LEUKEMIA & LYMPHOMA SOCIETY®

FACTS 2018-2019

UPDATED DATA ON BLOOD CANCERS

Table of Contents

Executive Summary

Facts 2018-2019 is an update of data available for leukemia, lymphoma, myeloma, myelodysplastic syndromes and myeloproliferative neoplasms (blood cancers). Blood cancers are diseases that can affect the bone marrow, the blood cells, the lymph nodes and other parts of the lymphatic system.

Facts 2018-2019 provides updates from the American Cancer Society's *Cancer Facts & Figures 2019* (published online in 2019, https://www.cancer.org/research/cancer-facts-statistics.html) for estimated numbers of new blood cancer cases and estimated numbers of deaths due to blood cancers. The incidence rates, prevalence and mortality data in *Facts 2018-2019* reflect the statistics from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program, *Cancer Statistics Review (CSR)* 1975-2015 (published online in April 2018, www.seer.cancer.gov). National incidence counts are generated from the United States Cancer Statistics (USCS) Public Use Database for 2001-2015 (www.cdc.gov/cancer/uscs/public-use/). Incidence rates by state are provided by the North American Association of Central Cancer Registries, *Cancer in North America*: 2011-2015 (published online in June 2018, www.naaccr.org).

Throughout this publication, "cases" and "counts" are used interchangeably.

About Blood Cancers

Leukemia, lymphoma, myeloma, myelodysplastic syndromes (MDS) and myeloproliferative neoplasms (MPNs) are types of blood cancer that can affect the bone marrow, the blood cells, the lymph nodes and other parts of the lymphatic system. These diseases may result from acquired mutations to the DNA of a single lymph- or blood-forming stem cell. With blood cancers, abnormal cells multiply and survive without the usual controls that are in place for healthy cells. The accumulation of these cells in the marrow, blood and/or lymphatic tissue interferes with production and functioning of red blood cells, white blood cells and platelets. The disease process can lead to severe anemia, bleeding, an impaired ability to fight infection and/or death. Figure 1 shows the percentage of estimated new cases for leukemia, lymphoma and myeloma in 2019.

Estimated New Cases (%) of Leukemia, Lymphoma and Myeloma, 2019

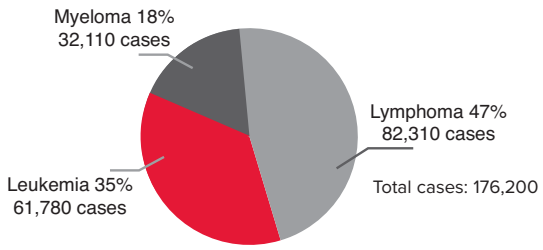

Figure 1. Source: *Cancer Facts & Figures, 2019.* American Cancer Society; 2019.

Highlights from *Facts 2018-2019*

Prevalence

Prevalence is the estimated number of people alive on a certain date in a population who previously had a diagnosis of the disease.

An estimated 1,399,180 people in the United States (US) are living with or in remission from leukemia, lymphoma or myeloma (see Table 1).

Approximate US Prevalence of the Four Major Types of Blood Cancers as of January 1, 2015

Type	Prevalence
Myeloma	124,483
Hodgkin Lymphoma	196,508
Non-Hodgkin Lymphoma	678,222
Leukemia	399,967

Table 1. Source: *SEER (Surveillance, Epidemiology, and End Results)* Cancer Statistics Review, 1975-2015, National Cancer Institute; 2018.

New Cases

Approximately every 3 minutes, one person in the US is diagnosed with a blood cancer*.

- An estimated combined total of 176,200 people in the US are expected to be diagnosed with leukemia, lymphoma or myeloma in 2019.
- New cases of leukemia, lymphoma and myeloma are expected to account for 10.0 percent of the estimated 1,762,450 new cancer cases that will be diagnosed in the US in 2019.

**Data specified for "blood cancer" include leukemia, lymphoma and myeloma, and do not include data for myelodysplastic syndromes (MDS) or myeloproliferative neoplasms (MPNs).*

Incidence

Incidence rates are the number of new cases in a given year, not counting the preexisting cases. Incidence rates are usually presented as a specific number per 100,000 population. Age-adjusted rates provide more reliable rates for comparison because they reduce the bias of age in the makeup of the populations that are being compared.

Overall age-adjusted incidence rates per 100,000 population reported in 2018 for leukemia, lymphoma and myeloma are close to data reported in 2017: leukemia 13.8 in 2018 vs 13.7 in 2017; non-Hodgkin lymphoma (NHL) 19.4 in 2018 vs 19.5 in 2017; Hodgkin lymphoma (HL) 2.5 in 2018 vs 2.6 in 2017; myeloma 6.7 in 2018 vs 6.6 in 2017.

Survival

Relative survival compares the survival rate of a person diagnosed with a disease to that of a person without the disease. The most recent survival data available may not fully represent the impact of all current therapies and, as a result, may underestimate current survival. Figure 2 shows 5-year relative survival rates.

Five-Year Relative Survival Rates by Year of Diagnosis

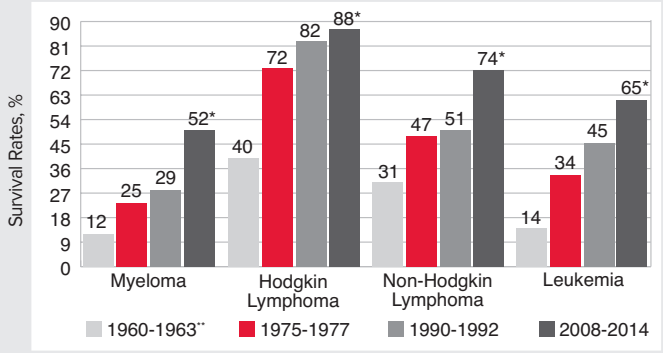

Figure 2. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*. National Cancer Institute; 2018.

*The difference in rates between 1975-1977 and 2008-2014 is statistically significant (p<.05).

**Survival rate among whites.

Deaths

Approximately every 9 minutes, someone in the US dies from a blood cancer*. This statistic represents approximately 156 people each day or more than 6 people every hour.

- Leukemia, lymphoma and myeloma are expected to cause the deaths of an estimated 56,770 people in the US in 2019.
- These diseases are expected to account for 9.4 percent of the deaths from cancer in 2019, based on the estimated total of 606,880 cancer deaths.

**Data specified for "blood cancer" include leukemia, lymphoma and myeloma, and do not include data for myelodysplastic syndromes (MDS) or myeloproliferative neoplasms (MPNs).*

- Overall, the likelihood of dying from blood cancer* decreased from 2000 to 2015 (the most recent data available). During this time, the mortality rate of leukemia decreased by 18.3 percent, lymphoma by 33.0 percent and myeloma by 13.8 percent.

Leukemia

- An estimated 399,967 people are living with or in remission from leukemia in the US.
- In 2019, 61,780 people are expected to be diagnosed with leukemia.
- In 2019, 22,840 people are expected to die from leukemia.
- Approximately 32.8 percent more males than females are living with leukemia. More males than females are diagnosed with leukemia and die of leukemia.

Hodgkin and Non-Hodgkin Lymphoma

- An estimated 874,730 people are living with or in remission from lymphoma in the US.
- An estimated 196,508 people are living with or in remission from HL.
- An estimated 678,222 people are living with or in remission from NHL.
- In 2019, 82,310 new cases of lymphoma are expected to be diagnosed in the US (8,110 cases of HL, 74,200 cases of NHL).
- In 2019, 20,970 people are expected to die from lymphoma (1,000 from HL, 19,970 from NHL).
- NHL is the seventh most common cancer in the US, and the age-adjusted incidence rate rose by 80.0 percent from 1975 (11.06 per 100,000 population) to 2015 (19.91 per 100,000 population).

Myeloma

- An estimated 124,483 people are living with or in remission from myeloma in the US.
- In 2019, 32,110 people are expected to be diagnosed with myeloma.
- In 2019, approximately 12,960 people are expected to die from myeloma.
- The age-adjusted incidence rate of myeloma increased by 43.4 percent from 1975 (4.91 per 100,000) to 2015 (7.04 per 100,000).
- The age-adjusted incidence rate of myeloma in black males and females (13.4 per 100,000) was 120 percent greater than that of white males and females (6.1 per 100,000) from 2011 to 2015.

Myelodysplastic Syndromes

- An average of 14,011 new cases of myelodysplastic syndromes (MDS) were diagnosed in the US each year from 2011 to 2015.
- The estimated overall age-adjusted incidence rate of MDS is 4.6 cases per 100,000 population. White males have the highest rate (6.6 per 100,000 population).

Myeloproliferative Neoplasms

- An average of 9,659 new cases of myeloproliferative neoplasms (MPNs) were diagnosed in the US each year from 2011 to 2015.
- The estimated overall age-adjusted incidence rate of MPNs is 2.7 cases per 100,000 population. White males have the highest rate (3.0 per 100,000 population).

Childhood Blood Cancers

- Leukemia is the most common cancer diagnosed in children, adolescents and young adults younger than 20 years and accounts for 25.8 percent of all cancer cases in this age group.
- From 2011 to 2015, the most recent 5 years for which data are available, leukemia and lymphoma accounted for 39.6 percent of all cancer types in children, adolescents and young adults younger than 20 years.
- The most common types of cancer in children, adolescents and young adults younger than 20 years are leukemia (25.8 percent), cancers of the brain and other nervous tissue (17.0 percent), NHL (7.1 percent), HL (6.6 percent), and soft tissue (6.0 percent).
- The age-adjusted incidence rate of leukemia and lymphoma in children, adolescents and young adults younger than 20 years was 7.2 per 100,000 (leukemia, 4.7 and lymphoma, 2.5).
- Leukemia is the second leading cause of cancer deaths (after cancers of the brain and other nervous tissue) among children, adolescents and young adults younger than 20 years. This accounts for 26.1 percent of all cancer-related deaths among this age group.
- From 2011-2015, 3.8 percent of all blood cancers (leukemia, lymphoma, myeloma, MDS and MPNs*) were diagnosed in children, adolescents and young adults younger than 20 years.
- From 2011-2015, 5.1 percent of all leukemia and lymphoma cases were diagnosed in children, adolescents and young adults younger than 20 years.

**Myeloma, MDS and MPNs are not commonly diagnosed in children, adolescents and young adults younger than age 20.*

Leukemia

"Leukemia" is the term used to describe the four major types of leukemia (see Table 2).

The Four Major Types of Leukemia	
Acute Lymphoblastic Leukemia (ALL)	Chronic Lymphocytic Leukemia (CLL)
Acute Myeloid Leukemia (AML)	Chronic Myeloid Leukemia (CML)

Table 2. Source: The Leukemia & Lymphoma Society.

The terms "myeloid" or "myelogenous" and "lymphoid," "lymphocytic" or "lymphoblastic" denote the cell types involved. In general, leukemia is characterized by the uncontrolled accumulation of blood cells. However, the natural history of each type, and the therapies used to treat people with each type, are different.

Prevalence

An estimated 399,967 people in the United States (US) are living with or in remission from leukemia (see Table 3). Thirty-three percent more males than females are living with leukemia.

Acute lymphoblastic leukemia (ALL) and acute myeloid leukemia (AML) are diseases that progress rapidly without treatment. They result in the accumulation of immature, nonfunctional cells in the marrow and blood. The marrow often stops producing enough normal platelets, red blood cells and white blood cells. Anemia, a deficiency of red blood cells, develops in virtually everybody who has acute leukemia. The lack of normal white blood cells impairs the body's ability to fight infections. A shortage of platelets results in bruising and easy bleeding.

