

Report on the Environment

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Childhood Cancer

The term “cancer” is used to characterize diseases in which abnormal cells divide uncontrollably. A cancerous cell loses its ability to regulate its own growth, control cell division, and communicate with other cells. If left unchecked, cancer cells can invade nearby tissues and can spread through the bloodstream and lymphatic system to other parts of the body (NCI, n.d.). The cellular changes caused by cancer cells are complex and occur over a period of time. This may be accelerated in children.

The International Classification of Childhood Cancer (ICCC) is based on tumor morphology (i.e., the type of tumor) and the primary site of origin, with an emphasis on morphology (Steliarova-Foucher et al., 2005). However, incidence rates are sometimes presented based solely on primary site to make them comparable with other published data. The United States Cancer Statistics (USCS), for example, provide data for childhood cancer based on the ICCC as well as primary tumor site (CDC, 2020).

As stated by the National Cancer Institute (NCI), “The causes of most childhood cancers are not known ... Most cancers in children, like those in adults, are thought to develop as a result of mutations in genes that lead to uncontrolled cell growth and eventually cancer” (NCI, 2018a). Environmental exposures have long been suspected of increasing the risk of certain childhood cancers, such as exposure to ionizing radiation. Researchers continue to examine environmental influences on childhood cancer, and indicate there could be “possible associations” between increased risk and exposures to pesticides, parental tobacco smoke, carcinogenic substances (e.g., solvents), outdoor air pollution, and cured meats (prenatally) (NCI, 2018a).

This indicator presents incidence rates for childhood cancers based on primary site from 1973 to 2017. For 1973 to 1998, this indicator uses data collected through the NCI’s Surveillance, Epidemiology, and End Results (SEER) Program. The SEER Program collects and publishes cancer incidence and survival data from 9 (SEER 9), 13 (SEER 13), 18 (SEER 18), and 21 (SEER 21) population-based cancer registries, including state, central, metropolitan, and Alaska Native registries. Specifically, this indicator uses data collected through NCI’s SEER 9 Registries, which cover 9 percent of the U.S. population and have the most years of available data (NCI, 2018b, 2020). For 1999 to 2017, this indicator uses data from the USCS database (CDC and NCI, 2020). The USCS combines data from NCI’s SEER Registries and the Centers for Disease Control and Prevention’s (CDC’s) National Program of Cancer Registries (NPCR). These data are available beginning in 1999 and represent the official federal statistics on cancer incidence for registries that meet annual data criteria for all 50 states and the District of Columbia. These data also include Puerto Rico, beginning in 2005. Due to differences between these two sources (e.g., population coverage), data shown for 1973 to 1998 should not be directly compared to data shown for 1999 to 2017. The 10 most commonly diagnosed cancer sites presented are based on 2017 data compiled from USCS (CDC and NCI, 2020).

What the Data Show

In general, overall childhood (ages 0-19 years) cancer incidence for the U.S. increased slightly between 1973 and 1998 from an age-adjusted incidence rate of 13.8 per 100,000 in 1973 to a rate of 16.3 per 100,000 in 1998. Childhood cancer incidence rates fluctuated between 1999 and 2015, with slight decreases seen in 2016 and 2017 (Exhibit 1). Over these two periods of record, males generally had higher childhood cancer incidence rates than females. In 2017, females and males age 0-19 years had overall incidence rates of 17.4 and 19.0 cases per 100,000, respectively. Throughout the 1973 to 1998 and 1999 to 2017 periods, whites had consistently higher rates than blacks. In 2017, whites and blacks had overall incidence rates of 18.9 and 13.2 cases per 100,000, respectively (Exhibit 1).

Exhibit 2 presents the age-adjusted incidence rates for the top 10 cancers among children 0-19 years of age in 2017 and shows incidence rate trends for these 10 cancers between 1973-1998 and 1999-2017. In general, there are no clearly identifiable temporal trends in rates among any of the top 10 cancers over these two time periods. In 2017, leukemia was the most frequently diagnosed cancer in children age 0-19 years (4.3 cases per 100,000) followed by brain and other nervous system cancers (3.3 cases per 100,000). The 2017 incidence rates of non-Hodgkin's lymphoma, Hodgkin's lymphoma, cancer of the soft tissue including heart, and thyroid cancer are all very similar, with rates ranging from 1.0 to 1.2 cases per 100,000. The remaining top 10 sites include cancer of the bones and joints (0.9 cases per 100,000), cancer of the kidney and renal pelvis (0.7 cases per 100,000), cancer of the colon and rectum (0.5 cases per 100,000), and cancer of the eye and orbit (0.4 cases per 100,000).

