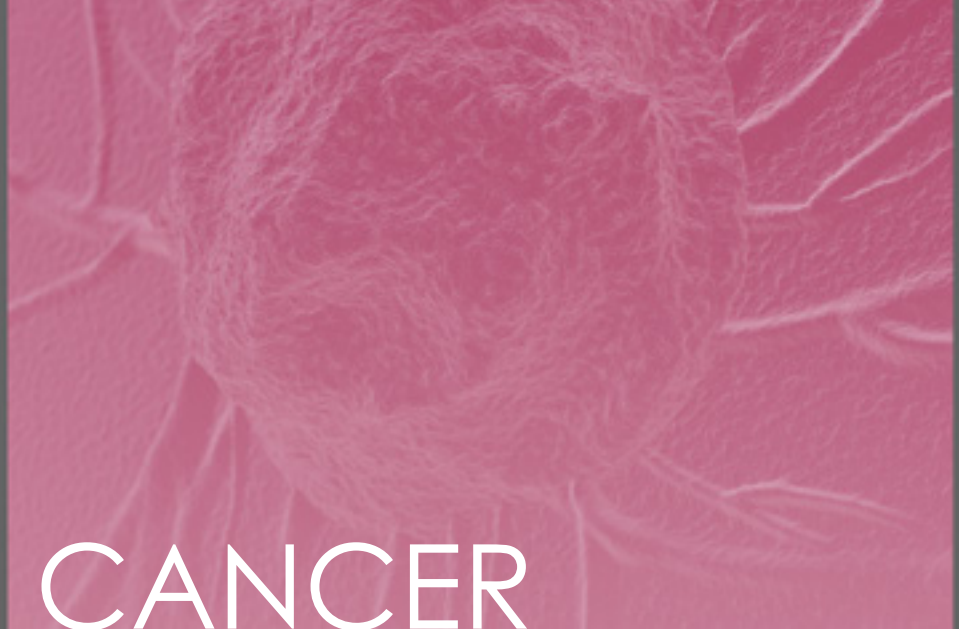


CANCER

QUICK FACTS

Approximately 1.4 million U.S. residents are diagnosed with cancer every year, excluding non-melanoma skin cancers.[1]

Approximately 40% of adults living in the U.S. will be diagnosed with cancer at some point in their lives.[2]

Skin cancer is the most common form of cancer among all persons in the United States.[3,4]

Breast cancer is the most commonly diagnosed cancer in U.S. women and the second leading cause of female deaths.[5,6]

The most common cancer and the leading cause of cancer death among children is leukemia.[7]

Preventive measures vary due to the wide variety of cancers that occur, but they do exist and can be followed to reduce the likelihood of developing cancer.[8]

Despite considerable progress in our understanding and prevention of the disease, cancer remains the second leading cause of death in the United States, claiming the lives of more than a half million Americans every year.[9]

WHAT IS CANCER?

Cancer is not one disease but rather a diverse group of diseases that occur when abnormal cells in the body begin to grow and spread out of control. Although cancer may affect people at all ages, about 77% of all cancers occur in adults 55 years and older[10,11] and the risk of most cancers increases with age as well.

Increasing evidence suggests an association between certain cancers and exposures to environmental pollutants, many of which are potentially avoidable through both behavioral and national policy strategies.[12,13] Airborne contaminants, pesticides, and chemicals in drinking water, for example, have been associated with certain types of cancer. Considering that over 1.4 million U.S. residents are diagnosed with cancer each year (not including the most curable forms of skin cancer),[1] even a small percentage of cases attributable to environmental factors represents a large number of people and a significant public health burden. In addition, the burden of cancer is expected to increase significantly—by an additional 45%—between now and 2030 because of our aging population.[14]

In this module, we will review several cancers that are of significant public health concern and for which evidence of environmental exposure links exists. Specifically, we will review selected environmental evidence for the following cancers:

- Skin (melanoma)
- Lung
- Breast
- Urinary/bladder
- Brain and Other Nervous System
- Thyroid
- Non-Hodgkin lymphoma
- Mesothelioma
- Childhood cancers
- Leukemia

WHAT ARE THE RISK FACTORS FOR CANCER?[15,16,17,18]

Causes of the many types of cancer are not well established and are likely determined by multiple factors acting together. Major well-established risk factors for various types of cancer include tobacco use, lack of physical activity, alcohol, human papilloma virus and other infectious causes, and sun exposure.[19] Genetics also appear to play a role in some types of cancer.

The Environmental Influence

Researchers have found that certain ethnic groups who migrate across geographical areas sometimes exhibit increased cancer rates that more closely match cancer rates found among the population of their new home rather than their country of origin. While the reasons for these changes in cancer rates remain largely unknown, it is believed that environmental factors play a role.

Also, cancer cluster investigations, such as those in Woburn, Massachusetts, and Tom's River, New Jersey, and marked worldwide geographical variations in cancer rates have also contributed to an increased understanding of environmental influences on certain types of cancer.[16,17]

In addition to these factors, accumulating evidence points to a number of links between certain cancers and exposure to environmental pollutants. This module will examine both established and suspected environmental associations for several types of cancer.

HOW ARE WE TRACKING CANCER?

Cancer surveillance is the most well-established and extensive disease surveillance network in the United States. Cancer incidence data are collected by state health departments and supported by federal funds through the National Cancer Institute's (NCI) Surveillance Epidemiology and End Results Program (SEER) and the Centers for Disease Control and Prevention's (CDC) National Program of Cancer Registries (NPCR). In addition, states contribute funding for these data. Cancer mortality data are collected by state vital statistics and are compiled as part of the National Vital Statistics System (NVSS), through the CDC's National Center for Health Statistics.[20] Together, these programs collect cancer data used to track trends and patterns in cancer incidence and mortality for the entire U.S. population.

SEER

Mandated by the 1971 National Cancer Act, SEER began cancer data collection in 1973 and now collects and publishes cancer incidence and survival data from population-based cancer registries covering 18 geographical areas in the United States and approximately 26% of the U.S. population.[21]

NPCR

Established in 1992 by the Cancer Registries Amendment Act,[22] the NPCR collects data on the occurrence of cancer; the type, extent, and location of the cancer; and the type of initial treatment. Forty-five states, the District of Columbia, and two territories participate, representing 96% of the U.S. population.[9]

NVSS

The National Vital Statistics System is a cooperative data-sharing system between the National Center for Health Statistics and public health departments in the 50 states, New York City, Washington, D.C., and five U.S. territories. These health departments are legally responsible for the regis-

tration of vital events—births, deaths, marriages, divorces, and fetal deaths. Deaths from cancer are part of the vital statistics collected using uniform procedures and forms and shared with the National Center for Health Statistics.[20]

SKIN CANCER

WHAT IS SKIN CANCER?

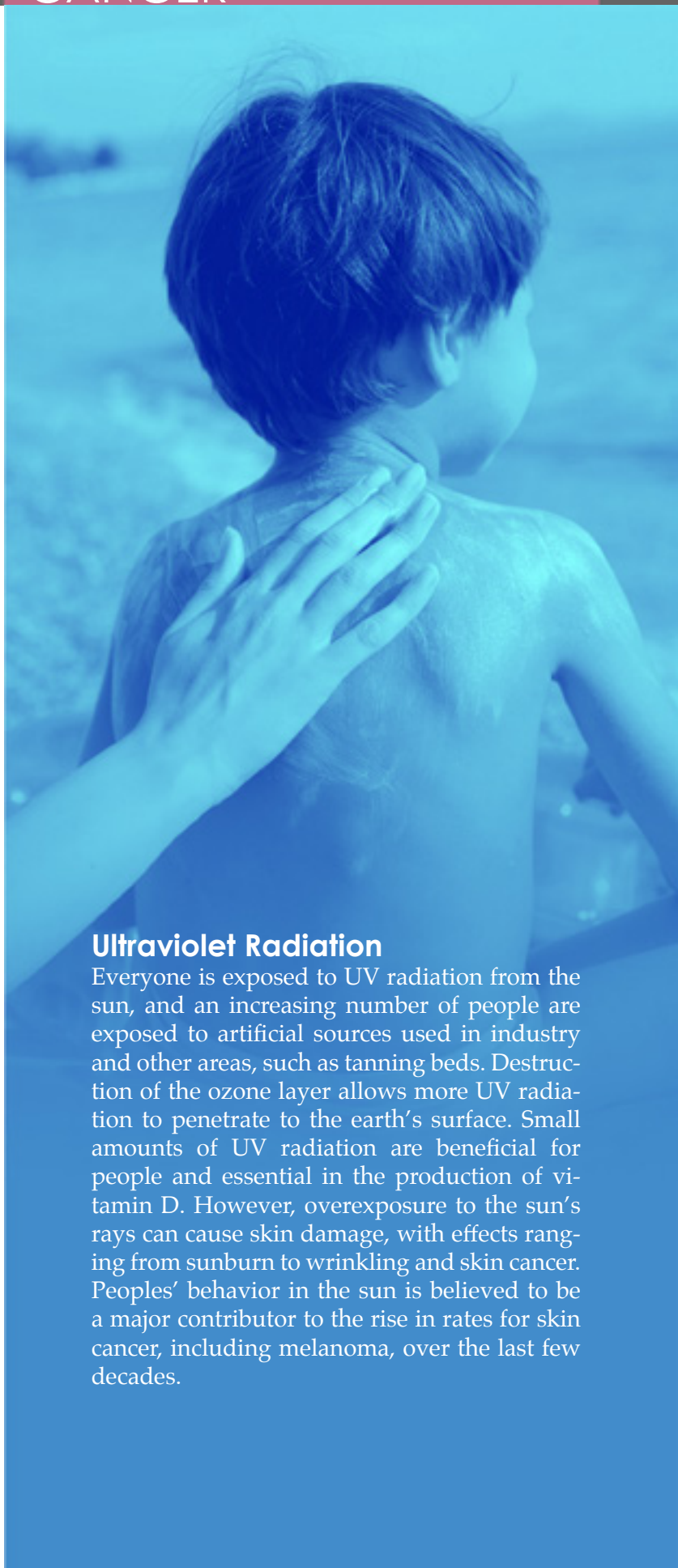
Skin cancers are malignant growths on the outside of the skin caused when a skin cell begins to grow rapidly. Skin cancers are usually one of three types, according to the type of skin cell affected: basal cell carcinoma, squamous cell carcinoma, or melanoma. Basal cell and squamous cell carcinoma are the more common skin cancers, and both are readily treatable if detected early. The type of skin cancer that claims the most lives is melanoma, a cancer of cells in the skin that produce the brown skin pigment called melanin.

Melanoma is much less common than the other types of skin cancer, producing only about 70,000 new cases as compared to over 1,000,000 cases per year of nonmelanoma skin cancer.[3,23] Diagnosed early, most melanomas can be cured. However, melanoma metastasizes much more quickly than basal or squamous cell carcinomas and may produce fatal results. The following discussion focuses on melanoma. (Basal cell and squamous cell carcinomas are not tracked separately by U.S. Cancer Statistics registries.)

WHAT ARE THE RISK FACTORS FOR MELANOMA?

NON-ENVIRONMENTAL RISK FACTORS FOR MELANOMA

Genetic characteristics, such as light skin color, light eyes, red or blonde hair, and freckles, strongly correlate with skin cancer incidence because people with these traits have a tendency to burn easily from sun exposure. Additionally, moles that often run in families tend to develop into melanomas, especially in persons who have many of this type of mole.[24] About 10% of all people with melanoma have a family history of melanoma.[24]



Ultraviolet Radiation

Everyone is exposed to UV radiation from the sun, and an increasing number of people are exposed to artificial sources used in industry and other areas, such as tanning beds. Destruction of the ozone layer allows more UV radiation to penetrate to the earth's surface. Small amounts of UV radiation are beneficial for people and essential in the production of vitamin D. However, overexposure to the sun's rays can cause skin damage, with effects ranging from sunburn to wrinkling and skin cancer. Peoples' behavior in the sun is believed to be a major contributor to the rise in rates for skin cancer, including melanoma, over the last few decades.