The progression of chronic lymphocytic leukemia (CLL) and chronic myeloid leukemia (CML) is usually slower than that of acute types of leukemia. The slower disease progression of chronic leukemia allows greater numbers of more mature, functional cells to be made.

Approximate US Prevalence of the Four Major Types of Leukemia as of January 1, 2015	
Type	Prevalence
Acute Lymphoblastic Leukemia	81,139
Chronic Lymphocytic Leukemia	179,683
Acute Myeloid Leukemia	53,491
Chronic Myeloid Leukemia	50,948

Table 3. Source: *Surveillance, Epidemiology, and End Results (SEER) Program* (www.seer.cancer.gov). Prevalence database: "US Estimated 40-Year L-D Prevalence Counts on 1/1/2015." National Cancer Institute, DCCPS, Surveillance Research Program, Data Modeling Branch, released April 2018, based on the November 2017 SEER data submission.

New Cases

An estimated 61,780 new cases of leukemia are expected to be diagnosed in the US in 2019 (see Figure 3 and Table 4). Chronic leukemia is expected to account for 8.5 percent more cases than those of acute leukemia.

Estimated Proportion of New Cases (%) in 2019 for Types of Leukemia, Adults and Children

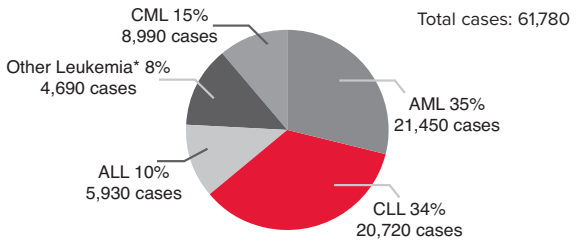

Figure 3. Source: *Cancer Facts & Figures, 2019*. American Cancer Society; 2019.
Note: Total percentage does not add up to 100% due to rounding in the calculation of individual percentages.

- Most cases of leukemia occur in older adults; the median age at diagnosis is 66 years.
- From 2011 to 2015, approximately 11 times as many adults over age 19 years (42,216) were diagnosed with leukemia as children, adolescents and young adults younger than 20 years (3,715).
- The most common types of leukemia in adults older than 19 years are CLL (38.5% of all new leukemia cases from 2011 to 2015) and AML (32.1% of all new leukemia cases from 2011 to 2015). CML accounted for 14.1 percent of new leukemia cases and ALL accounted for 5.8 percent of new leukemia cases in this age group from 2011 to 2015.
- Most cases of CML occur in adults. From 2011 to 2015, approximately 97.9 percent of all cases of CML occurred in adults age 20 years and older.

Estimated New Cases of Leukemia, by Gender, 2019

Type	Total	Male	Female
Acute Lymphoblastic Leukemia	5,930	3,280	2,650
Chronic Lymphocytic Leukemia	20,720	12,880	7,840
Acute Myeloid Leukemia	21,450	11,650	9,800
Chronic Myeloid Leukemia	8,990	5,250	3,740
Other Leukemia*	4,690	2,860	1,830
Total Estimated New Cases	61,780	35,920	25,860

Table 4. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

**There are other rare subtypes of leukemia, beyond the four main subtypes, which comprise "Other Leukemia."*

Incidence

Since 1975, the incidence of leukemia has increased slightly. In 1975 the incidence rate was 12.8 per 100,000 population and in 2015, it was 13.6 per 100,000 population. See Figure 4 (on page 6) for age-specific rates.

Gender. In 2019, approximately 58 percent of the new cases of leukemia are expected to occur in males. Incidence rates for all types of leukemia are higher among males than among females:

- ALL – 1.9 per 100,000 for males, 1.6 per 100,000 for females
- AML – 5.2 per 100,000 for males, 3.6 per 100,000 for females
- CLL – 6.4 per 100,000 for males, 3.3 per 100,000 for females
- CML – 2.4 per 100,000 for males, 1.4 per 100,000 for females.

Race and Ethnicity. Leukemia is the tenth most frequently occurring type of cancer in all races and ethnicities.

- Age-adjusted incidence of leukemia is highest among non-Hispanic whites (15.0 per 100,000 population); it is lowest among Asian and Pacific Islander populations (7.8 per 100,000 population) and American Indian and Alaska Native populations (8.3 per 100,000 population).
- Leukemia is the tenth most common cancer in whites, eleventh most common cancer in blacks, and twelfth most common cancer in Hispanics.
- In children, adolescents and young adults younger than 20 years, leukemia incidence rates are highest among Hispanics (5.8 per 100,000 population) and lowest among blacks (3.0 per 100,000 population). The incidence rate in whites is 5.4 per 100,000 population.

Children, Adolescents and Young Adults. From 2011 to 2015, leukemia represented 25.8 percent of all types of cancer occurring among children, adolescents and young adults younger than 20 years.

- In 2019, about 3,097 children and adolescents younger than 15 years are expected to be diagnosed with leukemia throughout the US.
- About 32.3 percent of cancer cases in children and adolescents younger than 15 years are leukemia.
- An average of 3,715 children and adolescents younger than 20 years were diagnosed with leukemia each year (including 2,769 diagnosed with ALL) in the US from 2011 to 2015.
- ALL is the most common cancer in children, adolescents and young adults younger than 20 years, accounting for 19.8 percent of all cancer cases in this age group.

- ALL is the most common type of leukemia in children, adolescents and young adults younger than 20 years, accounting for 77 percent of all types of new leukemia cases in this age group from 2011 to 2015.
- From 1975 to 2015, incidence rates increased for childhood, adolescent and young adult ALL (1.9 in 1975 vs 3.1 in 2015) and AML (0.6 in 1975 vs 0.8 in 2015).
- The highest incidence rates for ALL are seen in children and adolescents younger than 15 years (see Figure 5.) Within this group, the highest rate is in children ages 1 to 4 years (7.8 per 100,000).
- The incidence of ALL in children ages 1 to 4 years (7.8 per 100,000) is more than 11 times greater than the rate for young adults ages 30 to 34 years (0.7 per 100,000).
- In children, adolescents and young adults younger than 20 years, AML incidence is highest in children under 1 year (1.6 per 100,000) and lowest in children ages 5 to 9 years (0.5 per 100,000).
- From 2011 to 2015, among children ages 5 to 9 years, ALL incidence was seven times greater than that of AML (3.7 per 100,000 for ALL and 0.5 per 100,000 for AML).
- In young adults ages 25 to 29 years, AML incidence was 50 percent greater than that of ALL (1.2 per 100,000 for AML and 0.8 per 100,000 for ALL).

Adults. AML, CLL and CML are most prevalent in the sixth through ninth decades of life. Incidence rates begin to increase notably among people with

- AML – at age 60 years and older (see Figure 6 on page 7)
- CLL – at age 50 years and older (see Figure 7 on page 7)
- CML – at age 60 years and older. (see Figure 8 on page 7).

Age-Specific Incidence Rates for Leukemia, 2011-2015

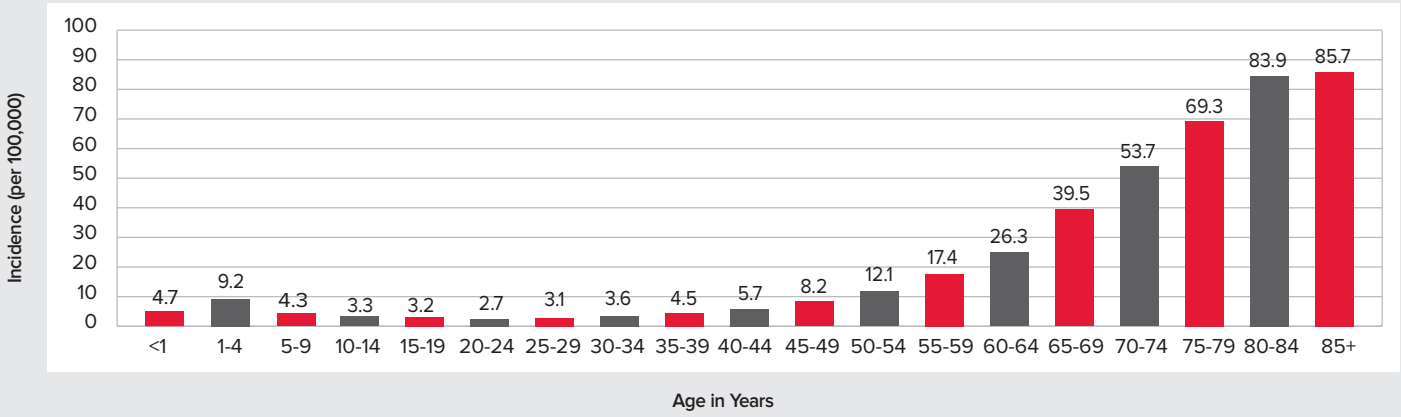

Figure 4. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.

Age-Specific Incidence Rates for Acute Lymphoblastic Leukemia, 2011-2015

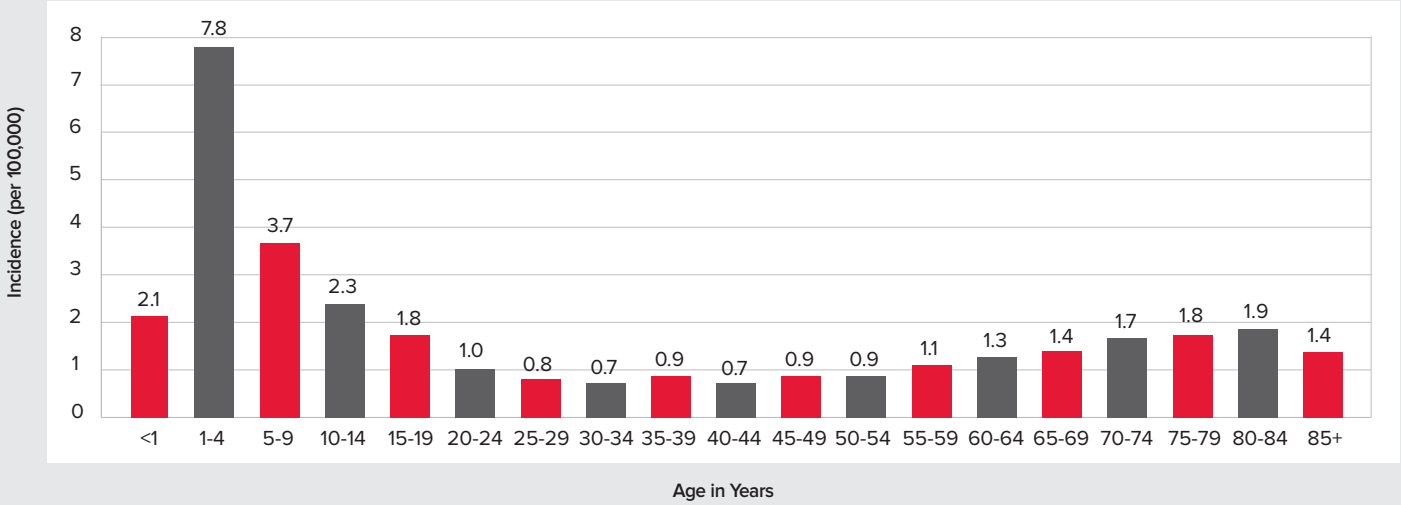

Figure 5. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.

