.
- Volume Two presents cancer mortality data for all geographic areas of Canada and the United States. The Canada combined and United States combined mortality data are presented as well.
- Volume Three contains cancer incidence data combined from registries that met NAACCR criteria for high quality cancer incidence data (NAACCR Combined Incidence Data).
- Volume Four presents cancer incidence data for the Hispanic/Latino populations covered by central cancer registries in the United States who have agreed to participate in the CINA monograph. Combined incidence data for registries that met NAACCR criteria for high quality of cancer incidence data are also presented.

### **CONTENTS OF VOLUME TWO**

For most cancer registries, five-year averages of data are presented for the years 1999 to 2003. If all five years of data were not available, an average of all available years are presented. Major sections of Volume Two, Mortality, are:

- Section I: Introduction and Technical Notes
- Section II: Average-annual Registry-specific Cancer Death Rates by Race and Sex, Age-adjusted to the 2000 United States and World Population Standards
- Section III: Average-annual Registry-specific Cancer Death Rates by Sex, Age-adjusted to the 1996 Canadian and World Population Standards
- Section IV: Average-annual Cancer Death Rates for the United States and Canada
- Appendix: The Recoding Schema of SEER Site Groups for Mortality Data Based on ICD-9 and ICD-10

## TECHNICAL NOTES

### Data Sources

**Mortality.** Mortality data for 1999 to 2003 for United States registries were obtained from the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC), as provided to NCI. The Canadian registry mortality data for 1999 to 2003 were obtained from Statistics Canada's Canadian Mortality Data Base (CMDDB). Only 1999 data is included for Quebec for the registry-specific tables in sections II and III and was not included in the combined statistics, section IV, of this volume.

**Population Estimates - United States.** Estimates of the population for the United States, individual states, and all SEER areas for 1999 through 2003 were obtained from the SEER program, based on United States 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 (NCHS) 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.<sup>1</sup>

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 had 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. Refer to the *SEER Cancer Statistics Review, 1975-2002*<sup>2</sup> and its methodologies for specific documentation regarding modifications made by the NCI to the Census Bureau estimates.

With the increasing availability of single year of age population data, single-age standardizing populations were needed in order to be able to age-adjust by single ages as well as by any arbitrary age groups (e.g. <18, 18+). Since single years of age standards have not been previously published, SEER obtained the original single-age population projections from the Bureau of the Census that were used by NCHS in developing the 2000 United States standard million populations. The single-age standard millions were created from the single-age populations following NCHS's methodology. As expected, the sum of the single ages in the 19 age groups do not match the NCHS published standards. Rather than adjusting the new single-age standards to match previously published numbers, the raw NCHS population numbers were used for the standards. The new standards sum to 274,633,642 rather than 1,000,000.<sup>3</sup>

To maximize the flexibility and use of the cancer statistics presented in this monograph, mortality data are age-adjusted to not only the 2000 United States population standard, but also the 1996 Canadian population standard and the World population standard.

**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 registry information page provided for each participating registry in Section II, Volume Two includes the estimated population of each registry by year. 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-9 was used for deaths occurring in 1999 and version 10 was used for deaths occurring in 2000, 2001, 2002, and 2003. In Canada, ICD-9 was used until 2000, and ICD-10 was used for 2001, 2002, and 2003. 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 the 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.

**Rates.** Rates were calculated per 100,000 population and age-adjusted by the direct method to the 2000 United States, the 1996 Canadian (Cdn.) and the World population standards.<sup>4</sup> The incidence and mortality rates in this monograph are annual averages for the period 1999 through 2003. The age distributions of the three population standards are presented below:

<b>AGE GROUP</b>	<b>2000 U.S.</b>	<b>1996 CDN.</b>	<b>WORLD</b>
00 years	3,794,901	12,342	24,000
01-04 years	15,191,619	53,893	96,000
05-09 years	19,919,840	67,985	100,000
10-14 years	20,056,779	67,716	90,000
15-19 years	19,819,518	67,841	90,000
20-24 years	18,257,225	67,761	80,000
25-29 years	17,722,067	72,914	80,000
30-34 years	19,511,370	87,030	60,000
35-39 years	22,179,956	88,510	60,000
40-44 years	22,479,229	80,055	60,000
45-49 years	19,805,793	71,847	60,000
50-54 years	17,224,359	55,812	50,000
55-59 years	13,307,234	44,869	40,000
60-64 years	10,654,272	40,705	40,000
65-69 years	9,409,940	37,858	30,000
70-74 years	8,725,574	32,589	20,000
75-79 years	7,414,559	23,232	10,000
80-84 years	4,900,234	15,424	5,000
85+ years	4,259,173	11,617	5,000
<b>Total</b>	<b>274,633,642</b>	<b>1,000,000</b>	<b>1,000,000</b>

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

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

where  $w_j$  = the fraction of the standard population in age group  $j$ ,  $n_j$  = number of cases or deaths in that age group, and  $p_j$  = person-years denominator.<sup>6</sup> 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.

**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.<sup>2,6</sup>

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:

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

where  $x = (R_1 - R_2) / \sqrt{(S.E._1^2 + S.E._2^2)}$  and  $z = 1.96$  for 95% limits.<sup>7</sup> 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.<sup>8</sup>

**Cell Suppression.** Counts and rates were suppressed (indicated by “-”) in the tables if the race, gender, and site-specific number of case 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:

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The monograph is available for download or viewing from the NAACCR website (<http://www.naaccr.org>).

## References

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