TECHNICAL NOTES

DATA USE AGREEMENT

By using these data, you signify your agreement to comply with the Illinois Health and Hazardous Substances Registry Act (410 ILCS 525/12). Data collected by the Illinois State Cancer Registry (ISCR) are made available to the public; however, identifying or contacting individuals is prohibited.

To exclude identifying information on individual patients, these data (e.g., age, race, Hispanic ethnicity, year of diagnosis, and type of cancer) have been aggregated into categories within individual records, the number of which depends on the size of the geographic area.

These data are provided as a public service for statistical reporting and analysis only. There should be no attempt to learn the identity of any person included in these data. If the identity of any person is discovered inadvertently, no disclosure or other use of the identity will be made.

The use of these data does not constitute an endorsement of the user's opinion or conclusions by the Illinois Department of Public Health, and none should be inferred.

DATA SOURCES

Cancer Mortality Data: The Surveillance Epidemiology and End Results (SEER) program of the National Cancer Institute (NCI) was the source of information on cancer mortality for 1986 through 2022 by race and ethnicity. The underlying cause of death was provided by the National Center for Health Statistics (NCHS). The data presented were released in April 2025.

Population Estimates: The population estimates of the sex- and race-specific, as well as sex- and ethnicity/race-specific groups in five-year age categories, were used as denominators in the formulation of rates. These population estimates of Illinois for all races, Whites, Blacks, and Asian/other races from 1986 through 2022, and for Hispanics, non-Hispanics, non-Hispanic Whites, and non-Hispanic Blacks for 1990 through 2022, were obtained from both the intercensal and Vintage 2020 bridged-race postcensal population estimates files. Vintage 2023 population estimates were calculated by Woods & Poole Economics, Inc. for the National Cancer Institute (NCI) (http://www.census.gov/programs-surveys/popest.html)(U.S. County Population Data 1969-2023 - SEER Population Data [cancer.gov]). The population estimates incorporate intercensal (for 2000-2009 from the U.S. Census Bureau and 2010-2019 from Woods & Poole) and Vintage 2023 (for 2020-2022) bridged-race estimates are derived from the original multiple race categories in 2000, 2010, and 2020 censuses (as specified in the 1997 Office of Management and Budget standards for the collection of data on race and ethnicity). The bridged single-race estimates, and a description of the methodology used to develop them, appear on the National Center for Health Statistics website (http://www.cdc.gov/nchs/nvss/bridged_race.htm). For more information on the modifications to county population categorized for each decade, visit https://seer.cancer.gov/popdata/modifications.html.
The intercensal estimates from Woods & Poole Economics align with the anticipated U.S. Census Bureau's 2000-2010 and 2010-2019 intercensal estimates methodology (Index of /programs-surveys/popest/technical-documentation/methodology/intercensal). Previous estimates utilized before the availability of the 2010 census data were prone to increased error as the time from the actual 2000 census increased. At the national level, estimates using both the 2000 2010 census are not very different from the previous estimates. However, more significant differences at the state and county levels may result in changes to cancer incidence

rates when comparing this report to earlier versions. Changes in rates also could be attributable to the addition of cases reported late.

DEFINITIONS

Cancer Site Coding for Mortality Data. The underlying cause of death was coded using the *International Classification of Diseases* (ICD-9)[1] for all deaths from 1986 through 1998 and the International Classification of Diseases (ICD-10)2 for all deaths for the year 1999 and later. In the present data, the SEER mortality recode scheme based on ICD-9 and ICD-10 was used to classify cancer death sites.

Because of many changes in ICD-10 as compared to ICD-9, discontinuities in trends for many causes of death, including cancer, may arise. According to a study, compared to using ICD-9 coding, overall, approximately 0.7% more deaths are assigned to cancer when ICD-10 is used, leading to a higher mortality rate for all cancers combined.[3] However, this pattern does not hold for specific cancer sites, whose rates may be higher or lower using ICD-10. These discontinuities are relatively small, and the changes in mortality rates across the years of the ICD-9/ICD-10 boundary are still interpretable, especially for major cancer sites.[4]

Cancer mortality rates are available by single year for Illinois only. Deaths among non-residents and deaths of unknown sex or age were omitted from all calculations. Statistics were not calculated for cells containing less than 10 deaths, due to the National Center for Health Statistics (NCHS) policy.