Age-Specific Incidence Rates for Acute Myeloid Leukemia, 2011-2015

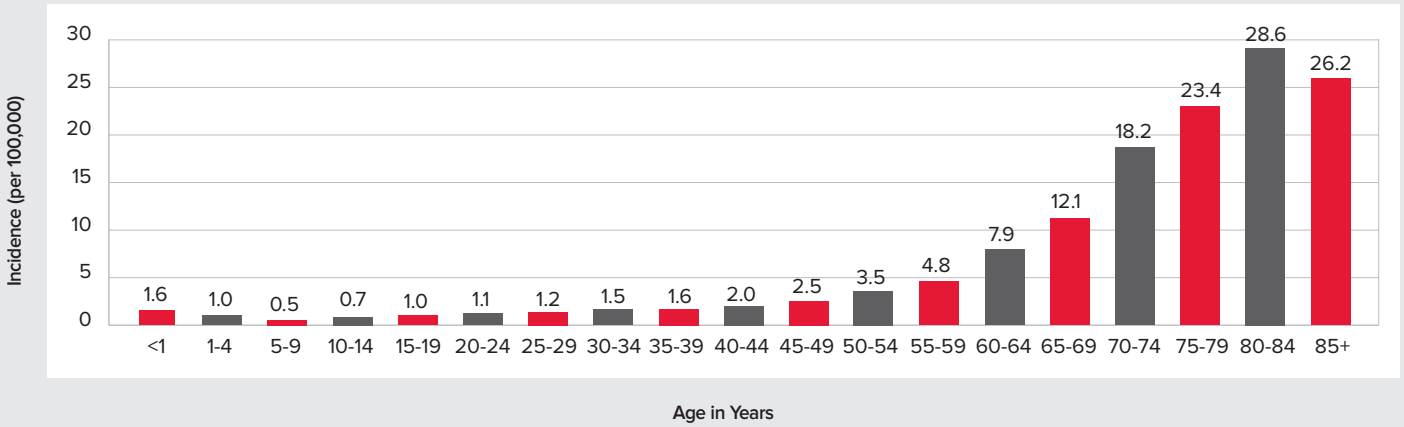

Figure 6. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.

Age-Specific Incidence Rates for Chronic Lymphocytic Leukemia, 2011-2015

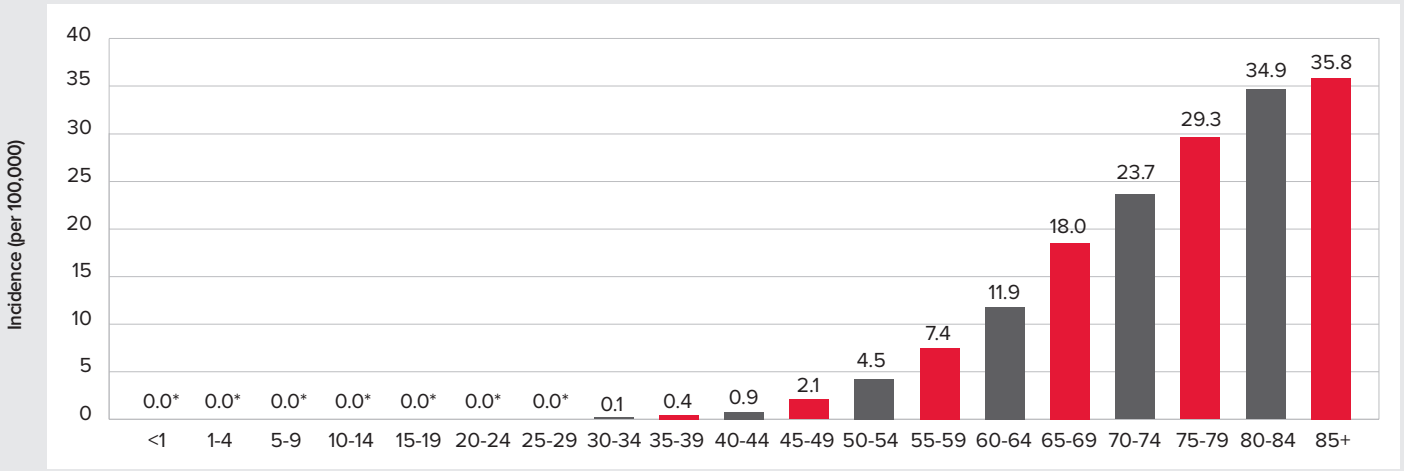

Figure 7. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.
*<16 cases for each age and time interval, SEER 18 areas

Age-Specific Incidence Rates for Chronic Myeloid Leukemia, 2011-2015

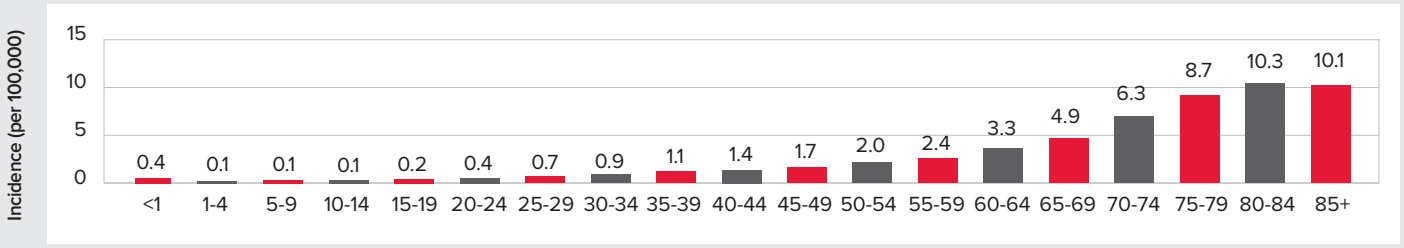

Figure 8. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.

Signs and Symptoms

Signs and symptoms of acute leukemia may include easy bruising or bleeding (because of platelet deficiency), paleness or easy fatigue (because of anemia), and/or recurrent minor infections or poor healing of minor cuts (because of a low white blood cell count). These signs and symptoms are not unique to leukemia and may be caused by other, more common conditions. Nonetheless, they do warrant medical evaluation. The diagnosis of leukemia requires specific blood tests, including an examination of cells in the blood and bone marrow. People who have chronic leukemia may not have major symptoms; they may be diagnosed as a result of a periodic physical examination and testing.

Possible Causes

The cause of most cases of leukemia is not known. Extraordinary doses of radiation and certain cancer therapies are possible causes. Repeated exposure to the chemical benzene may cause acute myeloid leukemia (AML). Automobile exhaust and industrial emissions account for about 20 percent of the total national benzene exposure. About half of the benzene exposure in the US population results from tobacco smoking or from exposure to tobacco smoke. The average smoker is exposed to about 10 times the daily intake of benzene compared to nonsmokers.

Treatment

The goal of leukemia treatment is to bring about a complete remission. Patients with acute myeloid leukemia (AML) and acute lymphoblastic leukemia (ALL) need to start treatment soon after diagnosis. Treatment may include chemotherapy, targeted therapies, monoclonal antibody therapy, immunotherapy and stem cell transplantation. Patients diagnosed with chronic myeloid leukemia (CML) are usually treated with tyrosine kinase inhibitors, oral dugs that may need to be taken indefinitely to keep CML under control. Some patients diagnosed with chronic lymphocytic leukemia (CLL) do not need treatment for a long period of time after diagnosis; this period is sometimes called "watch-and-wait." Patients who need treatment may receive chemotherapy, targeted therapy, monoclonal antibody therapy or treatments in combination. All patients should consider new approaches under study (clinical trials).

Survival

Relative survival rates vary according to a person's age at diagnosis, gender, race and type of leukemia. The 5-year relative survival rate for leukemia has more than quadrupled, from 14 percent in whites from 1960 to 1963 (the only data available) to 64.5 percent for all races from 2008 to 2014 (see Table 5; percentages in Table 5 are rounded to the nearest integer).

From 2008 to 2014, the 5-year relative survival rates overall were:

- ALL – 71.6 percent overall, 90.6 percent for children and adolescents younger than 15 years, and 94.5 percent for children younger than 5 years
- AML – 28.1 percent overall and 68.8 percent for children and adolescents younger than 15 years
- CLL – 86.8 percent
- CML – 68.7 percent*.

Gender. From 2008 to 2014, 5-year relative survival for leukemia was 62.5 percent for males and 60.0 percent for females.

Race and Ethnicity. Table 5 shows the 5-year survival rates, rounded to the nearest integer, for all races and for blacks and whites, spanning four decades.

Trends in Five-Year Relative Survival Rates for Leukemia, By Subtype, Race and Year of Diagnosis

Leukemia	1975-1977	1984-1986	1996-1998	2008-2014
All Races	34%	41%	48%	65%*
Whites	35%	42%	50%	66%*
Blacks	33%	33%	39%	58%*
ALL	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	41%	52%	66%	72%*
Whites	41%	53%	66%	73%*
Blacks	34%	36%	56%	61%*
AML	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	6%	11%	17%	28%*
Whites	6%	10%	16%	28%*
Blacks	10%	10%	22%	29%*
CLL	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	67%	72%	76%	87%*
Whites	68%	73%	77%	87%*
Blacks	57%	67%	58%	76%*
CML	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	22%	22%	37%	69%*
Whites	21%	23%	38%	68%*
Blacks	28%	21%	31%	73%*

Table 5. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*. National Cancer Institute; 2018

*The difference between 1975-1977 and 2008-2014 is statistically significant ($p<.05$).

**The survival rate of CML in clinical trials is higher than the survival rate reported here, based on SEER data. It is speculated that close clinical monitoring and better medication adherence in clinical trials are associated with a lower risk of disease progression and higher rates of survival.*

Children, Adolescents and Young Adults. Figure 9 shows that childhood ALL 5-year survival rates have improved significantly over the past 5 decades. Most children, adolescents and young adults younger than 20 years who have ALL are expected to become 5-year survivors of the disease. However, significant treatment-related long-term morbidity and mortality for childhood cancer have been well established by several studies. Long-term treatment-related effects among ALL and other childhood cancer survivors may include cognitive impairment, subsequent cancer, cardiac disease, pulmonary disease or other diseases.

Five-Year Relative Survival Rates for Acute Lymphoblastic Leukemia in Children Under 15, Diagnosed 1964-2014

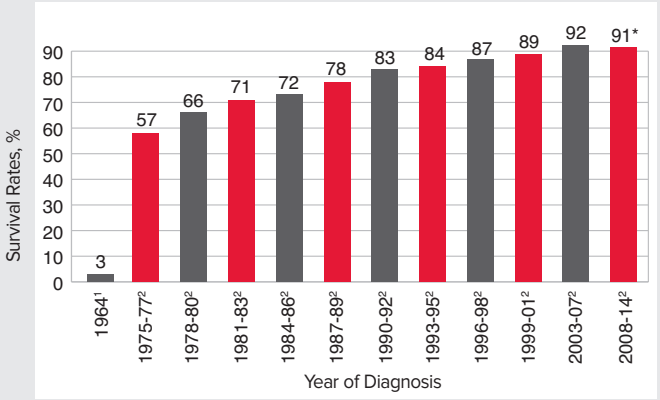

Figure 9. Sources: 1. Zuelzer WW. Implications of long-term survivals in acute stem cell leukemia of childhood treated with composite cyclic therapy. *Blood.* 1964:24:477-494. 2. *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*, National Cancer Institute; 2018.

* The difference in rates between 1975-1977 and 2008-2014 is statistically significant (p<.05).

Deaths

Approximately 22,840 deaths (13,150 males and 9,690 females) in the US are expected to be attributed to leukemia in 2019. Estimated deaths for the four major types of leukemia in 2019 are

- ALL – 1,500 deaths
- AML – 10,920 deaths
- CLL – 3,930 deaths
- CML – 1,140 deaths
- Other leukemia* – 5,350 deaths.

In general, mortality rates for leukemia decreased from 1975 (8.1 per 100,000) to 2015 (6.3 per 100,000).