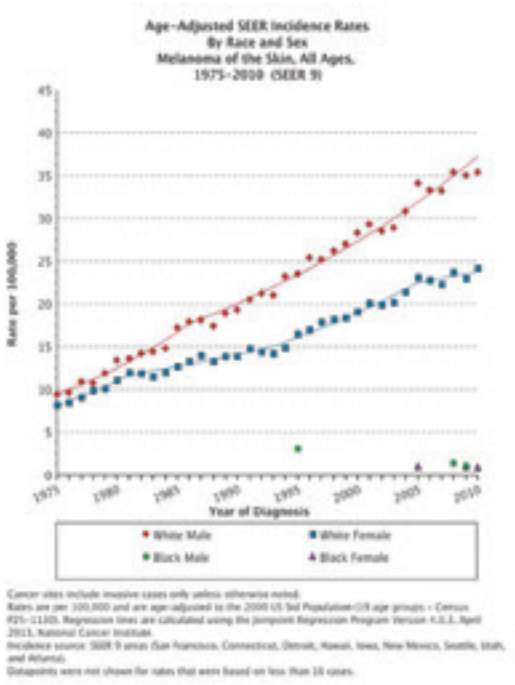


Figure 1. SEER age-adjusted incidence rates by race and sex for melanoma of the skin, all ages; SEER 9 Registries for 1975–2010, age-adjusted to the 2000 U.S. standard population.[31]

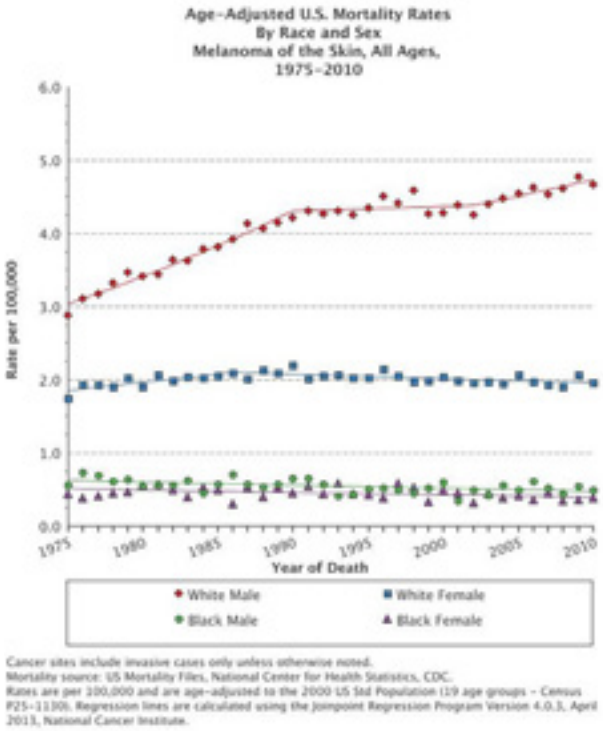


Figure 2. Age-adjusted total U.S. mortality rates for melanoma of the skin, all ages for 1975-2010 by race and sex, age-adjusted to the 2000 U.S. standard population[31]

ENVIRONMENTAL RISK FACTORS FOR MELANOMA

Approximately 65% of melanomas worldwide are caused by exposure to ultraviolet (UV) radiation.[25,26] Exposure to UV radiation is particularly high during childhood and adolescence,[27] and damage from UV radiation may influence the development of melanoma years after the exposure.[24,25]

TRENDS AND STATUS FOR MELANOMA

More than a million people—and up to 2 million by some estimates—are diagnosed with skin cancer each year, making skin cancer the most common form of cancer among all persons in the United States.[3,4] Melanoma represents less than 5% of these skin cancer cases. However, it causes the majority of skin cancer deaths.[28,29] The majority of people diagnosed with melanoma are white men over 50 years old.[30] Melanoma incidence rates for white males have more than tripled since 1975, and mortality rates have almost doubled (Figure 1). Melanoma incidence rates for white females have more than doubled since 1975, although mortality rates have remained essentially unchanged. Melanoma is relatively rare among African Americans and other nonwhite racial and ethnic groups; however, these groups have poorer survival when diagnosed with melanoma (Figure 2).

LUNG CANCER

WHAT IS LUNG CANCER?

Lung cancer is an uncontrolled growth of the tissues in the lung. The great majority of lung cancers appear in the cells that line the cavities and surfaces of the lung. The two main types of lung cancer are small cell lung cancer and non-small cell lung cancer, diagnosed by how the cells look under a microscope.

Most lung cancers appear in persons over 45 years old, with approximately one third of cases being diagnosed in persons 65 to 74 years of age.[32] While smoking is the primary cause of lung cancer, environmental factors, such as secondhand smoke and radon, are also significant contributors.

WHAT ARE THE RISK FACTORS FOR LUNG CANCER?

NON-ENVIRONMENTAL RISK FACTORS FOR LUNG CANCER

Cigarette smoking is the single most important risk factor for lung cancer.[33] People who smoke are 10 to 20 times more likely to get lung cancer or die from lung cancer than people who do not smoke. The longer a person smokes and the more cigarettes smoked each day, the greater the risk.[34,35,36,37,38,39,40,41] Using cigars or pipes also increases risk for lung cancer, but not as much as smoking cigarettes.[35,36,38,39,42,43,44]

ENVIRONMENTAL RISK FACTORS FOR LUNG CANCER

Radon is the second leading cause of lung cancer after tobacco smoke.[45] People are exposed to radon by breathing the radon gas that seeps into homes and buildings from underground rock formations. Currently, the U.S. Environmental Protection Agency (EPA) estimates that 21,000 lung cancer deaths each year in the United States are radon-related. Of these deaths, about 2,900 occur among people who have never smoked.[45]

Secondhand smoke, also called environmental tobacco smoke, is a well-established cause of lung cancer. Every year, about 3,000 nonsmokers in the United States die from lung cancer caused by secondhand smoke.[37,38,46,47,48,49] There is no risk-free level of secondhand smoke exposure.[50]

Exposures to high levels or for long periods of time or both to other agents found in the workplace or in the home environment can also increase the risk of lung cancer. Among these known lung carcinogens are arsenic, asbestos, polycyclic aromatic compounds, and some metals. For many of these other carcinogens, the risk of getting lung cancer is even higher for those who also smoke.[38,39,40,41,51,52]

Finally, there is evidence that exposure to increased levels of fine particulate matter air pollution can increase the risk for lung cancer.[53]

STATUS AND TRENDS FOR LUNG CANCER

More people die from lung cancer than from any other type of cancer. Lung cancer incidence and death rates among men increased from 1975 to the

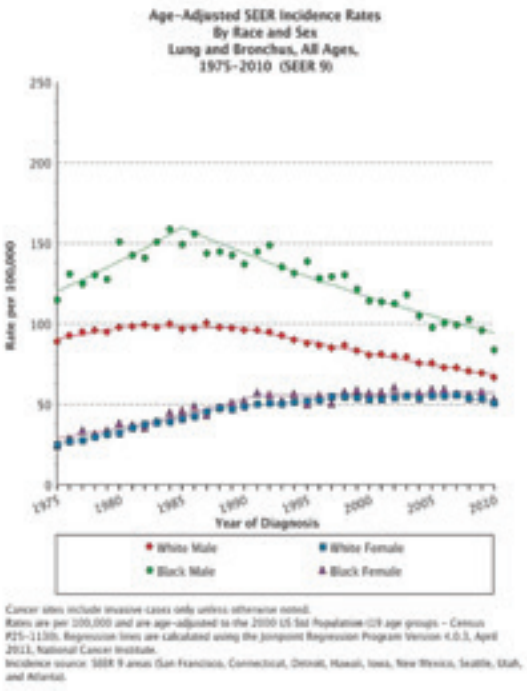


Figure 3. SEER age-adjusted incidence rates by race and sex for lung and bronchus cancer, all ages; SEER 9 Registries for 1975–2010, age-adjusted to the 2000 U.S. standard population[31]

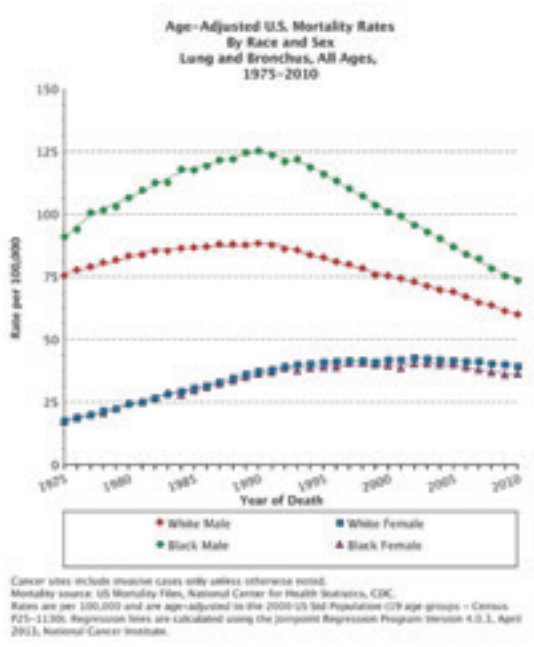


Figure 4. Age-adjusted total U.S. mortality rates for lung and bronchus cancer, all ages for 1975-2010 by race and sex, age-adjusted to the 2000 U.S. standard population[31]

mid-to-late 1980s but declined thereafter (Figures 3 and 4) following the reductions in smoking that began several decades earlier.[54] As the number of women who smoke increased, the lung cancer incidence and mortality rates for women also increased. Deaths due to lung cancer among women have only now begun to decline.[55] It is estimated that in 2010 there were over 201,000 new cases of lung and bronchus cancer diagnosed and 158,248 deaths from the disease.[56]

Approximately 54% of new cases and 56% of deaths were men.[1] Overall, African-American men have the highest incidence and death rates, with the death rate approximately 26% higher than that of white males.[1]

Meanwhile, African-American women have approximately the same lung cancer incidence and death rates as do white women. African Americans are less likely to receive the recommended treatment or surgery than are whites, even with comparable insurance and income levels, which accounts for much of the difference in survival rates.[57,58,59]

American Indians and Alaska Natives are diagnosed with lung cancer at younger ages than whites. Among American Indians and Alaska Natives, 41.6% of cases were less than 65 years of age at diagnosis compared with 29.8% of cases among whites. In addition, lung cancer rates are not decreasing for American Indians and Alaska Natives as they are for whites.[60]

FEMALE BREAST CANCER
WHAT IS FEMALE BREAST CANCER?

Breast cancer is an uncontrolled growth of malignant cells in the breast tissue. There are different kinds of breast cancer, depending on which cells in the breast turn into cancer. Breast cancer can begin in different parts of the breast and spread to adjacent tissue or other parts of the body.

Both men and women can get breast cancer, but it is far more frequent in women. In fact, breast cancer is the most commonly diagnosed cancer in U.S. women and the second leading cause of female deaths.[5,6] Although incidence and death rates for breast cancer have stabilized or decreased over the last decade, the rates are still high compared to most other types of cancer, and disparities between racial and ethnic groups persist.

WHAT ARE THE RISK FACTORS FOR FEMALE BREAST CANCER?