Mortality Rates: The SEER*Stat® software package,[5] developed by the Information Management Services Inc. for NCI, was used to calculate mortality rates. Rates are expressed per 100,000 population. Age-adjustment of rates was calculated using the direct method, adjusting to the 2000 U.S. standard million population. Rates are rounded to the nearest 10^{th}, and very small rates (e.g., 0.04) are shown as 0.0. They are presented with the lower and upper confidence intervals computed at the 95% level using the Tiwari method.[6] Algorithms used for calculating standard errors and 95% confidence intervals are displayed in Appendix C of the state incidence report (see Illinois State Cancer Incidence and Mortality Review and Update). As mentioned above, due to NCHS policy, mortality statistics were not calculated for cells containing less than 10 deaths. This is not the case for incidence rate-associated statistics.

Race-specific Rates: The race-specific categories in these data are “All Races” combined, “White,” “Black,” and “Asian/Other Races.” Cases reported as of unknown race were included in the "All Races" category, but not in any race-specific group.

Ethnicity/Race Rates: Hispanic ethnicity was used as defined in the database. Because there was a considerably large number of cancer deaths with unknown Hispanic ethnicity in the mortality database, the mortality rates calculated for Hispanics may be underestimated. To be consistent with all national reports, categories are reported as "Hispanic (any race)," "Non-Hispanic (any race)," "Non-Hispanic White," and "Non-Hispanic Black."

DATA INTERPRETATION

Observed variations and differences over the years and across sex and race groups in cancer mortality may reflect modifications in the risk factor status of the population or the consequence of participation in screening and early detection programs. Such changes or differences, however, may instead result from random fluctuations and other factors related to the estimation process. Any conclusions should be made only after carefully considering the following factors influencing annual mortality rates.

Random fluctuations in annual rates are usual and may be substantial, especially for rates based on small numbers of counts (i.e., less than 16).

Population estimates used for denominators may be inaccurate or lack precision. The population data for 1990, 2000, 2010, and 2020 (the years of the U.S. decennial census) are the most accurate for all age-, race-, ethnicity-, and sex-specific categories and would, therefore, produce the most accurate mortality rates. Those for other years are not based on actual population counts, but rather on interpolation or extrapolation of estimates based on demographic characteristics of the population. Mortality rates based on these population estimates would be expected to be less accurate than those for 1990, 2000, 2010, or 2020.

The 95% confidence intervals are included with reported rates to help put the rate in perspective and to facilitate rate comparisons over years and across sex, race, and ethnicity/race groups. Observed differences may not be statistically significant. The range between the lower confidence interval and the upper confidence interval defines, with 95% probability, where the "true" rate may fall. The comparison of two sets of confidence intervals is approximately equivalent to statistical significance tests for differences between two rates and is more conservative than the standard significance test when the null hypothesis is true.[7]

Acknowledgments

The Illinois State Cancer Registry has been funded in whole or in part with federal funds from the National Cancer Institute (NCI); National Institutes of Health; U.S. Department of Health and Human Services, under Contract No. 75N91021D00006; the National Program of Cancer Registries; Centers for Disease Control and Prevention under cooperative agreement 5NU58DP007162-02-00; and the state of Illinois.

Suggested citation for Mortality Data

Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With County, Total U.S. (1969-2022) <Katrina/Rita Population Adjustment> -National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2024. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).

If you have questions about these data, contact the Illinois State Cancer Registry at DPH.ISCRinquiries@illinois.gov.

REFERENCES

1. The Population Estimates Program, U.S. Census Bureau. *Release notes Vintage 2020.* U.S. Census Bureau. 2020-est-relnotes.pdf (census.gov) Accessed May 24, 2024.

2. Surveillance Epidemiology and End Results, National Cancer Institute, U.S. National Institutes of Health. SEER – website. http://seer.cancer.gov/popdata/. Accessed May 24, 2024.

3. World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*, based on the recommendations of the Ninth Revision Conference, 1975. Geneva: World Health Organization, 1977.

4. World Health Organization. *International Statistical Classification of Diseases and Related Health Problems*. 10th revision. Geneva: World Health Organization, 1992.

5. Anderson RN, Minino AM, Hoyert DL, Rosenberg HM. Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates. National Vital Statistics Reports 2001;49:1-32.

6. Sherman R, Firth R, Charlton M, et al (eds). *Cancer in North America, 2015-2019. Volume Three: Registry-specific Cancer Mortality in the United States and Canada.* Springfield, IL: North American Association of Central Cancer Registries, Inc., May 2022.

7. Surveillance Research Program, National Cancer Institute SEER*State software (seer.cancer.gov/seerstat) Version 8.4.3, January 18, 2024.

8. Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. *Stat Methods Med Res* 2006 Dec;15(6):547-69.

9. Schenke N, Gentleman JF. On judging the significance of differences by examining the overlap between confidence intervals. *The American Statistician* 2001;55:182-1