**There are other rare subtypes of leukemia, beyond the four main subtypes, which comprise "Other Leukemia."*

Gender. From 2011 to 2015, leukemia was the sixth most common cause of cancer deaths in both men and women in the US. In 2019, the estimated number of deaths expected to be attributed to leukemia in the US is 35.7 percent higher for males than for females. Expected deaths from leukemia in 2019, according to gender, are shown in Table 6.

Estimated Deaths from Leukemia, by Gender, 2019

Type	Total	Male	Female
Acute Lymphoblastic Leukemia	1,500	850	650
Chronic Lymphocytic Leukemia	3,930	2,220	1,710
Acute Myeloid Leukemia	10,920	6,290	4,630
Chronic Myeloid Leukemia	1,140	660	480
Other Leukemia*	5,350	3,130	2,220
Total	22,840	13,150	9,690

Table 6. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

Race and Ethnicity. For leukemia, the highest age-adjusted rates of death from 2011 to 2015 were in non- Hispanic whites at 7.0 per 100,000 population, followed by blacks at 5.6 per 100,000 population and Hispanic whites at 5.1 per 100,000 population.

- Leukemia is the fifth most common cause of cancer deaths in white males and the sixth most common in white females.
- Leukemia is the eighth most common cause of cancer deaths in black males and the ninth most common in black females.
- From 2011 to 2015, blacks between the ages of 30 and 64 years had a higher death rate from leukemia than whites.

Children, Adolescents and Young Adults. The leukemia age-adjusted death rate for children, adolescents and young adults younger than 20 years in the US has declined by 78.6 percent from 2.8 per 100,000 population in 1969 to 0.6 per 100,000 population in 2015. Despite this decline, leukemia is the second leading cause of cancer death among children, adolescents and young adults younger than 20 years, accounting for 26.1 percent of all cancer deaths in this age group.

Hodgkin and Non-Hodgkin Lymphoma

"Lymphoma" is a general term for many blood cancers that originate in the lymphatic system. Lymphoma results when a lymphocyte (a type of white blood cell) undergoes a malignant change and multiplies out of control. Eventually, healthy cells are crowded out and malignant lymphocytes amass in the lymph nodes, liver, spleen and/or other sites in the body.

Hodgkin Lymphoma. Hodgkin lymphoma (HL) represents 9.9 percent of all types of lymphoma expected to be diagnosed in 2019. This disease has characteristics that distinguish it from other diseases classified as lymphoma, including the presence of the Reed-Sternberg cell, a large, malignant cell found in HL tissues.

Non-Hodgkin Lymphoma. Non-Hodgkin lymphoma (NHL) represents 90.1 percent of all types of lymphoma expected to be diagnosed in 2019. This disease comprises a diverse group of diseases (subtypes) that are distinguished by the characteristics of the cancer cells associated with each disease type. The designations "indolent" and "aggressive" are often applied to types of NHL. Each type is associated with factors that categorize the prognosis as either more or less favorable.

Prevalence

An estimated total of 874,730 people in the United States (US) population are living with or in remission from lymphoma.

- There are 196,508 people living with or in remission from Hodgkin lymphoma.
- There are 678,222 people living with or in remission from non-Hodgkin lymphoma.

New Cases

About 82,310 people in the US are expected to be diagnosed with lymphoma in 2019 (8,110 cases of HL and 74,200 cases of NHL). The incidence of HL is consistently and considerably lower than that of NHL. Table 7 shows estimated new cases of lymphoma in 2019, by gender.

Estimated New Cases of Lymphoma by Gender, 2019

Type	Total	Male	Female
Hodgkin Lymphoma	8,110	4,570	3,540
Non-Hodgkin Lymphoma	74,200	41,090	33,110
Total	82,310	45,660	36,650

Table 7. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

Incidence

From 2011 to 2015, the age-adjusted incidence rate for lymphoma was 21.9 per 100,000. See Figure 10 (on page 11) for age-specific rates.

- The age-adjusted incidence rate for HL was 2.5 per 100,000.
- The age-adjusted incidence rate for NHL was 19.4 per 100,000.

The age-adjusted incidence rate of HL declined by 14.9 percent from 1975 (3.09 per 100,000) to 2015 (2.63 per 100,000), an annual percentage decrease of 0.4 percent. The age-adjusted incidence rate of NHL rose by 80.0 percent from 1975 (11.06 per 100,000) to 2015 (19.91 per 100,000), an average annual percentage increase of 2.0 percent.

Gender. Age-adjusted incidence rates for HL and NHL are higher among males than among females.

- HL – 2.9 per 100,000 for males; 2.2 per 100,000 for females
- NHL – 23.6 per 100,000 for males; 15.9 per 100,000 for females

In 2019, it is expected that 29.1 percent more males than females will be diagnosed with HL and about 24.1 percent more males than females will be diagnosed with NHL.

NHL is the sixth most common cancer in males and the seventh most common cancer in females in the US.

Race and Ethnicity. The highest age-adjusted incidence rate of lymphoma is in non-Hispanic whites (23.7 per 100,000), followed by Hispanic whites (20.3 per 100,000) and blacks (17.0 per 100,000).

- The highest age-adjusted incidence rate of HL is in non-Hispanic whites (2.9 per 100,000), followed by blacks (2.6 per 100,000) and Hispanic whites (2.3 per 100,000).
- The highest age-adjusted incidence rate of NHL is in non-Hispanic whites (20.8 per 100,000), followed by Hispanic whites (18.0 per 100,000) and blacks (14.4 per 100,000).

Blacks, from their early-20s to their early-40s, have higher incidence rates of NHL than whites. However, beginning at age 50 years, whites generally have considerably higher incidence rates of NHL than blacks.

NHL is the fifth most common cancer in Hispanics.

Children, Adolescents and Young Adults. Lymphoma (HL, 6.6 percent; NHL, 7.1 percent) is the third most common cancer in children, adolescents and young adults younger than 20 years.

- In 2019, lymphoma will account for 8 percent (HL, 3 percent; NHL, 5 percent) of all cancers expected to be diagnosed in children and adolescents younger than 15 years. The number of cases expected to be diagnosed in children and adolescents younger than 15 years is 332 for HL and 553 for NHL.
- In children ages 1 to 14, the age-adjusted incidence rate for NHL (1.1 per 100,000) is higher than for HL (0.6 per 100,000).
- In adolescents and young adults between the ages of 15 and 29, the age-adjusted incidence rate for HL (3.6 per 100,000) is higher than for NHL (2.6 per 100,000).
- In young adults ages 30 to 34, NHL incidence (4.6 per 100,000) is higher than HL incidence (3.4 per 100,000).

The following data are based on age-adjusted incidence rates for children, adolescents and young adults younger than 20 years:

- Lymphoma is most commonly diagnosed in non-Hispanic whites (2.8 per 100,000 population), followed by blacks (2.3 per 100,000 population).
- Lymphoma is least commonly diagnosed among American Indians and Alaska Natives (1.4 per 100,000 population).

Adults. HL incidence rates are higher in adolescents and young adults ages 15 to 34 years than in adults ages 35 to 64 years. Incidence peaks at ages 75 to 79 years (see Figure 11).

In contrast, the incidence rates of NHL increase with age (see Figure 12 on page 12).

- From ages 20 to 24 years, the incidence rate of NHL is 2.5 cases per 100,000 population.
- From ages 60 to 64 years, the incidence rate increases 17 times to 43.6 cases per 100,000 population.
- From ages 80 to 84 years, the incidence rate increases almost 48 times to 119.0 cases per 100,000 population.

Age-Specific Incidence Rates for Lymphoma, 2011-2015

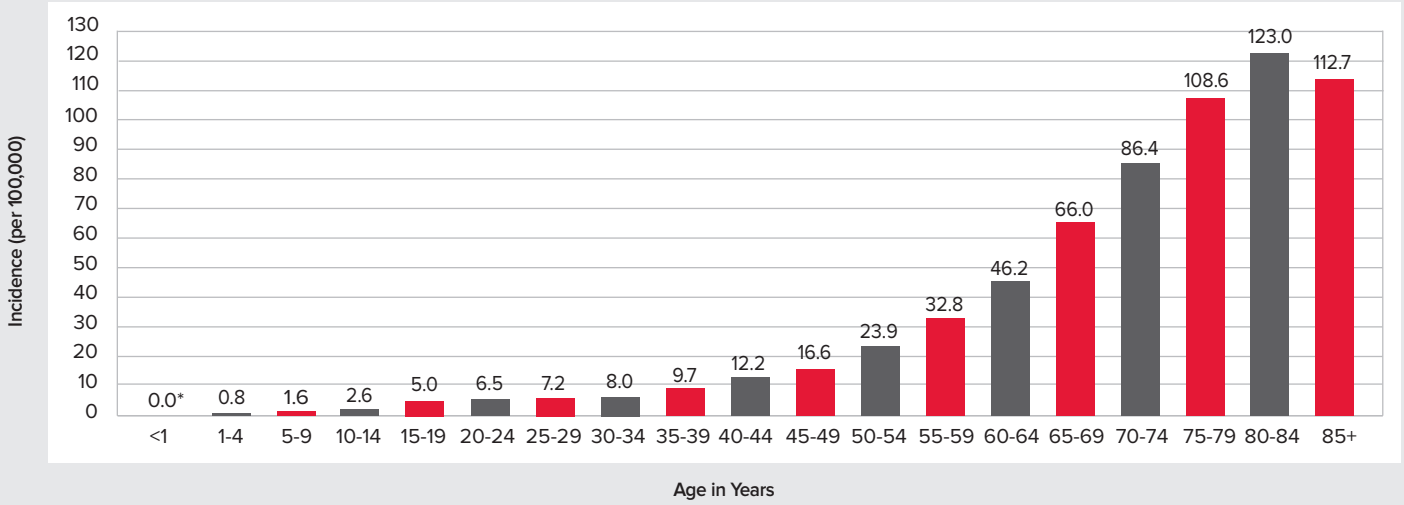

Figure 10. Source: *SEER (Surveillance, Epidemiology, and End Results) 18 Registries, 2011-2015.* National Cancer Institute; 2018.
*<16 cases for each age and time interval, SEER 18 areas

Age-Specific Incidence Rates for Hodgkin Lymphoma, 2011-2015

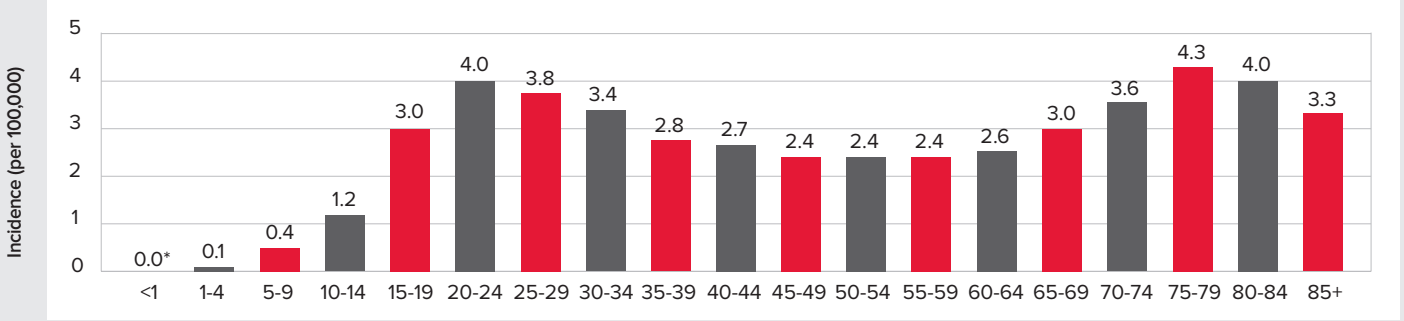

Figure 11. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.
*<16 cases for each age and time interval, SEER 18 areas