NONENVIRONMENTAL RISK FACTORS FOR BREAST CANCER

Age, genetics, and various reproductive issues are among the well-documented nonenvironmental risk factors. The following are known to increase breast cancer risk:

- Increased age.[61,62,63,64]
- First menstrual period earlier than normal (before age 12).[5,61,62,63,64,65]
- Menopause starting at a later age (after age 55).[5,61,65,66]
- Older age (after 30 years of age)at birth of first child.[5,61,63,64,65]
- Never given birth.[61,62,63,64,65]
- Never breastfed.[67]
- Personal history of breast cancer or some noncancerous breast diseases.[61,62,63,64,65]
- Family history of breast cancer (mother, sister, or daughter).[61,62,63,64,65]
- Treatment with radiation therapy to the breast/chest.[61,63,66,67]
- Overweight (increases risk for breast cancer after menopause).[61,65,67]
- Long-term use of hormone replacement therapy (estrogen and progesterone combined).[61,63,65,66,67]
- Changes (mutations) in the breast cancer-related genes BRCA1 or BRCA2.[61,65,66]
- Use of birth control pills, also called oral contraceptives. (Creates a slightly increased risk that decreases over time and disappears 10 years after use is discontinued.)[61,65,66]
- More than one drink of alcohol per day.[63,65,66]
- No regular exercise.[61,65,66,67,68]

ENVIRONMENTAL RISK FACTORS FOR BREAST CANCER

Clear links between environmental exposures and breast cancer have not yet been established. Studies on animals have shown that certain environmental pollutants can cause tumors in the animals' mammary glands. Whether these same pollutants cause breast cancer in humans is unclear.

Certain carcinogens, such as benzene and second-hand cigarette smoke, have been implicated as contributing to development of breast cancer. However, the evidence is weak, and more research is needed.[69,70,71]

Some industrial products and pesticides, such as DDT, PCBs, and dioxin, have also been investigated because of their persistence in the environment, their ability to dissolve in fatty tissues (lipophilic properties), and their potential to act as endocrine disruptors. Endocrine disruptors stop the production or block the transmission of hormones in the body. However, studies conducted to date do not support an association between the incidence of breast cancer and levels of these chemicals found in the body.[69,70,72,73,74]

WHAT ARE THE TRENDS AND STATUS FOR FEMALE BREAST CANCER?

Since the late 1990s, breast cancer incidence rates have decreased or remained essentially the same for women of racial and ethnic groups tracked by SEER. Current data indicate that the incidence of this disease has remained stable (Figure 5) following a decrease in incidence from 1999 to 2003, primarily among women less than 50 years old.[31] Death rates have continued to decrease since about 1990, especially for whites (Figure 6).[31]

More on Racial Disparities[77,78]

- The risk of the less treatable, more deadly basal-type breast cancer is 2.1 times greater in black women than in other women. This difference may explain the difference in mortality rates between black women and others.
- A Hispanic woman diagnosed at the same age and at the same stage of cancer as a non-Hispanic white woman is 20% more likely to die within 5 years.
- American Indian and Alaska Native women are more likely to be diagnosed with advanced-stage breast cancer than white women.

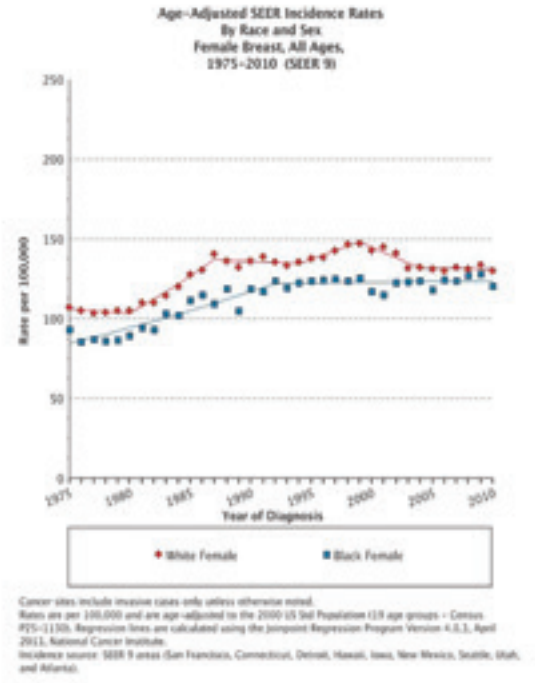


Figure 5. SEER age-adjusted incidence rates by race for breast cancer, all ages, females; SEER 9 Registries for 1975–2010 age-adjusted to the 2000 U.S. standard population[31]

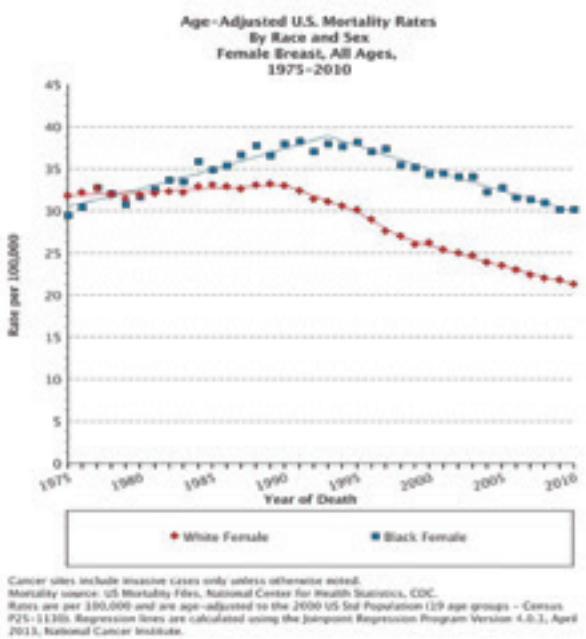


Figure 6. Age-adjusted total U.S. mortality rates for breast cancer, all ages, females for 1975-2010 by race, age-adjusted to the 2000 U.S. standard population[31]

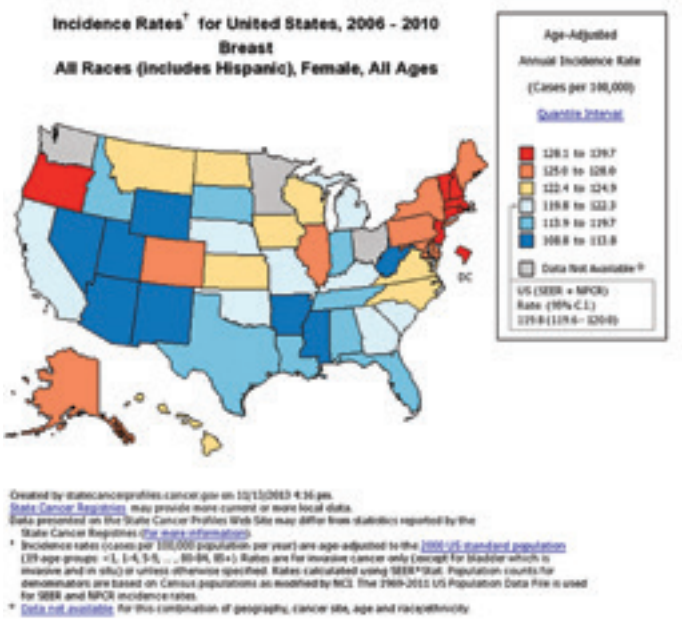


Figure 7. Geographic distribution of 2006-2010 incidence rates for female breast cancer in the United States, all ages and races, both sexes[56]

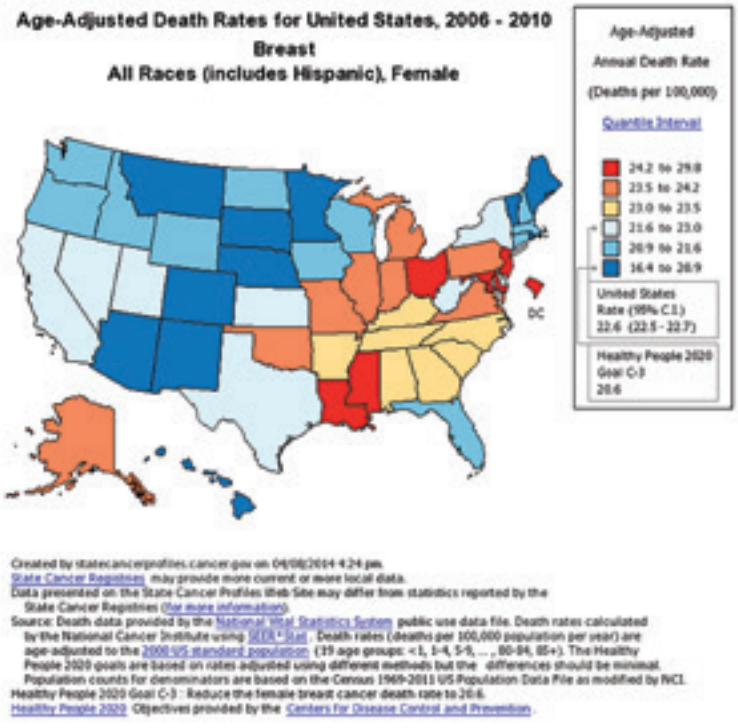


Figure 8. Geographic distribution of 2006-2010 mortality rates for female breast cancer in the United States, all ages and races[56]

Even with these improvements, breast cancer is the number one cause of cancer death in Hispanic women and the second most common cause of cancer death in white, black, Asian and Pacific Islander, and American Indian and Alaska Native women.[1] In 2010, 209,005 women were newly diagnosed with breast cancer,[56] and 41,435 died from the disease[1]. White women are more likely to be diagnosed with breast cancer than women of any other race or ethnicity in the United States.[75] African-American women, however, are more likely to die from the disease than women of any other race or ethnicity (see More on Racial Disparities box).[76]

Incidence and mortality rates of breast cancer are generally highest in the eastern half of the United States (Figure 7 and Figure 8). Oregon, however, has one of the highest incidence rates while Vermont and Maine rank among the states with the lowest death rates.

Research has shown that geographic differences in breast cancer incidence may be caused by the population distribution of known breast cancer risk factors, such as menstrual and reproductive variables. In addition, geographic variations in breast cancer incidence and mortality may be caused by differences in the presence of environmental hazards, geographic lifestyle differences and changes or advances in medical practice and health care management. However, more research is needed to determine the complete effect these factors have on breast cancer incidence and mortality.[77,78,79]

WHAT IS URINARY BLADDER CANCER?

URINARY BLADDER CANCER

Urinary bladder cancer refers to any of several types of malignant growths in the bladder, a hollow, muscular, and flexible organ that collects and stores the body's fluid wastes. Usually, urinary bladder cancer starts in the cells that line the inner surface of the bladder.

Smoking is estimated to be responsible for almost half of all bladder cancers, and historical observations of high bladder cancer incidence among dye workers testifies to the role that occupational exposure—and perhaps environmental exposure—can play in this cancer.

WHAT ARE THE RISK FACTORS FOR URINARY BLADDER CANCER?

NON-ENVIRONMENTAL RISK FACTORS FOR URINARY BLADDER CANCER

Cigarette smoking is well established as a risk factor for bladder cancer. About 50% of these cancers in men and 30% in women are attributable to smoking.[80] Most of the genetic changes associated with urinary bladder cancer develop in the bladder tissue during a person's lifetime. Individuals with a family history of urinary bladder cancer do have an increased risk of getting the disease.[81] Also, studies suggest that chronic bladder inflammation, the parasitic infection schistosomiasis, and some medications used to treat cancer may be risk factors associated with urinary bladder cancer.[82]

ENVIRONMENTAL RISK FACTORS FOR URINARY BLADDER CANCER

Studies have shown a small increase in urinary bladder cancer after long-term exposure to disinfection by-products found in drinking water disinfected with chlorine, chlorine-containing agents, or ozone.[83,84,85,86,87,88,89] These results are of concern because of the large number of people who regularly drink treated water. On the other hand, the risk posed by these carcinogens is miniscule in comparison to the risk of other diseases caused by the microorganisms removed by the water treatment process.