Limitations

- SEER 9 Registries data cover 9 percent of the U.S. population, though it is designed to be representative of the entire U.S. population (NCI, 2018b, 2020). However, these data provide the longest temporal record of cancer incidence in the U.S.
- USCS population coverage varies year to year, depending on which registries met CDC's NPCR and NCI's SEER publication criteria. Population coverage may also be affected by the suppression of state incidence data if 16 or fewer cases were reported or if the state requested that the data be suppressed. However, the USCS data set used for this indicator provides coverage for approximately 98 percent of the U.S. population from 1999-2017 (CDC, 2020).
- Due to differences between the two source data sets used for this indicator (e.g., population coverage), cancer incidence estimates for 1973-1998 from SEER 9 Registries (NCI, 2018b, 2020) cannot be directly compared to cancer incidence estimates for 1999-2017 from USCS (CDC and NCI, 2020).

Data Sources

Cancer incidence data for this indicator from 1973-1998 were obtained by querying the NCI's SEER Program database through its Cancer Query System (CanQues) (NCI, 2018b, 2020), available at <https://seer.cancer.gov/canques/incidence.html>. Cancer incidence data from 1999-2017 were accessed from the USCS database housed in CDC's Wide-ranging Online Data for Epidemiologic Research (WONDER) system (CDC and NCI, 2020), available via <https://wonder.cdc.gov/cancer.html>.

References

CDC (Centers for Disease Control and Prevention). 2020. U.S. Cancer Statistics Data Visualizations Tool technical notes. 2019 submission diagnosis years 1999-2017. <https://www.cdc.gov/cancer/uscs/pdf/uscs-data-visualizations-tool-technical-notes-h.pdf> (PDF) (37 pp, 504K).

CDC and NCI (National Cancer Institute). 2020. United States cancer statistics: 1999-2017. Wide-ranging Online Data for Epidemiologic Research (WONDER) online database. Accessed February 2021. <https://wonder.cdc.gov/cancer.html>.

NCI (National Cancer Institute). 2020. Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence - SEER 9 Regs Research Data, Nov 2019 Sub (1975-2017). National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2020, based on the November 2019 submission. Accessed February 2021. <https://seer.cancer.gov/canques/incidence.html>.

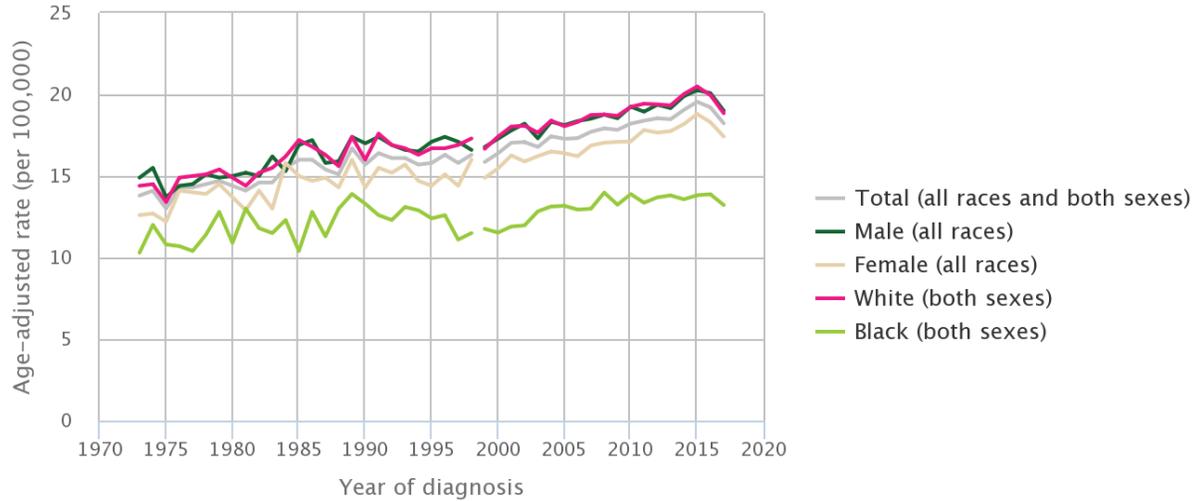
NCI. 2018a. National Cancer Institute fact sheet: Cancer in children and adolescents. Accessed February 9, 2021. Last reviewed October 8, 2018. <https://www.cancer.gov/types/childhood-cancers/child-adolescent-cancers-fact-sheet>.