Age-Specific Incidence Rates for Non-Hodgkin Lymphoma, 2011-2015

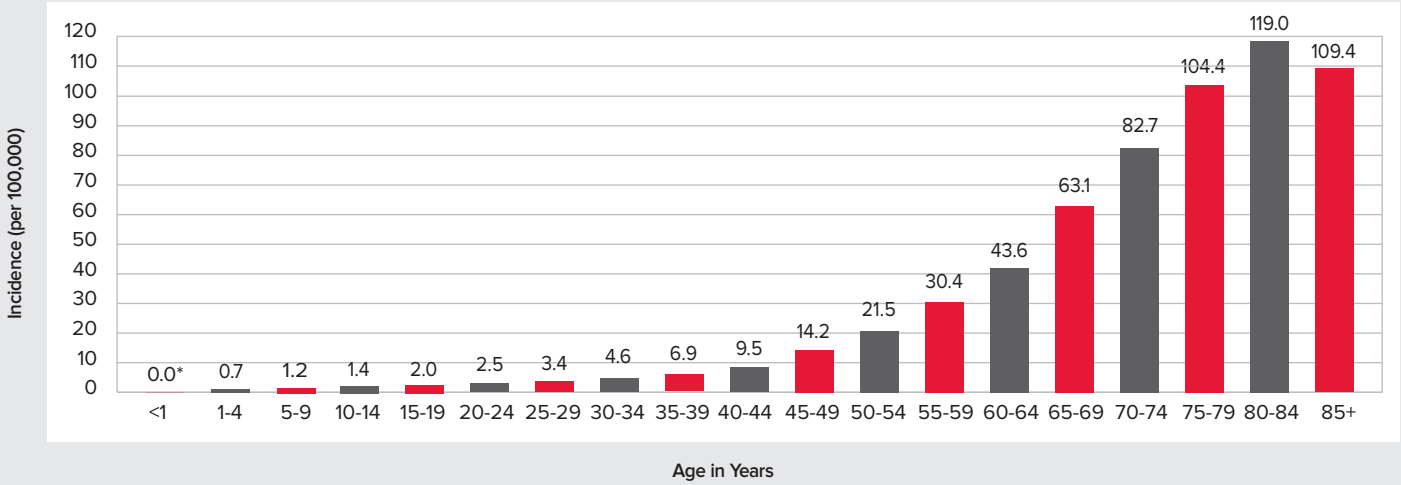

Figure 12. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015.* National Cancer Institute; 2018.
*<16 cases for each age and time interval, SEER 18 areas

Signs and Symptoms

A common early sign of HL or NHL is a painless enlargement of one or more lymph nodes. Enlarged lymph nodes may also be the result of inflammation in the body and are not necessarily a sign of cancer.

Other HL signs and symptoms may include recurrent high fever, persistent cough and shortness of breath, drenching night sweats of the whole body, itching and weight loss.

Other signs and symptoms of NHL may include bone pain, cough, chest pain, abdominal pain, rash, fever, night sweats, enlarged spleen, unexplained fatigue or weight loss. Some individuals may have no symptoms, and a diagnosis of NHL is made as a result of a periodic physical examination and testing.

Possible Causes

The results of certain studies about causes of HL have not been definitive—many studies of links between HL and environmental exposures have been conducted, with unclear results. Although Epstein-Barr virus (EBV) has been associated with nearly half of HL cases, EBV has not been conclusively established as a cause. People infected with human immunodeficiency virus (HIV) have increased probability of developing HL.

The reasons for the development of NHL are not known. Immune suppression plays a role in some cases. People infected with the human immunodeficiency virus (HIV) have a higher risk of developing lymphoma. Studies suggest that specific ingredients in herbicides and pesticides may be linked to NHL. Exposure to certain viruses, such as EBV and human T-lymphotropic virus (HTLV), are also associated with NHL.

The bacterium *Helicobacter pylori* causes ulcers in the stomach, and it is associated with the development of mucosa-associated lymphoid tissue (MALT) lymphoma in the stomach wall. About a dozen uncommon, inherited syndromes can predispose individuals to develop NHL. These risk factors explain only a small proportion of cases.

Treatment

The goal of treatment for HL is to cure the disease. Chemotherapy, either alone or combined with an antibody-drug conjugate or modality therapy (chemotherapy and radiation), are commonly administered treatment approaches for HL. Involved field radiation therapy (IFRT) and involved site radiation therapy (ISRT) are the most common types of radiotherapy used to treat HL. The radiation targets primarily the lymph node regions involved by disease. Chemotherapy is used to kill neighboring lymphoma cells.

In general, the goal of treatment for NHL is to destroy as many lymphoma cells as possible and to induce a complete remission. Treatment protocols vary according to the type of disease. Chemotherapy and radiation therapy are the two principal forms of treatment. Although radiation therapy is often neither the sole nor the principal curative therapy, it is an important additional treatment in some cases. Stem cell transplantation and a watch-and-wait strategy are also used to treat some NHL subtypes. Immunotherapy is indicated to treat individuals with specific types of NHL.

Survival

HL is now considered to be one of the most curable forms of cancer.

- The 5-year relative survival rate for people with HL has more than doubled, from 40 percent in whites from 1960 to 1963 (the only data available) to 88.4 percent for all races from 2008 to 2014.
- The 5-year relative survival rate is 93.9 percent for all people with HL who were younger than 45 years at diagnosis.

The 5-year relative survival rate for people with NHL has risen from 31 percent in whites from 1960 to 1963 (the only data available) to 74.1 percent for all races from 2008 to 2014.

- The 5-year relative survival rate is 83.3 percent for all people with NHL who were younger than 45 years at diagnosis.

Gender. From 2008 to 2014, 5-year relative survival rates were

- HL – 87.4 per 100,000 for males and 89.7 per 100,000 for females
- NHL – 73.3 per 100,000 for males and 75.0 per 100,000 for females.

Race and Ethnicity. Table 8 shows the 5-year relative survival rates, rounded to the nearest integer, for all races and for blacks and whites, spanning four decades.

Trends in Five-Year Relative Survival Rates for Lymphoma, by Subtype, Race and Year of Diagnosis

Lymphoma	1975-1977	1984-1986	1996-1998	2008-2014
All Races	53%	57%	63%	76%*
Whites	53%	57%	63%	77%*
Blacks	56%	53%	60%	72%*
Hodgkin Lymphoma	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	72%	78%	85%	88%*
Whites	72%	79%	86%	89%*
Blacks	70%	75%	81%	86%*
Non-Hodgkin Lymphoma	**1975-1977**	**1984-1986**	**1996-1998**	**2008-2014**
All Races	47%	52%	59%	74%*
Whites	47%	52%	60%	75%*
Blacks	49%	47%	55%	69%*

Table 8. Source: SEER (Surveillance, Epidemiology, and End Results) 9 Registries, 1973-2015. National Cancer Institute; 2018

*The difference between 1975-1977 and 2008-2014 is statistically significant ($p<.05$).

Children, Adolescents and Young Adults. Five-year relative survival is 98.3 percent for HL in children, adolescents and young adults younger than 20 years.

In children, adolescents and young adults younger than 20 years, 5-year relative survival for NHL is 84.3 percent. This represents a significant improvement in the rate of survival. As recently as the mid-1970s, most children and adolescents with NHL did not survive 5 years after they were diagnosed (44.6 percent in 1975 to 1977).

Deaths

In 2019, an estimated 20,970 members of the US population are expected to die from lymphoma (1,000 HL and 19,970 NHL), as shown in Table 9.

Estimated Deaths from Lymphoma, by Gender, 2019

Type	Total	Male	Female
Hodgkin Lymphoma	1,000	590	410
Non-Hodgkin Lymphoma	19,970	11,510	8,460
Total	20,970	12,100	8,870

Table 9. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

Gender. NHL is the eighth most common cause of cancer death in males and females in the US. Death rates for HL are much lower than those for NHL for both males and females.

- Males – 0.4 per 100,000 for HL; 7.4 per 100,000 for NHL
- Females – 0.3 per 100,000 for HL; 4.5 per 100,000 for NHL

Race and Ethnicity. For NHL, the highest age-adjusted rates of death from 2011 to 2015 were in non-Hispanic whites at 6.0 per 100,000 population, followed by Hispanic whites at 5.2 per 100,000 population and blacks at 4.2 per 100,000 population.

Children, Adolescents and Young Adults. For children, adolescents and young adults under 20 years, age-adjusted death rates for HL and NHL per 100,000 population declined from 1975 to 2015.

- For HL, the rate was 0.1 in 1975 vs 0.0* in 2015.
- For NHL, the rate was 0.4 in 1975 vs 0.1 in 2015.

**Statistic not reported due to fewer than 16 deaths.*

Myeloma

Myeloma is a cancer of the plasma cells (a type of white blood cell). Plasma cells are found primarily in the bone marrow. About 90 percent of people with myeloma have disease involving multiple sites at the time of diagnosis (multiple myeloma). Some individuals have myeloma that progresses very slowly (sometimes referred to as "smoldering" or "indolent" myeloma).

In myeloma, a B lymphocyte (the cell type that forms plasma cells) becomes malignant. Eventually, malignant plasma cells (myeloma cells) amass in the marrow and sometimes in other sites in the body. The myeloma cells disrupt normal blood production, destroy normal bone tissue and cause pain. Healthy plasma cells produce immunoglobulins (antibodies) that protect the body against certain types of infection. The onset of myeloma interferes with antibody production, making people with myeloma susceptible to infection and other serious complications.

Prevalence

An estimated 124,483 people in the US are living with or in remission from myeloma.

New Cases

An estimated 32,110 new cases of myeloma (18,130 males and 13,980 females) are expected to be diagnosed in the US in 2019 (see Table 10).

Estimated New Cases of Myeloma, by Gender, 2019

Cancer Type	Total	Male	Female
Myeloma	32,110	18,130	13,980

Table 10. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

The median age at diagnosis is 69 years; myeloma is seldom diagnosed in people younger than 40 years.

Incidence

For the years 2011 to 2015, the age-adjusted incidence rate for myeloma was 6.7 per 100,000.

Gender. The age-adjusted incidence rate for the years 2011 to 2015 was 58.5 percent higher in males (8.4 per 100,000 population) than it was in females (5.3 per 100,000 population).

Race and Ethnicity. From 2011 to 2015, myeloma was the ninth most commonly diagnosed cancer among black males and females.

- The median age at diagnosis is 66 years for blacks and 70 years for whites.
- Blacks have more than twice the age-adjusted incidence rate (13.4 per 100,000 population) of myeloma than whites (6.1 per 100,000 population).
- Black males have a higher age-adjusted myeloma incidence rate (15.9 per 100,000) than males or females of any other race or ethnicity.
- The highest incidence rate is found in black males who are ages 80 to 84 (113.9 per 100,000 population).

Age. Figure 13 shows the age-specific incidence rates for myeloma for the years 2011 to 2015.