Exposure to high levels of arsenic in drinking water has been associated with many adverse health effects including bladder cancer.[90,91,92,93] Arsenic in community water systems is currently regulated at 10 micrograms per liter ($\mu g/L$). However, concentrations of arsenic in groundwater, a source of untreated private well water, have been found as high as 3400 $\mu g/L$ in some western states.[94]

Exposure to benzidine, a chemical used in dyes, is a widely recognized environmental risk factor[83,95] as is exposure to polycyclic aromatic hydrocarbons (PAHs) from the combustion of carbon-containing compounds, such as wood and motor vehicle exhaust.[96] Additionally, occupational exposures may account for up to 25% of all urinary bladder cancers.[81]

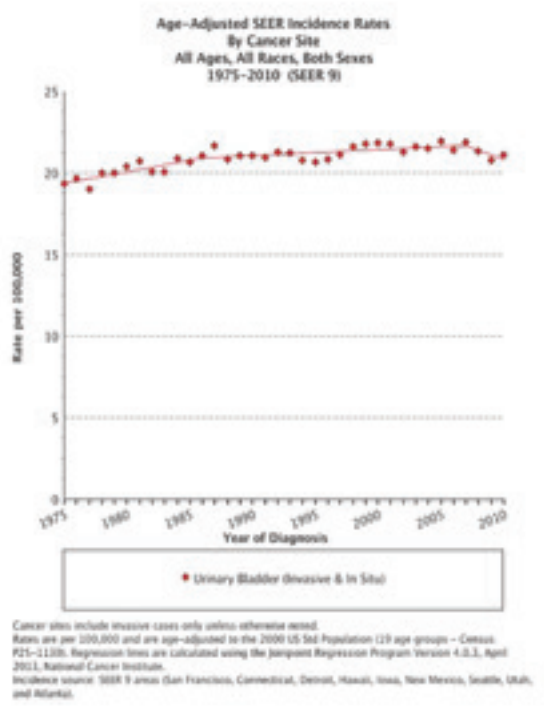


Figure 9. Age-adjusted incidence rates for urinary bladder cancer, all ages, all races, both sexes; SEER 9 Registries for 1975–2010, age-adjusted to the 2000 U.S standard population[31]

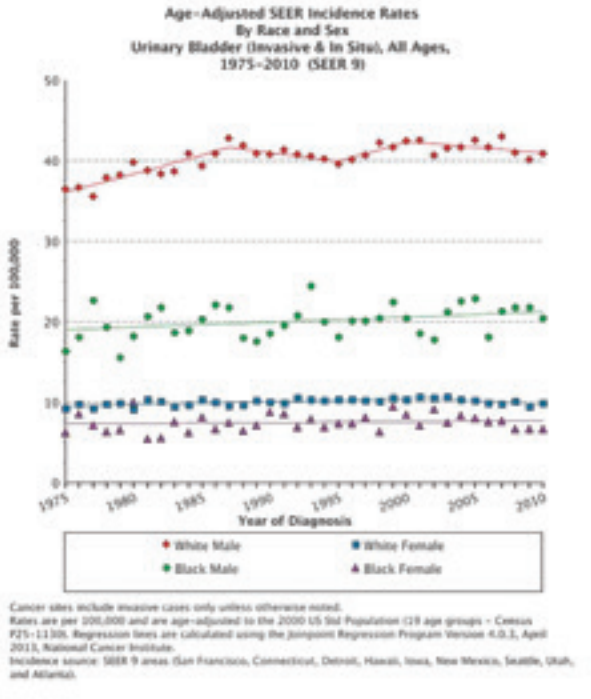


Figure 10. Age-adjusted incidence rates by race and sex for urinary bladder cancer, all ages; SEER 9 Registries for 1975–2010 age-adjusted to the 2000 U.S. standard population[31]

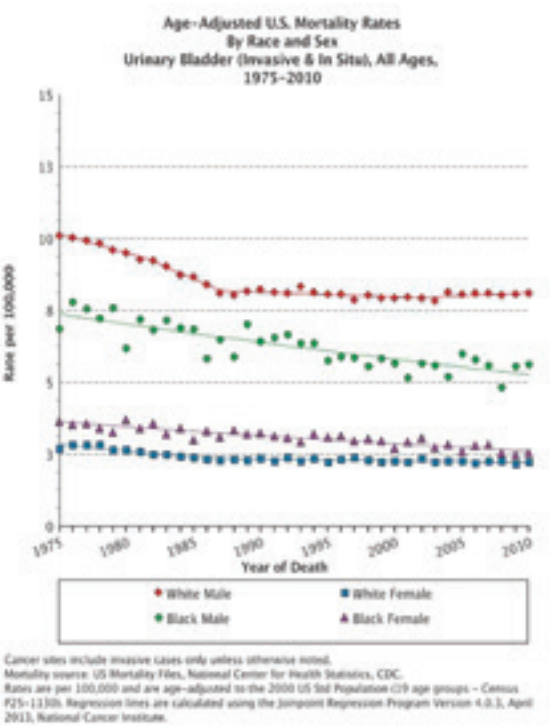
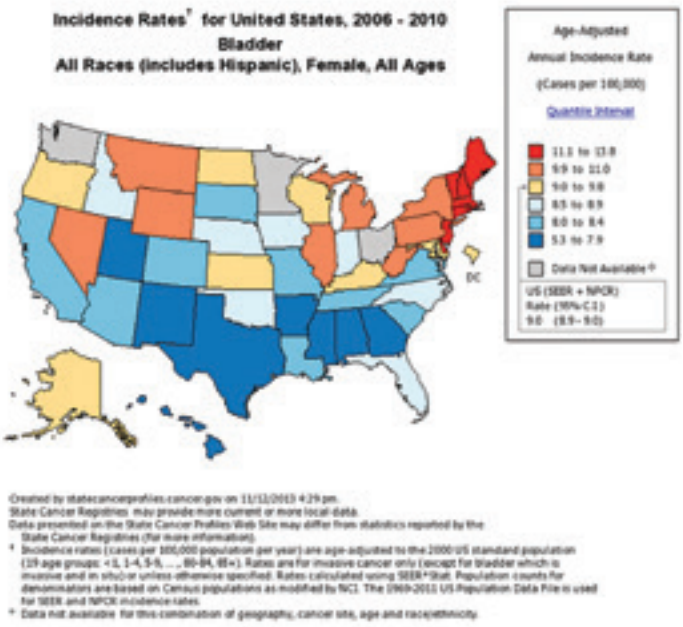


Figure 11. Age-adjusted total U.S. mortality rates for urinary bladder cancer, all ages for 1975-2010 by race and sex, age-adjusted to the 2000 U.S. standard population[31]

Figure 12. Geographic distribution of 2006-2010 incidence rates for urinary bladder cancer in the United States, all ages and races, both sexes[56]



STATUS AND TRENDS FOR URINARY BLADDER CANCER

Urinary bladder cancer is the fourth most common type of cancer among men in the United States, and it is the 14th most common cancer among white women.[31] More than 64,000 people, 75% of them men, were diagnosed with bladder cancer in 2010. Most of these people were 55 years of age or older.[56]

The overall incidence rate for bladder cancer has increased over the last several decades (Figure 9) from 19.3 per 100,000 U.S. residents in 1975 to 21.1 per 100,000 in 2010.[97] Incidence rates for white males increased about 12%. Incidence rates for black males increased roughly 25% but remained below the corresponding incidence rates for white males (Figure 10).

Urinary bladder cancer mortality rates have improved, however. They decreased slowly but steadily from 5.5 per 100,000 U.S. residents in 1975 to 4.4 per 100,000 in 2010.[98] During this same time period, death rates of blacks and whites of both genders decreased 20% to 35% (Figure 11).

Both incidence and mortality rates for urinary bladder cancer exhibit significant racial and gender disparities. The incidence rate for white men is about double the incidence rate for black men and about four times the incidence rate for white women. Other races and ethnicities (e.g., American Indian and Alaska Native, Asian and Pacific Islander, Hispanic) have lower incidence and mortality rates than do whites or blacks and, likewise, exhibit wide gender gaps in incidence and mortality rates.[97] Note that although black women consistently have had a lower incidence rate than white women, the mortality rates for black women are higher than those for white women.

In the United States, the highest incidence rates for urinary bladder cancer are found in the northern part of the country, particularly the northeast (Figure 12). Investigations are currently underway to determine why incidence rates are higher in the Northeast.

WHAT IS THYROID CANCER?

THYROID CANCER

Thyroid cancer is a malignancy that develops in the small, butterfly-shaped gland below the Adam's apple that regulates the body's metabolism, governing everything from heart rate to how fast the body burns calories. Thyroid cancer refers to the types of malignancies that can occur among the different functional cell types found in the thyroid. There are four major

types of thyroid cancer (papillary, follicular, medullary, and anaplastic) that vary in frequency of occurrence and in aggressiveness, with anaplastic, the least common type, being the most aggressive.

WHAT ARE THE RISK FACTORS FOR THYROID CANCER?

NON-ENVIRONMENTAL RISK FACTORS FOR THYROID CANCER

Nonenvironmental risk factors associated with this type of cancer include a family history of thyroid cancer, being white and female, and having a diet deficient in iodine.[98]

ENVIRONMENTAL RISK FACTORS FOR THYROID CANCER

The increased risk of thyroid cancer associated with exposure to external ionizing radiation, any one of several types of particles and rays given off by items such as radioactive material, high-voltage equipment, and nuclear reactions, has been well established. Because the thyroid is more radiosensitive in children than adults, radiation-induced risk decreases with increasing age at exposure.[99]

Internal exposure to radioactive iodine (I-131) has been a concern as a result of nuclear weapons testing and nuclear power plant accidents such as Chernobyl. Studies of people who received I-131 for medical diagnostic use have not demonstrated an increased thyroid cancer risk. However, the large majority of the study subjects were adults at the time of I-131 administration. Increases in childhood thyroid cancer cases were reported in areas heavily contaminated with radioactive fallout including I-131 following the Chernobyl accident and in the decades since.[98,99, 100]

STATUS AND TRENDS FOR THYROID CANCER

Thyroid cancer is the seventh most commonly diagnosed cancer among women in the United States. Over 41,000 U.S. residents were diagnosed with thyroid cancer in 2010.[1]

In the U.S. population, the incidence of thyroid cancer doubled from 4.9 per 100,000 people in 1975 to 13.8 in 2010.[101] The increase is especially marked for white women, whose rate more than tripled from 1975–2010 (Figure 13). Although it is much rarer than many other cancers, thyroid cancer incidence rates have been increasing faster than those for any other type of cancer.[1] The cause of the rise in thyroid cancer incidence rates is not yet clear.[102,103,104] Mortality, on the other hand, has held steady around 0.5 per 100,000 people from 1975 to 2010 (Figure 14).[101]

Thyroid cancer tends to appear in relatively young adults. This incidence pattern differs from many other adult cancers in that the majority of cases are diagnosed in adults 20 to 55 years of age.

WHAT IS NON-HODGKIN LYMPHOMA?