NCI. 2018b. Surveillance, Epidemiology, and End Results (SEER) Program SEER*Stat Database: Incidence - SEER 9 Regs Research Data, Nov 2017 Sub (1973-2015). National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2018, based on the November 2017 submission. Accessed October and November 2018. <https://seer.cancer.gov/canques/incidence.html>.

NCI. n.d. NCI dictionary of cancer terms. Accessed February 9, 2021. <https://www.cancer.gov/publications/dictionaries/cancer-terms>.

Steliarova-Foucher, E., C. Stiller, B. Lacour, and P. Kaatsch. 2005. International classification of childhood cancer, third edition. *Cancer* 103(7):1457-1467. <https://seer.cancer.gov/iccc/iccc3.html>.

Exhibit 1. Age-adjusted cancer incidence rates in the U.S., 1973–2017: All cancer sites for ages 0–19, by sex and race



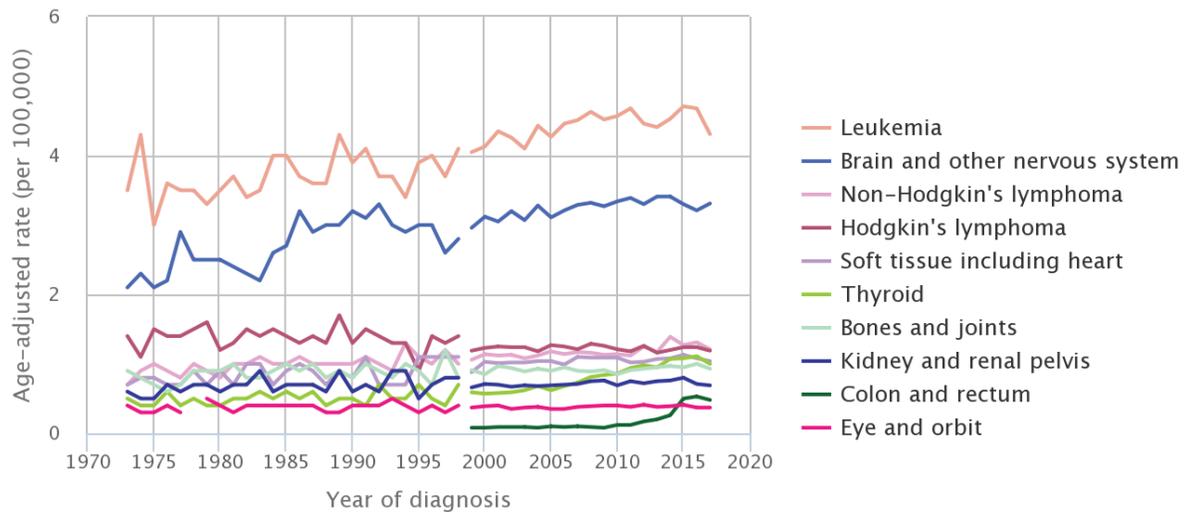
Due to differences in the data sets used to estimate cancer incidence, data from 1973–1998 (NCI, 2018b, 2020) should not be directly compared with data from 1999–2017 (CDC and NCI, 2020).

Rates are age-adjusted to the 2000 U.S. standard population.

Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: CDC and NCI, 2020; NCI, 2018b, 2020

Exhibit 2. Age-adjusted cancer incidence rates in the U.S., 1973–2017: Top 10 cancers for ages 0–19



Due to differences in the data sets used to estimate cancer incidence, data from 1973–1998 (NCI, 2018b, 2020) should not be directly compared with data from 1999–2017 (CDC and NCI, 2020).

Rates are age-adjusted to the 2000 U.S. standard population.

Incidence data for colon and rectum cancer were suppressed in the 1973–1998 data set (NCI, 2018b, 2020) because fewer than 16 cases were reported.

Information on the statistical significance of the trends in this exhibit is not presented here. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: CDC and NCI, 2020; NCI, 2018b, 2020