Age-Specific Incidence Rates for Myeloma, 2011-2015

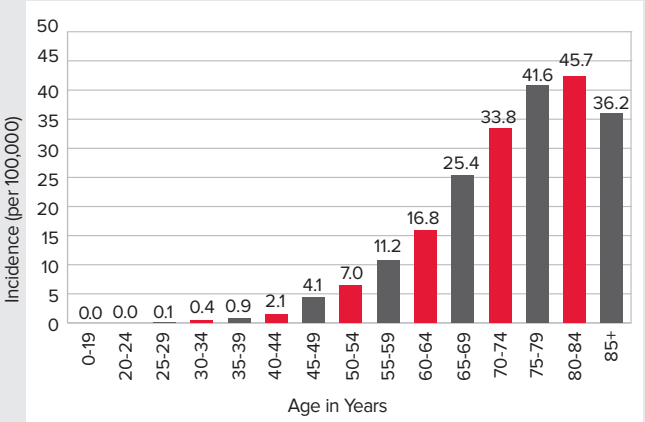

Figure 13. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*, National Cancer Institute; 2018.

Signs and Symptoms

The first symptom of myeloma is often bone pain from the effects that myeloma cells are having on the marrow. Fractures may occur as a result of the weakened bones. Anemia, recurrent infections, or numbness or pain in the hands and/or feet (caused by a condition called "peripheral neuropathy") can also be early signs of the disease. People with myeloma may also tire more easily and feel weak, or they may have no symptoms.

Possible Causes

The cause of myeloma is unknown in most cases. Long-term exposure to certain chemicals seems to increase the risk of developing myeloma, but most people who have myeloma do not have any history of such exposure, indicating that other

factors must play a major role. There are presently clinical trials going on to look at possible causes and precursors of myeloma. Contact an LLS Information Specialist at (800) 955.4572 for more information.

Treatment

The goals of treatment for people with myeloma are to reduce symptoms, to slow disease progression and to provide prolonged remission. There have been significant treatment advances in recent years. The approach for treating each person is customized, based on the extent of disease and the rate of disease progression. People who have a slow-growing myeloma and no symptoms may not need treatment immediately. Some people need only supportive care to reduce symptoms of anemia, high blood calcium levels, infections and/or bone damage or osteoporosis. Patients who require myeloma-specific therapies may receive combination drug therapy, high-dose chemotherapy with stem cell transplantation (autologous, allogeneic or reduced-intensity allogeneic), radiation therapy for local disease and/or new and emerging drug therapies as part of clinical trials.

Survival

Current statistical databases show that overall 5-year relative survival in people with myeloma has improved significantly since the 1960s. Table 11 shows the 5-year relative survival rates, rounded to the nearest integer, for all races and for blacks and whites, spanning four decades.

- Five-year relative survival has increased from 12 percent from 1960 to 1963 (for whites, the only data available) to 52.4 percent from 2008 to 2014 (for all races and ethnicities).
- The 3-year survival rate as of January 1, 2015, was 66.2 percent (for all races and ethnicities).
- The 5-year survival rate is 75.7 percent for people with myeloma who were younger than 45 years at diagnosis.

Gender. From 2008 to 2014, 5-year relative survival was 50.6 percent for males and 50.9 percent for females.

Race and Ethnicity. Five-year survival from 2008 to 2014 is highest for black females (55.2 percent) compared to 51.8 percent for black males, 52.0 percent for white males and 51.8 percent for white females.

Trends in Five-Year Relative Survival Rates for Myeloma, by Race and Year of Diagnosis

	1975-1977	1984-1986	1996-1998	2008-2014
All Races	25%	27%	33%	52%*
Whites	24%	26%	32%	52%*
Blacks	29%	32%	32%	54%*

Table 11. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015,* National Cancer Institute; 2018.
*The difference between 1975-1977 and 2008-2014 is statistically significant (p<.05).

Deaths

Approximately 12,960 deaths from myeloma are expected in 2019 (see Table 12).

Estimated Deaths from Myeloma, by Gender, 2019

Cancer Type	Total	Male	Female
Myeloma	12,960	6,990	5,970

Table 12. Source: *Cancer Facts & Figures 2019.* American Cancer Society; 2019.

Gender. Myeloma was the seventh most common cause of cancer death for black females and the twelfth most common cause of cancer death for white females from 2011 to 2015.

Myeloma was the seventh leading cause of cancer death for black males and the thirteenth most common cause of cancer death for white males from 2011 to 2015.

Race and Ethnicity. As reported in *Cancer Facts & Figures for African Americans 2019-2021,* the American Cancer Society estimated that approximately 3 percent of all cancer-related deaths among blacks are expected to be caused by myeloma.

- The age-adjusted mortality rate for myeloma from 2011 to 2015 for black males was nearly double the rate for white males (7.5 per 100,000 population vs 4.0 per 100,000 population).
- For black females, the age-adjusted mortality rate from myeloma was more than twice the rate for white females (5.5 per 100,000 population vs 2.4 per 100,000 population).
- The US median age at death from myeloma is 75 years. It is 76 years for whites, 71 years for blacks and 72 years for Hispanics.

Myelodysplastic Syndromes

Myelodysplastic syndromes (MDS) comprise a group of diseases of the blood and marrow, with varying degrees of severity and life expectancy. A myelodysplastic syndrome begins with a change to a normal stem cell in the marrow. The marrow becomes filled with an increased number of developing blood cells. However, the blood is usually deficient in cell numbers because the cells in the marrow die before they can be released into the blood. Normally, immature cells known as "blasts" make up less than 5 percent of all cells in the marrow. In a person with MDS, blasts often constitute more than 5 percent of the cells, and in a person with acute myeloid leukemia (AML), blasts constitute more than 20 percent of the cells in the marrow. MDS has been known as "smoldering leukemia" or "preleukemia." These terms may be misleading because they imply that MDS is only serious and problematic if it evolves into AML; this is not the case.

The most common MDS subtypes are

- Refractory anemia with excess blasts, 16.1 percent
- Refractory cytopenia with multilineage dysplasia, 7.8 percent.

People diagnosed with MDS, not otherwise specified (MDS NOS), constitute 59.9 percent of all MDS cases.

Prevalence

The SEER program only recently began maintaining statistics for MDS. Prevalence statistics were not reported by SEER for MDS in 2019 at the time of this publication.

New Cases

For the 5-year period from 2011 to 2015, there were 70,056 new cases of MDS throughout the US, averaging 14,011 cases per year.

Incidence

The overall age-adjusted incidence rate of MDS is 4.6 cases per 100,000 population (see Table 13).

Gender. In the United States (US), for the 5-year period from 2011 to 2015, 40,730 MDS cases were diagnosed in males (averaging 8,146 per year) and 29,326 MDS cases were diagnosed in females (averaging 5,865 per year). The overall age-adjusted incidence rates of MDS by gender are 6.3 per 100,000 in males and 3.4 per 100,000 in females.

Race and Ethnicity. White males have the highest age-adjusted incidence rates (6.6 per 100,000 population), while the lowest occur among Asian and Pacific Islander females (2.5 per 100,000 population).

Myelodysplastic Syndromes Age-Adjusted Incidence Rates, per 100,000 Population, 2011-2015

By Race	Rate
All Races	4.6
White	4.8
Black	3.9
Asian/Pacific Islander	3.2
American Indian/Alaska Native*	3.4
Hispanic**	3.2
By Age	**Rate**
Ages <40	0.4
Ages 40-49	0.7
Ages 50-59	2.2
Ages 60-69	8.6
Ages 70-79	28.3
Ages 80+	56.8

Table 13. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*. National Cancer Institute; 2018.

*Incidence data for American Indians/Alaska Natives are based on the CHSDA (Contract Health Service Delivery Area) counties.

**Hispanics are not mutually exclusive from whites, blacks, Asian/Pacific Islanders, and American Indians/Alaska Natives. Incidence data for Hispanics are based on NAACCR Hispanic Identification Algorithm (NHIA), and exclude cases from the Alaska Native Registry.

Age. The age-adjusted incidence rate for MDS is highest for males ages 80 years and older (85.1 per 100,000) and lowest for both males and females younger than 40 years (0.1 per 100,000).

Signs and Symptoms

Most often, people diagnosed with MDS first seek medical attention because they are experiencing fatigue and shortness of breath (from anemia). Some individuals have no symptoms, and a diagnosis of MDS is made as a result of a periodic physical examination and testing.

Possible Causes

Most people with MDS have "primary MDS," for which there is usually no clear-cut triggering event. A possible cause of MDS is repeated exposure to the chemical benzene. Automobile exhaust and industrial emissions account for about 20 percent of the total national exposure to benzene. About half of the benzene exposure in the US population results from smoking tobacco or from exposure to tobacco smoke. The average smoker is exposed to about 10 times the daily intake of benzene compared to nonsmokers. Secondary MDS is caused by previous cancer treatments, such as chemotherapy or radiation.

Treatment

The goal of therapy for a person with lower-risk MDS is to manage the disease by reducing transfusion needs and infection risk. Currently, the only potentially curative therapy is high-dose chemotherapy with allogeneic stem cell transplantation. This may be a practical option for certain younger people with higher-risk MDS (individuals whose life expectancy without successful treatment warrants the risk associated with transplantation). Other general approaches to treatment (either used alone or in combination) include a watch-and-wait strategy; transfusion; administration of blood cell growth factors; drug therapy with newer agents; or chemotherapy used to treat AML.

Survival

Because the SEER program only recently began maintaining statistics for MDS, survival statistics were not reported in 2019 at the time of this publication.

Deaths

Because the SEER program only recently began maintaining statistics for MDS, mortality statistics were not reported in 2019 at the time of this publication.

Myeloproliferative Neoplasms

Myeloproliferative neoplasms (MPNs) make up a group of blood cancers characterized by the overproduction of one or more types of blood cells—red blood cells, white blood cells and/or platelets. MPNs usually develop slowly over time, and different MPNs affect different blood cells.

There are several types of MPNs. The following three classic types are traditionally grouped together because of their overlapping features:

- Essential thrombocythemia (ET), which accounted for 43.7 percent of MPNs from 2011 to 2015
- Polycythemia vera (PV), which accounted for 42.0 percent of MPNs from 2011 to 2015
- Myelofibrosis (MF), which accounted for 12.9 percent of MPNs from 2011 to 2015.

Prevalence

The SEER program only recently began maintaining statistics for MPNs. Prevalence statistics were not reported by SEER for MPNs in 2019 at the time of this publication.

New Cases

For the 5-year period from 2011 to 2015, there were 48,296 new cases of MPNs throughout the US, averaging 9,659 cases per year.

Incidence

The overall age-adjusted incidence rate of MPNs is 2.7 cases per 100,000 population (see Table 14).

Gender. In the United States (US), for the 5-year period from 2011 to 2015, 23,839 MPN cases were diagnosed in males (averaging 4,768 per year) and 24,457 MPN cases were diagnosed in females (averaging 4,891 per year). The overall age-adjusted incidence rates of MPNs by gender are 2.9 per 100,000 in males and 2.6 per 100,000 in females.

Race and Ethnicity. White males have the highest age-adjusted incidence rates of MPNs (3.0 per 100,000 population), while the lowest occur among American Indian and Alaska Native females (1.4 per 100,000 population) and Hispanic females (1.5 per 100,000 population).

Age. The age-adjusted incidence rate for MPNs is highest for males ages 80 years and older (17.5 per 100,000) and lowest for both males and females younger than 40 years (0.4 per 100,000).

Myeloproliferative Neoplasms Age-Adjusted Incidence Rates, per 100,000 Population, 2011-2015

By Race	Rate
All Races	2.7
White	2.8
Black	2.5
Asian/Pacific Islander	1.8
American Indian/Alaska Native*	1.6
Hispanic**	1.6
By Age	**Rate**
Ages <40	0.4
Ages 40-49	1.9
Ages 50-59	3.5
Ages 60-69	7.4
Ages 70-79	12.6
Ages 80+	16.2

Table 14. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*. National Cancer Institute; 2018.

*Incidence data for American Indians/Alaska Natives are based on the CHSDA (Contract Health Service Delivery Area) counties.