NON-HODGKIN LYMPHOMA

Non-Hodgkin lymphoma comprises a diverse group of malignancies that may develop in lymphoid tissue. Lymphoid tissue includes organs associated with the lymphatic system (e.g., the lymph nodes, spleen, or tonsils) that are part of the body's immune system which produces certain blood cells and protects against infection. In non-Hodgkin lymphoma, tumors develop from lymphocytes — a type of white blood cell that is part of the immune system.

Rates of non-Hodgkin lymphoma have increased dramatically in the last few decades.

Typical Exposures to Ionizing Radiation:

Medical X-rays. Routine diagnostic X-rays use very low doses of radiation. This exposure is slight and not thought to cause thyroid cancer.

Medical treatments. Radiation therapy for some childhood cancers increases the risk for thyroid cancer. In the past, radiation was used on children to treat conditions, such as acne, infections of the scalp, and enlarged tonsils and adenoids, for which we do not use it today.[101]

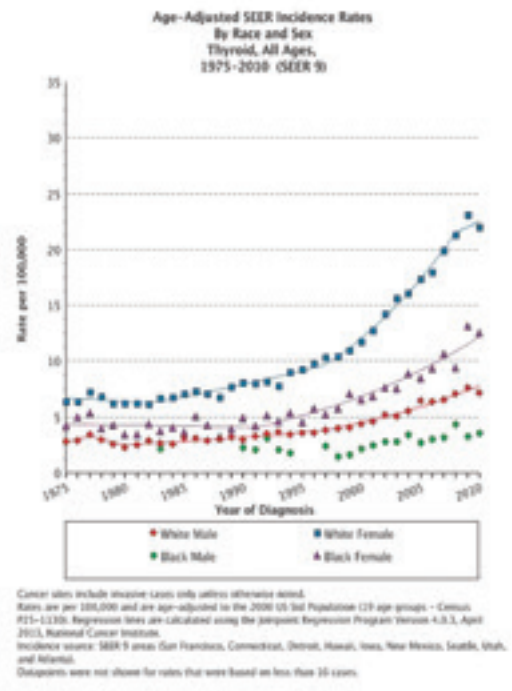


Figure 13. SEER age-adjusted incidence rates by race and sex for thyroid cancer, all ages; SEER 9 Registries for 1975-2010, age-adjusted to the 2000 U.S. standard population[31]

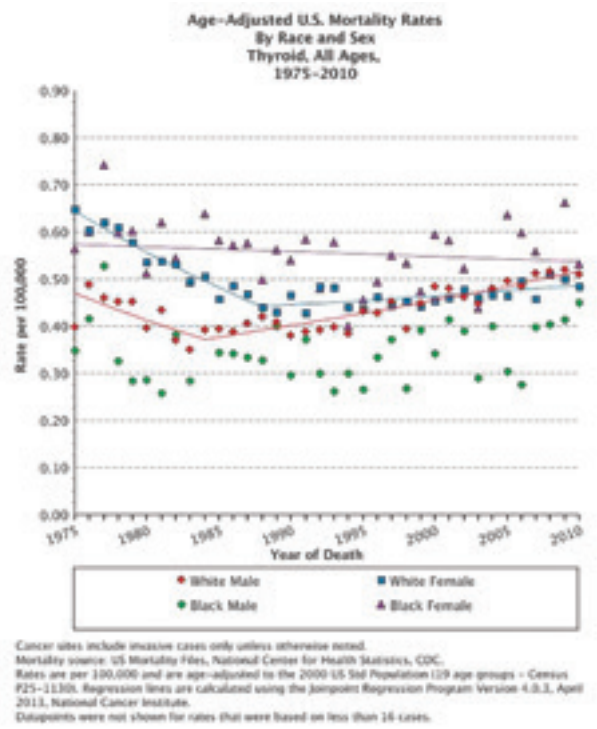


Figure 14. Age-adjusted total U.S. mortality rates for thyroid cancer, all ages for 1975-2010 by race and sex, age-adjusted to the 2000 U.S. standard population[31]

More on Disparities

Thyroid cancer incidence is about one-third higher for whites than for blacks and more than twice as high for women than for men (for both blacks and whites). In 2010, thyroid cancer incidence rates were 22 per 100,000 for white females and 7.2 for white males; the rate for black females was 12.5, and the rate for black males was 3.6.[101] All incidence rates have been increasing at an accelerated pace (Figure 13).

Thyroid cancer mortality affects all races and ethnicities equally. The only noticeable difference is that Asian and Pacific Islanders have a 45% higher mortality rate than the other groupings at 70 years of age and older. In 1975, the thyroid cancer mortality rate for women was almost 50% greater than that for men. Since then, the rate for men has decreased very slightly, and the rate for women has declined significantly (1.1% per year) until parity with men was gained in 1999. The male and female mortality rates have remained similar in the ensuing years.[56]

WHAT ARE THE RISK FSCTORS FOR NON-HODGKIN LYMPHOMA?

NON-ENVIRONMENTAL RISK FACTORS FOR NON-HODGKIN LYMPHOMA

Nonenvironmental risk factors associated with non-Hodgkin lymphoma include the following:

- Increased age
- Male gender
- An immune system weakened by an inherited immune disorder, an autoimmune disease, or immunosuppressant drugs[105]
- Precursor Hodgkin lymphoma
- Viruses such as human T-lymphotropic virus type I (HTLV-1), HIV/AIDS, and Epstein-Barr[105]

ENVIRONMENTAL RISK FACTORS FOR NON-HODGKIN LYMPHOMA

Environmental risk factors for non-Hodgkin lymphoma include working with or being extensively exposed to pesticides[106,107,108,109] solvents[110,111] or agricultural chemicals.[112,113]

STATUS AND TRENDS FOR NON-HODGKIN LYMPHOMA

Non-Hodgkin lymphoma can occur at any age, but incidence increases markedly with age. In the U.S. population, the incidence of non-Hodgkin lymphoma has almost doubled in the past 30 years for which data are available, increasing from 11.1 cases per 100,000 people in 1975 to 21.0 in 2010 (Figure 15).[114] Non-Hodgkin lymphoma is more common in men than in women. In 1975, white males and white females were almost twice as likely to develop non-Hodgkin lymphoma as black males and black females respectively, with black males and white females having similar incidence. Over time, the ratio has decreased (Figure 16).

The non-Hodgkin lymphoma mortality rate has increased by 20% in the past 30 years, increasing from 5.6 deaths per 100,000 people in 1975 to 6.1 in 2010.56 Like incidence rates, mortality rates are highest for white males, lowest for black females, and similar for black males and white females. (Figure 17).

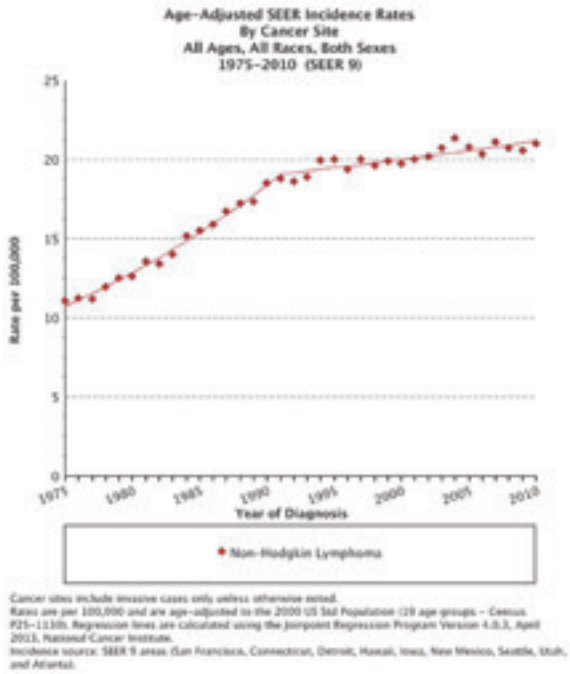


Figure 15. SEER age-adjusted incidence rate for non-Hodgkin lymphoma, all races, both sexes, all ages; SEER 9 Registries for 1975–2010 age-adjusted to the 2000 U.S. standard population[31]

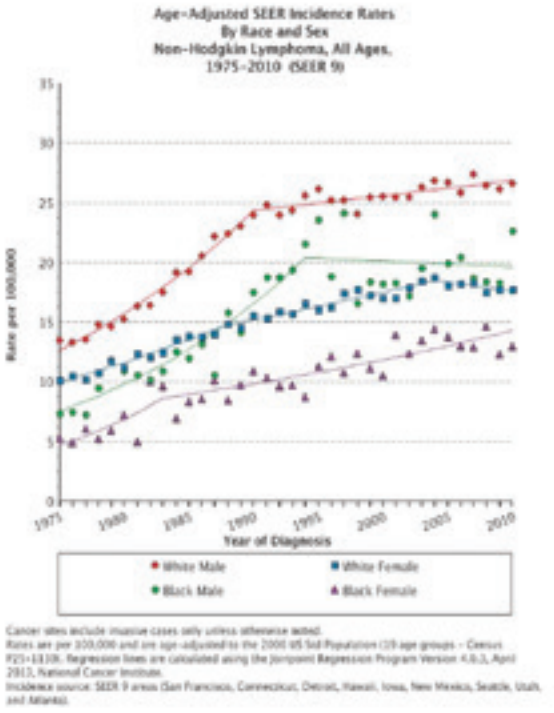


Figure 16. SEER age-adjusted incidence rates by race and sex for non-Hodgkin lymphoma, all ages, both sexes; SEER 9 Registries for 1975–2010 age-adjusted to the 2000 U.S. standard population[31]

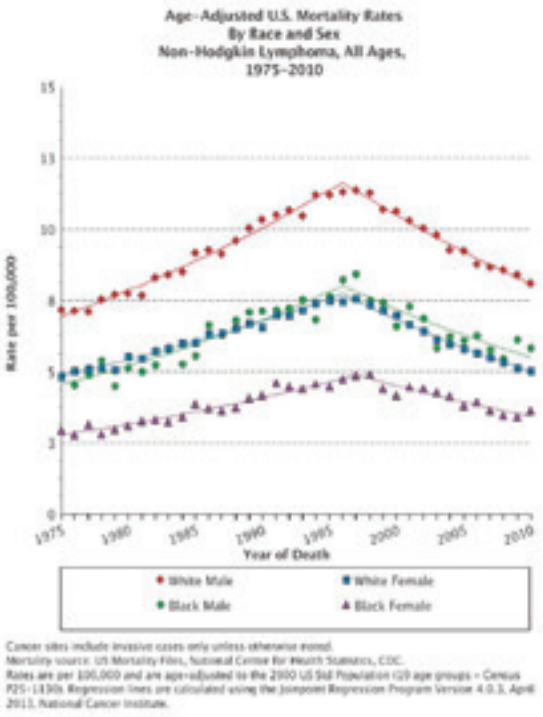


Figure 17. Age-adjusted total U.S. mortality rates for non-Hodgkin lymphoma, all ages for 1975-2010 by race and sex, age-adjusted to the 2000 U.S. standard population[31]

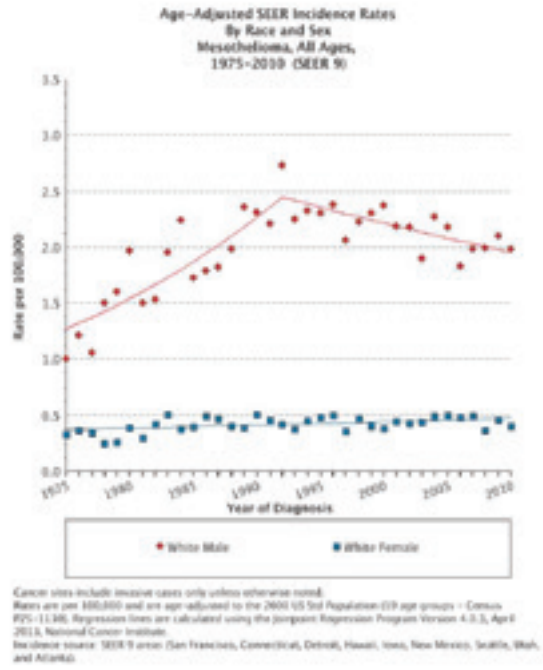


Figure 18. SEER Age-adjusted incidence rates by race and sex for mesothelioma, all ages; SEER 9 Registries for 1975–2010 age-adjusted to the 2000 U.S. standard population[31]

WHAT IS MESOTHELIOMA?