**Hispanics are not mutually exclusive from whites, blacks, Asian/Pacific Islanders, and American Indians/Alaska Natives. Incidence data for Hispanics are based on NAACCR Hispanic Identification Algorithm (NHIA), and exclude cases from the Alaska Native Registry.

Signs and Symptoms

Many people with MPNs experience few or no signs or symptoms for extended periods of time with proper monitoring and treatment. Each type of MPN may show different signs and symptoms.

ET is often detected during a routine blood test before an individual has any signs or symptoms. One of the first indications of ET may be the development of a blood clot (thrombus). In a small subset of patients, ET may cause bleeding in individuals with an extremely high platelet count.

PV develops slowly, and it may not cause signs or symptoms for many years. The condition is often diagnosed during a routine blood test, before severe symptoms occur.

MF usually develops slowly. Often, MF does not cause early signs or symptoms and it may be found during a routine blood test. However, as disruption of normal blood cell production increases, people may experience symptoms such as fatigue, weakness, shortness of breath or pale skin.

Possible Causes

MPNs are considered "clonal disorders." Clonal disorders begin with one or more changes to the DNA of a single stem cell in the bone marrow.

In most cases, the cause of the change to the stem cell is unknown. Mutations may be caused by environmental factors or by an error during cell division. While family clusters of ET, PV and MF have been reported, these are generally not inherited diseases. They arise from gene mutations that occur during a person's lifetime.

Researchers believe that proteins known as "Janus kinases" (JAKs) are involved. JAKs send signals that affect the production of blood cells in the bone marrow. These proteins help control the numbers of red blood cells, white blood cells and platelets. When JAKs send too many signals, they cause the bone marrow to make too many blood cells. This chain of events is referred to as "overactive JAK signaling." JAK signaling may become overactive in many ways. One way is a mutation of the *JAK2* gene.

Approximately 95 percent of PV patients have a mutation of the *JAK2* gene. Mutations in genes of hematopoietic stem cells are thought to be responsible for the overactive JAK signaling that causes MF. The mutations may be in the genes that make JAKs, or the mutations may be in genes that affect how JAKs work. Most patients with MF have either a mutation of the *JAK2, MPL* or *CALR* gene.

Most cases of ET are associated with one or more acquired genetic mutations to a hematopoietic stem cell that results in the overproduction of megakaryocytes, the precursor cells of platelets in the bone marrow. Most patients with ET have a mutation of the *JAK2, MPL* or *CALR* gene.

Treatment

Treatment for MPNs can vary based on specific diagnosis. Patients have symptoms and circumstances that require different treatments. There is no single treatment that is effective for all patients. Treatment for patients may include low-dose aspirin, therapeutic phlebotomy, drug therapy or allogeneic stem cell transplantation. The doctor will monitor the patient closely through regular examinations, watching for any signs of disease progression. All patients, however, need to be closely monitored.

Survival

Because the SEER program only recently began maintaining statistics for MPNs, survival statistics were not reported in 2019 at the time of this publication.

Deaths

Because the SEER program only recently began maintaining statistics for MPNs, mortality statistics were not reported in 2019 at the time of this publication.

Incidence Rates

Leukemia, Lymphoma, Myeloma, Myelodysplastic Syndromes and Myeloproliferative Neoplasms

Tables 15, 16 and 17 show incidence rates for leukemia, non-Hodgkin lymphoma, Hodgkin lymphoma, myeloma, myelodysplastic syndromes and myeloproliferative neoplasms using data figures from 2011 to 2015 (the most recent data available). Rates are per 100,000 population and are age-adjusted to the 2000 US standard population.

Age-Adjusted Incidence Rates, by Gender, All Races, per 100,000 Population, 2011-2015

Type	Total	Male	Female
Leukemia	13.8	17.6	10.8
Non-Hodgkin Lymphoma	19.4	23.6	15.9
Hodgkin Lymphoma	2.5	2.9	2.2
Myeloma	6.7	8.4	5.3
Myelodysplastic Syndromes	4.6	6.3	3.4
Myeloproliferative Neoplasms	2.7	2.9	2.6

Table 15. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*, National Cancer Institute; 2018.

Age-Adjusted Incidence Rates, by Gender, for Blacks, per 100,000 Population, 2011-2015

Type	Total	Male	Female
Leukemia	11.0	14.0	9.0
Non-Hodgkin Lymphoma	14.4	17.5	12.1
Hodgkin Lymphoma	2.6	3.1	2.2
Myeloma	13.4	15.9	11.6
Myelodysplastic Syndromes	3.9	5.0	3.2
Myeloproliferative Neoplasms	2.5	2.7	2.4

Table 16. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*, National Cancer Institute; 2018.

Age-Adjusted Incidence Rates, by Gender, for Whites, per 100,000 Population, 2011-2015

Type	Total	Male	Female
Leukemia	14.6	18.6	11.4
Non-Hodgkin Lymphoma	20.3	24.7	16.8
Hodgkin Lymphoma	2.7	3.0	2.4
Myeloma	6.1	7.9	4.7
Myelodysplastic Syndromes	4.8	6.6	3.5
Myeloproliferative Neoplasms	2.8	3.0	2.6

Table 17. Source: *SEER (Surveillance, Epidemiology, and End Results) Cancer Statistics Review, 1975-2015*, National Cancer Institute; 2018.

Estimated New Cases and Estimated Deaths, by State

Estimated New Cases of Blood Cancers, by State, 2019

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	840	990	480	110
Alaska	90	130	*	*
Arizona	1,110	1,420	570	140
Arkansas	560	640	290	70
California	6,030	8,230	3,060	850
Colorado	810	1,130	470	140
Connecticut	670	950	380	110
Delaware	210	240	120	*
Dist. of Columbia	80	120	80	*
Florida	4,980	5,420	2,510	510
Georgia	1,800	2,030	1,180	240
Hawaii	200	280	110	*
Idaho	340	380	150	*
Illinois	2,380	2,890	1,240	330
Indiana	1,230	1,550	620	170
Iowa	730	830	330	80
Kansas	590	650	300	70
Kentucky	940	1,050	420	110
Louisiana	830	1,060	510	120
Maine	310	400	150	*
Maryland	960	1,280	640	160
Massachusetts	1,140	1,720	700	210
Michigan	1,930	2,530	1,040	260
Minnesota	1,360	1,360	630	150
Mississippi	520	570	340	70
Missouri	1,240	1,430	640	150
Montana	240	260	110	*
Nebraska	420	460	190	50
Nevada	530	600	240	60
New Hampshire	260	370	130	*
New Jersey	2,070	2,330	990	260
New Mexico	360	400	170	*
New York	4,540	5,030	2,250	580
North Carolina	1,960	2,220	1,200	240
North Dakota	170	180	70	*
Ohio	2,100	2,850	1,160	310
Oklahoma	780	850	360	90
Oregon	670	1,010	350	100
Pennsylvania	3,040	3,430	1,370	390
Rhode Island	190	270	100	*
South Carolina	1,040	1,100	680	120
South Dakota	200	210	90	*
Tennessee	1,280	1,550	670	160
Texas	4,820	5,430	2,420	660
Utah	480	550	210	70
Vermont	130	170	60	*
Virginia	1,400	1,760	810	210
Washington	1,370	1,800	620	190
West Virginia	410	470	200	50
Wisconsin	1,320	1,480	580	160
Wyoming	110	130	50	*
United States	61,780	74,200	32,110	8,110

Table 18. *Estimate is fewer than 50 cases
Estimates are rounded to the nearest 10. State estimates may not sum to US total due to rounding and exclusion of state.
Source: American Cancer Society.
(Note: The projected numbers of new cancer cases and deaths in 2019 should not be compared with previous years to track cancer trends because they are model-based and vary from year to year for reasons other than changes in cancer occurrence. Age-standardized incidence and death rates should be used to measure cancer trends.)

Estimated Deaths from Blood Cancers, by State, 2019

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	380	290	210	*
Alaska	*	*	*	*
Arizona	510	410	260	*
Arkansas	240	200	130	*
California	2,400	2,110	1,320	130
Colorado	330	250	190	*
Connecticut	270	230	140	*
Delaware	80	80	60	*
Dist. of Columbia	*	*	*	*
Florida	1,740	1,500	970	70
Georgia	590	530	420	*
Hawaii	80	90	60	*
Idaho	110	120	70	*
Illinois	900	770	480	*
Indiana	510	460	280	*
Iowa	240	240	140	*
Kansas	240	190	130	*
Kentucky	370	320	180	*
Louisiana	320	290	190	*
Maine	110	110	60	*
Maryland	390	340	300	*
Massachusetts	480	380	270	*
Michigan	770	740	460	*
Minnesota	420	380	230	*
Mississippi	210	170	140	*
Missouri	480	370	260	*
Montana	80	70	*	*
Nebraska	150	120	80	*
Nevada	200	160	100	*
New Hampshire	100	110	50	*
New Jersey	590	570	350	*
New Mexico	130	120	70	*
New York	1,370	1,210	770	60
North Carolina	720	610	480	*
North Dakota	50	50	*	*
Ohio	920	860	530	*
Oklahoma	340	270	160	*
Oregon	300	280	170	*
Pennsylvania	1,080	960	590	*
Rhode Island	80	70	*	*
South Carolina	380	320	270	*
South Dakota	70	60	*	*
Tennessee	520	470	310	*
Texas	1,580	1,350	850	80
Utah	160	130	90	*
Vermont	50	50	*	*
Virginia	520	490	340	*
Washington	480	450	260	*
West Virginia	190	150	90	*
Wisconsin	490	400	200	*
Wyoming	50	*	*	*
United States	22,840	19,970	12,960	1,000

Table 19. *Estimate is fewer than 50 deaths
Estimates are rounded to the nearest 10. State estimates may not sum to US total due to rounding and exclusion of state.
Source: American Cancer Society.
(Note: The projected numbers of new cancer cases and deaths in 2019 should not be compared with previous years to track cancer trends because they are model-based and vary from year to year for reasons other than changes in cancer occurrence. Age-standardized incidence and death rates should be used to measure cancer trends.)

Five-Year Incidence and Mortality Cases, by State

Five-Year Blood Cancer Incidence Cases, by State, 2011-2015

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	3,335	4,530	1,902	555
Alaska	353	552	154	59
Arizona	4,287	5,933	2,000	738
Arkansas	2,211	2,993	1,206	416
California	24,534	36,500	11,674	4,376
Colorado	3,634	4,667	1,652	652
Connecticut	3,149	4,518	1,540	636
Delaware	782	1,152	435	142
Dist. of Columbia	306	511	266	110
Florida	16,201	22,407	8,308	2,631
Georgia	6,975	8,976	4,149	1,227
Hawaii	918	1,444	487	119
Idaho	1,382	1,638	538	206
Illinois	9,401	13,676	4,580	1,798
Indiana	4,861	6,883	2,459	898
Iowa	3,022	4,003	1,295	482
Kansas	2,467	3,172	1,035	356
Kentucky	3,977	5,047	1,723	593
Louisiana	3,419	4,919	1,960	619
Maine	1,315	1,794	557	219
Maryland	4,052	5,579	2,323	827
Massachusetts	4,857	7,581	2,611	1,019
Michigan	8,006	11,609	4,005	1,387
Minnesota	5,077	6,650	2,071	803
Mississippi	2,004	2,759	1,240	387
Missouri	4,804	6,533	2,304	845
Montana	954	1,195	424	147
Nebraska	1,462	2,118	678	294
Nevada	1,783	2,212	663	257
New Hampshire	1,122	1,681	516	187
New Jersey	7,705	10,944	3,652	1,424
New Mexico	1,507	1,828	643	247
New York	18,083	24,084	9,184	3,282
North Carolina	7,496	9,545	4,221	1,282
North Dakota	649	787	258	112
Ohio	8,145	12,974	4,127	1,582
Oklahoma	2,957	3,892	1,338	471
Oregon	2,862	4,336	1,277	497
Pennsylvania	11,685	17,180	5,519	2,133
Rhode Island	885	1,393	385	177
South Carolina	3,666	4,597	2,323	625
South Dakota	755	937	322	109
Tennessee	5,042	6,575	2,393	885
Texas	17,191	22,066	8,704	3,130
Utah	1,736	2,228	739	338
Vermont	490	867	228	99
Virginia	4,762	7,590	2,778	1,017
Washington	5,593	7,703	2,402	910
West Virginia	1,668	2,250	752	227
Wisconsin	5,702	7,035	2,412	901
Wyoming	423	532	183	52
United States	239,652	332,575	118,595	42,485

Table 20. Reported in NAACCR's Cancer in North America: 2011-2015: Volume Two: Registry-specific Cancer Incidence in the United States and Canada.