Mesothelioma is a form of cancer, almost always caused by exposure to asbestos, where malignant cells develop in the mesothelium, a protective lining that covers most of the body's internal organs. The most common site for mesothelioma is the pleura, where malignant cells develop around asbestos particles that have embedded in the outer lining of the lungs or chest cavity, in the lining of the abdominal cavity, or in the sac that surrounds the heart. Symptoms take 20 to 50 years to develop.

WHAT ARE THE RISK FACTORS FOR MESOTHELIOMA?

NON-ENVIRONMENTAL RISK FACTORS FOR MESOTHELIOMA

Scientists are investigating a possible link between the SV40 virus, a virus found in both humans and monkeys, and mesothelioma, but evidence to date is inconclusive. Studies of smokers show no association with mesothelioma, although the risk of lung cancer is increased greatly in people who smoke and have also been exposed to asbestos.[115,116]

ENVIRONMENTAL RISK FACTORS FOR MESOTHELIOMA

Exposure to airborne particles of asbestos, or similar fibrous silicates, is the major environmental risk factor for mesothelioma. Such exposure may result from the following:

- Mining or milling minerals[117,118,119,120,121,122,123]
- Fireproofing the superstructures of buildings or ships[124,125,126,127,128]
- Maintaining railroad or automotive brakes[129-130]
- Insulating pipes and ductwork[131,132,133,18]
- Release of building materials to the air by wear or demolition[134]
- Being near a road paved with crushed serpentine stone[135]
- Handling the work clothes of asbestos miners or millers[136]

As the link between asbestos and mesothelioma emerged in the late 1970s[137] use of asbestos decreased, and most use stopped by 1989. Experts believe that the leveling off of mesothelioma incidence rates is attributable to the drop in asbestos use after recognition of the cancer link.[118] Historically, ingestion of asbestos in treated water or from smoking early filter cigarettes (with asbestos filters) have also been risk factors.

Thorium dioxide, which was used many years ago for certain x-ray tests, was associated with mesothelioma and therefore, is no longer used.[118]

STATUS AND TRENDS FOR MESOTHELIOMA

Mesothelioma is a rare cancer and is more common in whites compared to blacks. The incidence rate for mesothelioma more than doubled for white males from 1.0 per 100,000 people to 2.5 between 1975–1992 (Figure 18). Since then, it has decreased and leveled out. Incidence rates for black males and black females are too low to produce a stable trend line. The mortality rate has remained at about 24 cases per million people since 1999 for white males (Figure 19).[138,1] The number of deaths per year, 2,606 in 2009,[11] is increasing with the elderly population at about 1.2 % per year.[140]

Mesothelioma-related death rates in the United States are greatest in the northern half of the country, especially the Northwest, Alaska, and the northern states east of the Mississippi River (Figure 20).

CHILDHOOD CANCERS

Cancer is the third most common cause of death (after unintentional injury and homicide) among persons 1 to 19 years of age in the United States.[141] Because cancer occurs much more rarely in children than it does in older people, the different types of cancer that do occur during childhood are generally considered collectively and include the following:

Year	Overall	White		Black		Other	
		Male	Female	Male	Female	Male	Female
	Age-Adjusted Death Rate						
1999	11.64	23.88	4.29	10.32	2.57	6.47	2.18
2000	11.59	24.22	4.20	10.96	2.02	5.44	1.30
2001	11.32	23.83	4.23	7.53	1.32	6.68	1.10
2002	11.44	24.54	3.73	10.61	1.56	5.11	1.31
2003	11.48	23.84	4.20	11.54	1.24	6.56	1.38
2004	11.44	23.95	4.30	10.19	1.27	4.71	1.27
2005	11.41	23.38	4.51	10.76	1.82	4.77	1.06
1999–2005	**11.48**	**23.98**	**4.21**	**10.32**	**1.67**	**5.62**	**1.34**

Before 1999, mortality data for mesothelioma could be listed only as cancer of the pleura[139]

Figure 19. Malignant mesothelioma. Death rates per million population by race and sex, U.S. residents 15 years and older, 1999–2005

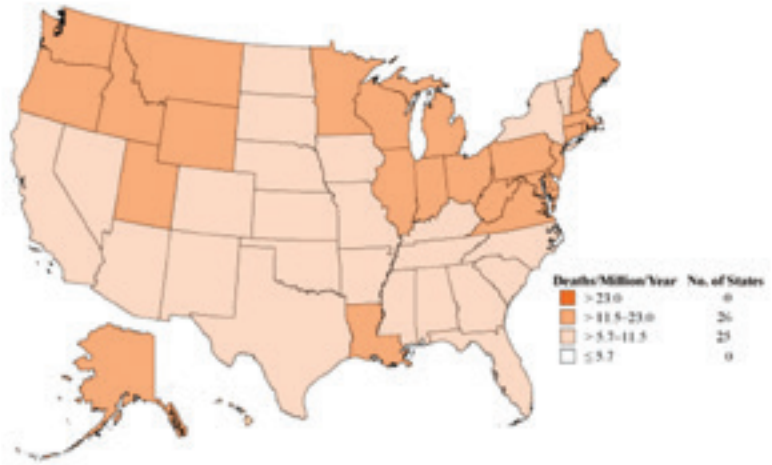


Figure 20. Malignant mesothelioma mortality by state for U.S. residents age 15 and older, 1999–2005[140]

- Leukemia
- Central nervous system tumors
- Intracranial and intraspinal neoplasms
- Lymphoma and reticuloendothelial neoplasms
- Carcinomas and other malignant epithelial neoplasms
- Soft-tissue sarcomas
- Germ-cell tumors
- Trophoblastic and other gonadal neoplasms
- Malignant bone tumors
- Sympathetic nervous system tumors
- Renal tumors
- Retinoblastoma
- Hepatic tumors
- Other malignant tumors[26]

WHAT ARE THE RISK FACTORS FOR CHILDHOOD CANCER?

NON-ENVIRONMENTAL RISK FACTORS FOR CHILDHOOD CANCER

The cause of most childhood cancers is not known. Some of these cancers are the result of genetics (cancer runs in the family), but most are not. Lifestyle factors, like poor diet and lack of exercise, which are thought to be important risk factors for adult cancers, do not seem to contribute to childhood cancers.

A common DNA mutation called *translocation* has been linked to some childhood leukemias. Specifically, during cell division one chromosome breaks off and mistakenly becomes attached to another chromosome. When this translocation occurs with specific chromosomes, leukemia can result.[142,143]

Limited evidence links viruses or other infectious agents to the development of childhood cancers. Epstein-Barr virus (EBV) occurs worldwide, is one of the most common human viruses, and infects most people sometime during their lives. EBV is strongly linked to Burkitt lymphoma (BL), the most common childhood cancer in sub-Saharan Africa and New Guinea.[125] Evidence suggests that childhood Hodgkin disease may be a rare response to Epstein-Barr virus infection.[126] Helicobacter pylori is a type of bacteria that infects about half the world's population. It has been known to cause epithelial cells that line the stomach to become cancerous; this occurs mainly in childhood.[127]

ENVIRONMENTAL RISK FACTORS FOR CHILDHOOD CANCER

Childhood cancer includes a wide variety of malignancies. Within the spectrum of childhood cancers, environmental factors may contribute to some childhood cancers more than they do to others. Environmental factors that have been associated with the incidence of different forms of cancer include:

- Pesticides[147,148,149,150,151,152,153]
- Polynuclear aromatic hydrocarbons (PAHs)[154,155,156]
- Metals[155,156,157,158,159]
- Ionizing radiation[160,161,162,163,164,165]
- Electromagnetic fields[166,167,168]
- Solvents[158,169,170]

Evidence suggests a link between parental pesticide exposure and leukemia, brain cancer, non-Hodgkin lymphoma, Wilms' tumor, and Ewing's sarcoma in children.[142,143,145,147,148] In utero exposure to ionizing radiation (e.g., X-rays) may cause leukemia and brain tumors.[55,163,164] Parental (both maternal and paternal) exposure to solvents (e.g., benzene, carbon tetrachloride, trichloroethylene) has been linked with childhood leukemias.[165,169,170] In addition, an association has been found between childhood leukemia and living close to heavy traffic and its emissions.[154]

Both radon[171,172,173] and secondhand tobacco smoke[38] have been investigated as putative risks for childhood cancer with little or no evidence of any association with such cancer.

STATUS AND TRENDS FOR CHILDHOOD CANCER

The overall childhood cancer death rate has declined significantly since 1990, most likely a result of improvements in cancer treatment. However, the incidence rate for all childhood cancers has increased slightly.

An estimated 11,630 cases of cancer occurred in children less than 15 years of age in the United States in 2013.[174] Incidence rates have been increasing, with the number of children diagnosed with all forms of invasive cancer totaling 11.5 cases per 100,000 children in 1975 compared with 17.4 in 2010 (Figure 21).[1]

In 2010 incidence rates per 100,000 people 0 to 19 years of age for the most common types of childhood cancer were as follows:[175]

Cancer	Incidence Rate
Leukemia	4.5
Brain & other nervous system	3.1
Hodgkin Lymphoma	1.2
Non-Hodgkin Lymphoma	1.1
Soft-tissue	1.0
Bones & joints	0.8
Kidney & renal pelvis	0.7

Table 1. Incidence rate of childhood cancers

The most common childhood cancer—and the leading cause of cancer death among children—is leukemia. The highest incidence rate is found among children 1 to 4 years of age. Mortality rates are highest among children less than 1 year of age and between 10 and 19 years of age.[7] The second most common cancer among children is cancer of the brain and central nervous system. The highest incidence rates of brain cancer are found among children 1 and 4 years of age while the highest mortality rates are found among children 5 to 9 years of age.[175]

Although uncommon, childhood cancer is the leading cause of death by *disease* in U.S. children between 1 and 19 years of age. However, mortality for all childhood cancers combined has decreased since 1975 (Figure 22).[31] Furthermore, the 5-year survival rate for all childhood cancers combined has improved significantly.[175] During the 1970s, the 5-year survival rate was less than 50%. By the late 1990s, that rate had increased to nearly 80% because of improvements in treatment. It should be noted that individual childhood cancers often exhibit incidence and mortality patterns that differ from the trends for overall childhood cancer.

A 2010 study of trends in childhood cancer incidence and mortality[176] showed that while incidence rates had significantly increased from 1975 to 2006, mortality rates had declined from 5.14 per 100.000 to 2.48 per 100.000. In 2010, the mortality rate for all childhood cancers combined was 2.31 per 100,000 with leukemia and brain and other nervous system cancers accounting for 55% of all deaths (Figure 23).

From a geographic perspective (Figure 24), in 2006-2010, mortality rates for all cancers combined for children and adolescents were similar for all states ranging from 1.6 per 100,000 in Connecticut to 3.2 in North Dakota.[56]

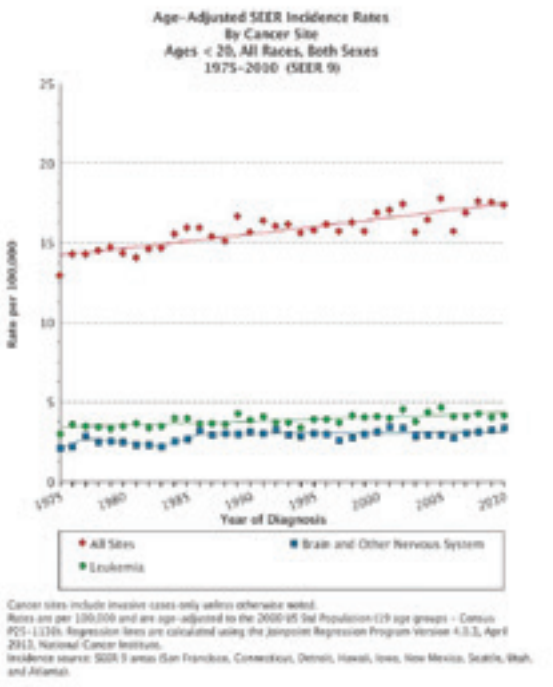


Figure 21. SEER age-adjusted childhood cancer incidence rates at selected primary sites 1975–2010[31]

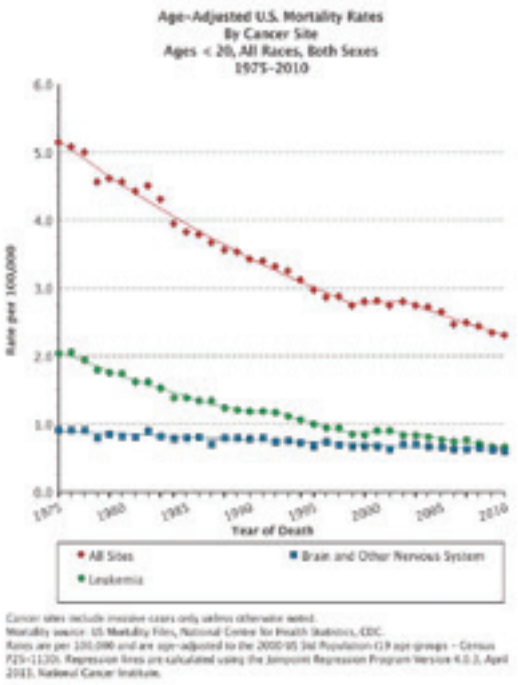


Figure 22. Age-adjusted childhood cancer mortality rates at selected primary sites 1975-2010[31]

Figure 23 Percentage of childhood cancer mortality in the United States in 1975 and 2010 by cancer site[11]

Cancer Site	1975	%	2010	%
All malignant cancers	5.15		2.31	
Leukemia	2.03	39.4	0.66	28.7
Brain and Other nervous system	0.93	18.1	0.60	25.9
Lymphoma (Non-Hodgkin's)	0.44	8.5	0.09	3.9
Lymphoma (Hodgkin's)	0.12	2.3	~	0.6
Neuroblastoma	0.36	7.0	0.18	7.7
Bones and Joints	0.35	6.8	0.20	8.6
Soft tissue	0.17	3.3	0.18	7.6
Kidney and Renal pelvis	0.14	2.7	0.07	2.9
Liver and Intrahepatic bile duct	0.09	1.7	0.07	2.9
Gonad	0.13	2.5	~	0.6
All other cancer sites	0.38	7.4	0.24	10.6

~ Rates are suppressed if fewer than 16 cases were reported for a specific cancer site.

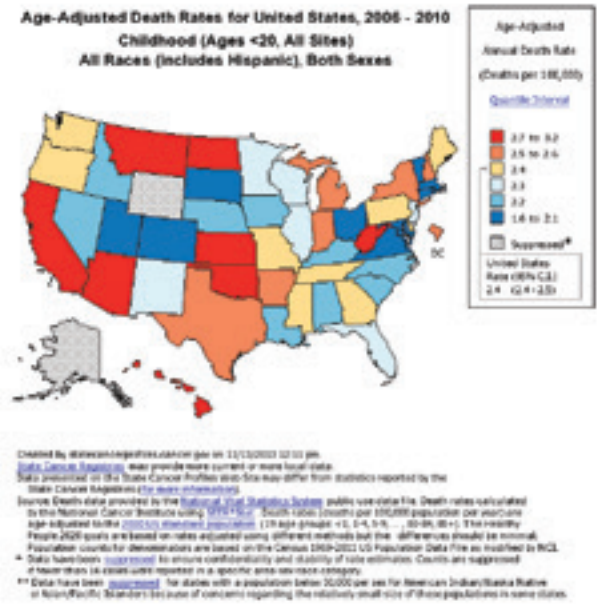


Figure 24. Age-adjusted childhood cancer mortality rates by state for all ages, 2006–2010[56]

BRAIN AND OTHER NERVOUS SYSTEM CANCERS

WHAT IS BRAIN CANCER?

The brain is composed of many types of cells and tissues. An abnormal growth of cells or combinations of cells can cause formation of brain tumors. Primary brain tumors, those that originate in the cells and tissues of the brain, can be either benign (noncancerous) or malignant. Secondary (metastatic) brain tumors originate from cancer cells migrating to the brain from elsewhere in the body.

Though rare among the general U.S. population, cancer of the brain and other parts of the nervous system is the second most common cancer in children.[1] The American Cancer Society (ACS) estimates that 3,800 central nervous system tumors, one fourth of which are benign, are diagnosed in children each year. More than 20,000 people (55% of them men) in the U.S. were diagnosed with cancer of the brain and other nervous systems (ONS) in 2010,[56] and 14,164 people died from it in 2010.[1] Since 1991, mortality rates for most groups have decreased.

WHAT ARE THE RISK FACTORS FOR BRAIN CANCER?

NON-ENVIRONMENTAL RISK FACTORS FOR BRAIN CANCER

Certain rare inherited conditions such as tuberous sclerosis and von Recklinghausen neurofibromatosis increase the risk for cancers of the nervous system in children and adults. Viruses and immunosuppression can also increase the risk of brain and ONS cancers.[177]

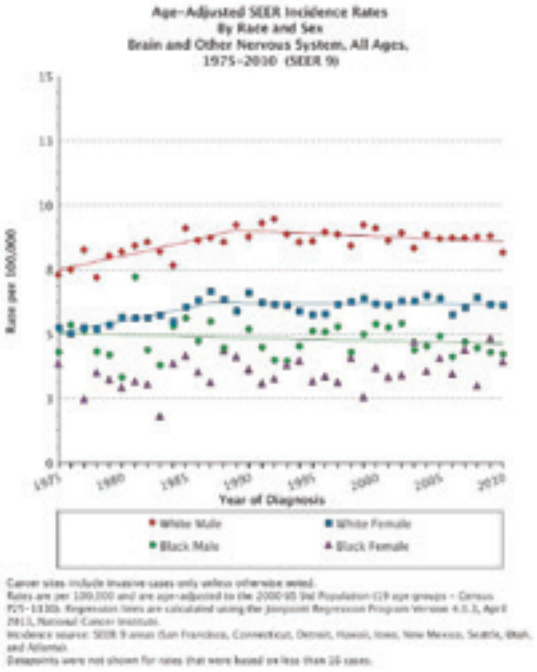


Figure 25. Age-adjusted brain and other nervous system (ONS) cancer incidence both sexes, 1975–2010[31]

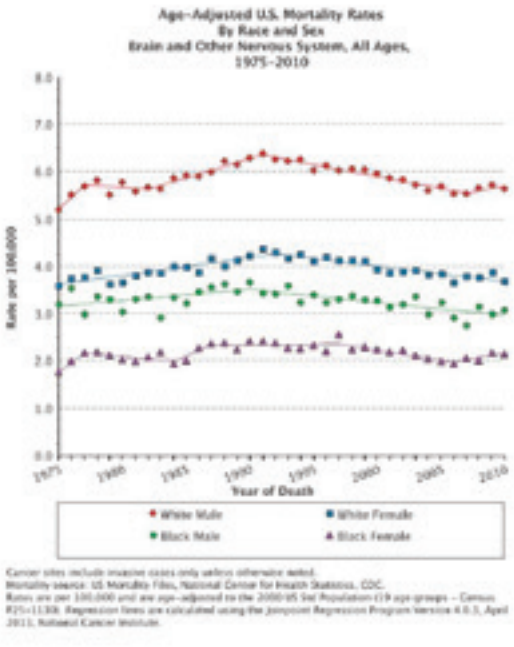


Figure 26. Aged-adjusted death rates for brain and other nervous systems cancers, 1975-2010[31]

ENVIRONMENTAL RISK FACTORS FOR BRAIN CANCER

The lack of individual level exposure data makes it difficult to determine the environmentally-related risk factors associated with brain and ONS cancers. However, some studies suggest that the excess risk among adult men may be linked to occupations in several industries including plastics or textiles, pulp and paper mill, petrochemical or petroleum exploration research, and firefighting.[178,179,180,181,182] Specific exposures that have been linked to brain and ONS cancers include ionizing radiation, n-hexane, organometallics, amines (other than nitrosamines), formaldehyde, vinyl chloride, and acrylonitrile[183] and, to a limited degree, agricultural and occupational exposure to pesticides.[184,185]

Electromagnetic fields—in particular the radio frequencies from mobile phones—have been investigated, but the results are mixed. Several studies have found no association between handheld cell phone use and increased risk for brain cancer[188,189] but other studies have suggested a slightly increased risk for certain kinds of brain cancer.[186,187] The World Health Organization has classified cell phones as possibly carcinogenic to humans.[190] Further studies of long term usage of cell phones are needed.

Research suggests that children are at risk from exposure to pesticides and other chemical toxicants in the environment, especially during fetal development and in early life.[147,148,149, 150] Other research suggests parental work in agriculture, electricity, or motor vehicle-related occupations, e.g., a driver or a mechanic, and maternal textile work are related to children's risk for brain and ONS cancers.[191,192]

STATUS AND TRENDS FOR BRAIN CANCER

In 2010, the incidence rate of brain and ONS cancers for all ages in the United States was 6.3 per 100,000 persons.[1] Almost 80% more whites were diagnosed with brain cancer than were blacks, and males were diagnosed more often than were females.[193] In 2010, the incidence rate was 8.2 per 100,000 for white males, 6.1 per 100,000 for white females, and about 4 per 100,000 for black males and females (Figure 25).[193]

The median age at diagnosis is 56 years old. Only about 13% of cancers of the brain and ONS are diagnosed in persons under aged 20 years,[193]

but, because children rarely get cancer, it is still the second most common cancer diagnosed in children.

The age-adjusted death rate for cancer of the brain and ONS was 4.2 per 100,000 residents in the U.S. in 2010. White males and white females are more likely than black males and black females, respectively, to die from brain cancer, and this disparity has persisted for at least three decades (Figure 26). Cancer of the brain and ONS claims the lives of 50% more males than females, and the majority of deaths occur in persons 45 years of age or older.[57]

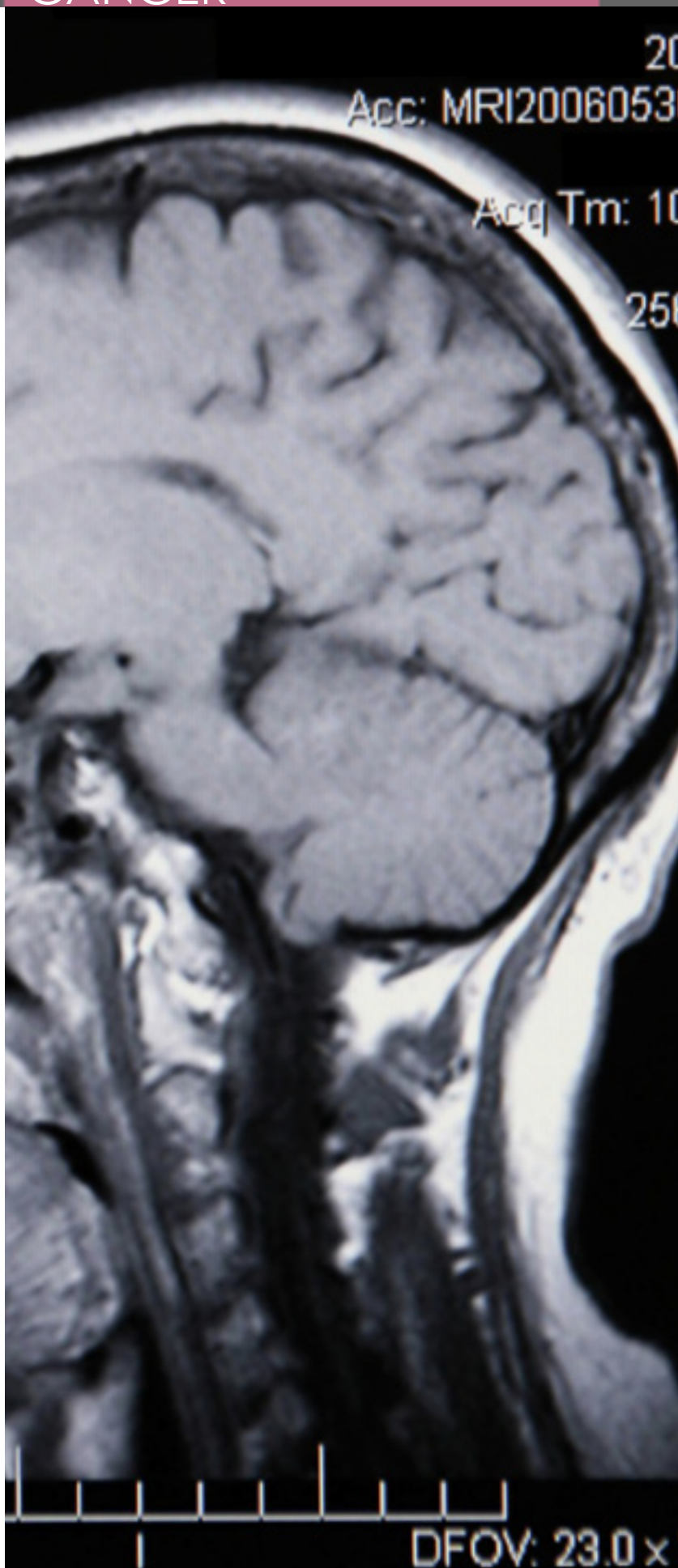
WHAT IS LEUKEMIA?

LEUKEMIA

Leukemia is the most common blood cancer and starts in bone marrow where blood cells are formed.[194] Leukemia occurs when the bone marrow makes abnormal white blood cells. These leukemia cells grow in number and occupy the available space, crowding out normal white blood cells, red blood cells, and platelets and making it hard for the normal cells to function as they should. Leukemia cells can divide and grow quickly and spread from blood to other parts of the body, including the lymph glands, spleen, liver, central nervous system (brain and spinal cord), and other organs.

There are several types of leukemia that fall into two categories, acute and chronic, based on how rapidly the disease develops and worsens. In *acute leukemia*, the cancerous white blood cells increase rapidly and do not mature normally. They can crowd out normal blood cells, and the bone marrow might even stop producing normal white cells. If untreated, a person with acute leukemia likely would live only a few months. Some types of acute leukemia respond well to treatment; others do not. The leukemia cells in *chronic leukemia* can look normal and appear to function as normal white cells early in the disease. Chronic leukemia gets worse slowly as the number of leukemia cells in the blood increases. Patients with chronic leukemia can live for many years.

The types of leukemia can also be categorized based on the type of white blood cell affected. Leukemia can start in either the lymphoid cells or the myeloid cells. The four most common types of leukemia are



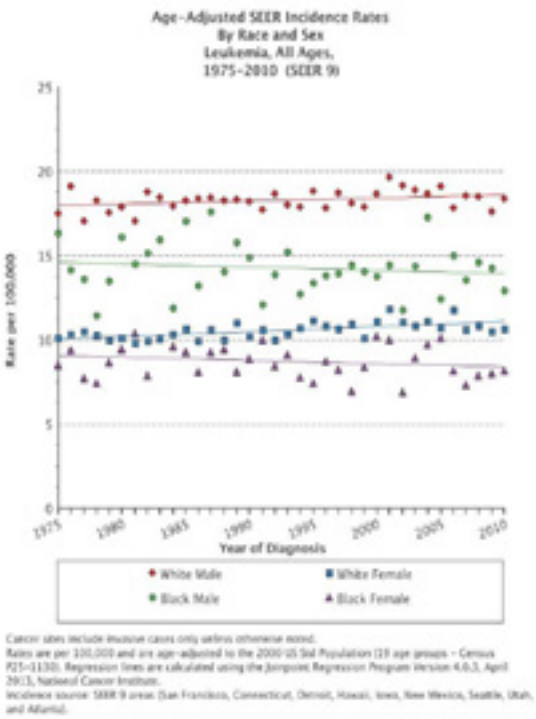


Figure 27 SEER age-adjusted incidence rates by race and sex for leukemia, all ages, both sexes; SEER 9 Registries for 1975-2010[31]

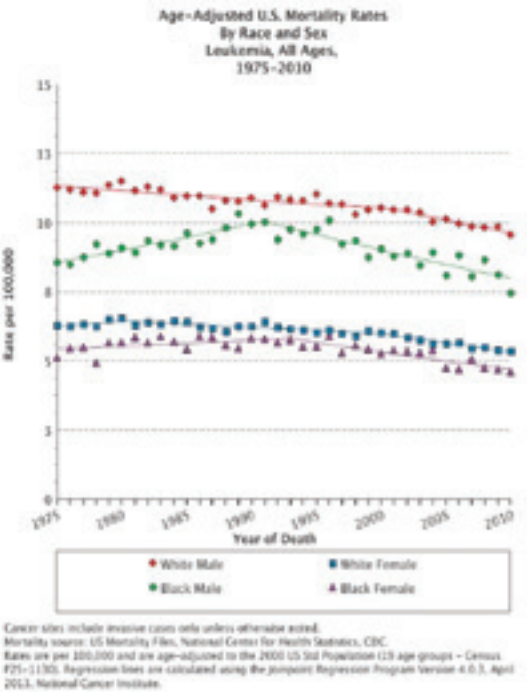


Figure 28. SEER age-adjusted mortality rates by race and sex for leukemia, all ages, both sexes; SEER 9 Registries for 1975-2010[31]

- Chronic lymphocytic leukemia (CLL), usually diagnosed in people over 55
- Acute lymphocytic (lymphoblastic) leukemia (ALL), the most common leukemia among children
- Chronic myeloid leukemia (CML), mainly affects adults and accounts for 5,000 new cases of leukemia each year
- Acute myeloid leukemia (AML), occurs in both adults and children and accounts for more than 13,000 new cases each year

Leukemia can occur in both children and adults with ALL being the most common type of leukemia in children. It represents 70% of all childhood leukemias.[195,196]

WHAT ARE THE RISK FACTORS FOR LEUKEMIA?

NON-ENVIRONMENTAL RISK FACTORS FOR LEUKEMIA

Leukemia is not thought to be an inherited disease so family history is not considered to be a risk factor. However, some inherited illnesses do appear to increase the risk of ALL. These are Down syndrome, Klinefelter syndrome, Fanconi anemia, and Bloom syndrome.

A rare type of leukemia called adult t-cell leukemia has been linked to the human T-cell lymphoma/leukemia virus-1 (HTLV-1). People infected with HTLV-1 have an increased risk of developing this rare leukemia. This disease is not common in the United States but occurs most often in Japan and the Caribbean.[197]

ENVIRONMENTAL RISK FACTORS FOR LEUKEMIA

There are only a few known environmental risk factors for leukemia, but most cases are not attributed to these factors.[198] Exposure to extremely high levels of radiation increases risk for developing leukemia. Atomic bomb explosions, such as in Japan, and radiation therapy for cancer treatment are sources of radiation considered high enough to increase the risk of leukemia.

Currently, it is unclear whether there is an increased risk of developing leukemia with exposure to low

level radiation from numerous X-rays or from having CT scans as a child. Researchers continue to investigate these possible links.[204]

Occupational exposure to benzene has been linked to CML and ALL.[199] Benzene is used to make some lubricants, rubbers, dyes, detergents, drugs, pesticides, and so on.[200] Some chemotherapy drugs have also been linked with an increase in risk for AML and ALL.[196]

STATUS AND TRENDS FOR LEUKEMIA

The overall incidence and mortality rates for leukemia have decreased slightly over the last 20 years.[203]

Leukemia incidence and mortality are higher in whites than in any other racial or ethnic group, and generally, men are more likely to develop leukemia than women (Figure 27 and Figure 28).[56] In 2010, there were over 39,000 new cases of leukemia 56 and 22,673 leukemia-related deaths in the United States.[1]

Leukemia affects approximately ten times more adults than children, yet leukemia is the most common cancer among children. Leukemia represented 21 % of all cancers occurring among children younger than 20 years of age from 2006–2010. In 2010, a total of 3,609 children under 20 years old were diagnosed with leukemia throughout the U.S.[1]

HOW CAN YOU PREVENT CANCER IN GENERAL?

Because cancer is not a single disease, it does not have a single cause. Many causes or risk factors can contribute to a person's chance of getting cancer, and risk factors are different with each type of cancer. Thus, preventive measures vary depending on the cancer. In fact, we do not know what causes most cancers, but the following preventive measures can reduce the risk of developing cancer in general.[1]

- Avoid tobacco use as well as exposure to tobacco smoke. Thirty percent of all cancers are attributed to smoking or chewing tobacco. Cigarette smoking is associated with cancers of the lung, mouth, pharynx, larynx, esophagus, pancreas, kidney, and bladder. Exposure to secondhand smoke increases the risk of lung cancer.
- Test your home for radon gas using kits and guidance available from your local health or environmental department.
- Avoid overexposure to the sun, and avoid indoor tanning beds.[201,202] Ultraviolet radiation, such as that from the sun and from tanning beds, increases the risk of skin cancer.
- Avoid or, at least, limit alcohol consumption. Breast cancer has been linked with alcohol intake.
- Reduce the amount of fat and preservatives in the diet, including smoked and salt-cured meats.
- Limit intake of red and processed meats.[203]
- Participate in regular exercise.
- Maintain a healthy body weight throughout life.[203]
- Get annual health check-ups.
- Enjoy consistent periods of relaxation and leisure.
- Exercise care in using pesticides and other household chemicals. Follow the manufacturer's instructions including recommended use of protective masks, eyewear, and gloves.
- Avoid occupational exposures to ionizing radiation and known or suspected carcinogens such as asbestos and certain solvents.
- Seek immediate medical care if cancer is suspected.

ADDITIONAL RESOURCES

- American Cancer Society: www.cancer.org
- National Cancer Institute: www.cancer.gov
- Centers for Disease Control and Prevention, Division of Cancer Prevention and Control www.cdc.gov/cancer.

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