Five-Year Blood Cancer Mortality Cases, by State, 2011-2015

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	1,942	1,576	1,056	98
Alaska	156	152	90	^
Arizona	2,395	2,015	1,129	109
Arkansas	1,244	1,010	596	53
California	12,145	10,616	5,963	686
Colorado	1,556	1,271	778	75
Connecticut	1,435	1,214	680	61
Delaware	362	326	213	17
Dist. of Columbia	160	129	114	12
Florida	8,652	7,442	4,249	365
Georgia	2,891	2,531	1,809	153
Hawaii	407	448	234	21
Idaho	555	540	273	27
Illinois	4,890	4,136	2,363	205
Indiana	2,679	2,342	1,290	117
Iowa	1,333	1,292	684	55
Kansas	1,235	982	603	50
Kentucky	1,786	1,603	856	61
Louisiana	1,618	1,552	935	99
Maine	615	582	286	27
Maryland	2,026	1,733	1,226	96
Massachusetts	2,535	2,146	1,290	93
Michigan	4,027	3,874	2,158	192
Minnesota	2,200	1,969	1047	94
Mississippi	1,122	854	638	58
Missouri	2,554	2,004	1,262	104
Montana	387	344	212	15
Nebraska	757	637	362	32
Nevada	928	723	433	42
New Hampshire	508	435	266	25
New Jersey	3,266	2,851	1,636	151
New Mexico	646	596	344	42
New York	7,191	6,223	3,516	360
North Carolina	3,498	3,038	2,065	162
North Dakota	276	243	151	^
Ohio	4,852	4,455	2,554	228
Oklahoma	1,635	1,339	717	72
Oregon	1,481	1,432	840	80
Pennsylvania	5,767	5,190	2,789	257
Rhode Island	429	370	183	18
South Carolina	1,792	1,473	1148	92
South Dakota	390	292	172	13
Tennessee	2,532	2,281	1,389	145
Texas	7,845	6,509	3,789	459
Utah	769	623	385	30
Vermont	257	241	128	12
Virginia	2,660	2,427	1,533	136
Washington	2,420	2,273	1,216	109
West Virginia	924	770	449	36
Wisconsin	2,498	2,079	1,182	119
Wyoming	235	176	95	^
United States	116,463	101,359	59,376	5,585

Table 21. *Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov)* SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2015) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, released December 2017. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).
Underlying mortality data provided by NCHS (www.cdc.gov/nchs).
^ Statistic not displayed due to fewer than 10 cases.

Five-Year Leukemia Incidence and Mortality Cases, by State

Five-Year Leukemia Incidence Cases, by State, 2011-2015

State	Leukemia	Acute Lymphoblastic Leukemia	Chronic Lymphocytic Leukemia	Acute Myeloid Leukemia	Chronic Myeloid Leukemia
Alabama	3,335	302	1,096	1,061	404
Alaska	353	44	94	113	47
Arizona	4,287	569	1,114	1,468	523
Arkansas	2,211	198	795	688	276
California	24,534	3,796	7,414	7,791	2,984
Colorado	3,634	375	1,238	1,049	450
Connecticut	3,149	256	1,220	926	410
Delaware	782	81	267	234	99
Dist. of Columbia	306	38	84	91	38
Florida	16,201	1,587	5,078	5,425	2,204
Georgia	6,975	657	2,483	2,087	969
Hawaii	918	114	216	352	132
Idaho	1,382	143	560	337	195
Illinois	9,401	1,038	2,853	3,215	1,204
Indiana	4,861	491	1,519	1,692	675
Iowa	3,022	241	1,206	893	382
Kansas	2,467	225	953	700	337
Kentucky	3,977	311	1,495	1,202	584
Louisiana	3,419	321	1,207	1,023	516
Maine	1,315	107	548	374	162
Maryland	4,052	405	1,332	1,328	489
Massachusetts	4,857	495	1,613	1,551	604
Michigan	8,006	758	2,824	2,542	1,091
Minnesota	5,077	427	2,051	1,367	663
Mississippi	2,004	211	666	631	287
Missouri	4,804	407	1,584	1,519	613
Montana	954	63	438	241	122
Nebraska	1,462	149	501	468	192
Nevada	1,783	203	601	533	191
New Hampshire	1,122	86	437	313	137
New Jersey	7,705	714	2,971	2,182	925
New Mexico	1,507	176	565	409	198
New York	18,083	1,556	7,338	4,993	2,314
North Carolina	7,496	739	2,715	2,177	1,066
North Dakota	649	50	285	176	83
Ohio	8,145	849	2,442	2,689	1,017
Oklahoma	2,957	297	1,017	896	371
Oregon	2,862	307	1,025	939	293
Pennsylvania	11,685	1,019	4,235	3,696	1,496
Rhode Island	885	56	341	249	112
South Carolina	3,666	350	1,272	1,136	500
South Dakota	755	62	281	225	111
Tennessee	5,042	494	1,861	1,516	625
Texas	17,191	2,403	5,525	4,454	2,397
Utah	1,736	241	609	484	214
Vermont	490	49	178	163	60
Virginia	4,762	516	1,407	1,609	604
Washington	5,593	578	2,191	1,616	692
West Virginia	1,668	120	609	515	233
Wisconsin	5,702	428	2,278	1,551	863
Wyoming	423	45	151	124	55
United States	239,652	25,147	82,783	73,013	31,209

Table 22. Reported in NAACCR's Cancer in North America: 2011-2015, Volume Two: Registry-specific Cancer Incidence in the United States and Canada.

Five-Year Leukemia Mortality Cases, by State, 2011-2015

State	Leukemia	Acute Lymphoblastic Leukemia	Chronic Lymphocytic Leukemia	Acute Myeloid Leukemia	Chronic Myeloid Leukemia
Alabama	1,942	96	313	713	78
Alaska	156	^	24	76	^
Arizona	2,395	203	452	976	116
Arkansas	1,244	50	208	457	56
California	12,145	1,193	2,163	5,283	583
Colorado	1,556	113	319	666	74
Connecticut	1,435	73	295	613	76
Delaware	362	16	75	161	17
Dist. of Columbia	160	15	31	63	10
Florida	8,652	535	1,573	3,507	437
Georgia	2,891	182	469	1064	133
Hawaii	407	18	41	199	20
Idaho	555	37	120	234	27
Illinois	4,890	255	939	1,953	190
Indiana	2,679	131	531	1,206	122
Iowa	1,333	80	317	591	64
Kansas	1,235	57	280	492	63
Kentucky	1,786	104	374	739	74
Louisiana	1,618	81	251	558	87
Maine	615	20	136	273	28
Maryland	2,026	86	373	794	101
Massachusetts	2,535	144	540	1,074	91
Michigan	4,027	220	840	1,662	178
Minnesota	2,200	116	519	1015	89
Mississippi	1,122	61	180	351	42
Missouri	2,554	138	536	1,099	107
Montana	387	22	85	152	21
Nebraska	757	39	183	334	30
Nevada	928	80	129	393	33
New Hampshire	508	22	123	206	23
New Jersey	3,266	162	609	1,310	112
New Mexico	646	49	124	279	22
New York	7,191	441	1,380	3,272	285
North Carolina	3,498	183	738	1,520	181
North Dakota	276	17	58	133	^
Ohio	4,852	250	950	2,119	232
Oklahoma	1,635	101	301	617	78
Oregon	1,481	85	318	670	68
Pennsylvania	5,767	293	1,191	2,310	224
Rhode Island	429	19	90	186	17
South Carolina	1,792	102	310	779	94
South Dakota	390	21	96	156	14
Tennessee	2,532	129	525	1,059	140
Texas	7,845	667	1,315	3,050	414
Utah	769	56	157	291	40
Vermont	257	11	60	130	10
Virginia	2,660	138	535	1,073	119
Washington	2,420	181	522	1,230	94
West Virginia	924	33	216	350	48
Wisconsin	2,498	129	517	1,098	110
Wyoming	235	14	47	96	10
United States	116,463	7,276	22,478	48,632	5,300

Table 23. *Surveillance, Epidemiology, and End Results (SEER) Program* (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2015) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, released December 2017. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).

Underlying mortality data provided by NCHS (www.cdc.gov/nchs).
^ Statistic not displayed due to fewer than 10 cases.

Notes and Definitions

The data within *Facts 2018-2019* reflect the most recent statistics from The National Cancer Institute's *Surveillance, Epidemiology, and End Results (SEER) Program, Cancer Statistics Review (CSR) 1975-2014*. The CSR reports cancer incidence, mortality, survival, prevalence and lifetime risk statistics. Incidence, prevalence and survival data were released online by SEER, www.seer.cancer.gov, on April 15, 2018. The next SEER Cancer Statistics Review is expected to be published online in the spring of 2019.

Incidence and mortality rates measure exactly what occurred, and cover the entire period through the most recent year reported, 2015. However, in order to calculate survival rates, the most current year of data is not considered, because not enough time has passed for it to be included.

The SEER Program's CSR presents statistics by age, sex, race and ethnicity. Statistics for these categories reflect a blend of biological and cultural factors. Additionally, data reported by race and ethnicity represent both the diversity and the mixed heritage of the US population.

Data on Hispanic ethnicity are not shown for statistics/years for which they are not available. The Hispanic ethnicity categorization is not mutually exclusive with race, so in instances where comparisons are made using ethnicity, the groupings Hispanic whites and non-Hispanic whites are used to enable meaningful comparisons.

Mortality data reflected in the 2018 referenced SEER report reflect data from the National Cancer for Health Statistics (NCHS) from 1969 to 2015, and were made available in 2018.

The SEER (18 region) data cover only about 27.8 percent of the US population. The data can be extrapolated for the entire US by multiplying by the population ratio, but these figures do not take into account differences in geography, race and ethnicity in various regions, or region-specific health risks.

Data on American Indians and Alaska Natives (AIs/ANs) should be interpreted with care because the data reflect statistics from Indian Health Service (IHS) Contract Health Service Delivery Area (CHSDA) counties only. Many AIs/ANs do not reside in such counties, and other AI/AN individuals are not members of federally recognized tribes and cannot avail themselves of IHS services.

Limited data on myelodysplastic syndromes (MDS) and myeloproliferative neoplasms (MPNs) were included in the SEER statistics as separate entities beginning in 2007.

State level incidence rates presented in *Facts 2018-2019* are provided by the North American Association of Central Cancer Registries (NAACCR). NAACCR presents the most current 5-year incidence rate for the US and Canada in the annual publication, *Cancer in North America*.

The American Cancer Society (ACS) projected the number of estimated cancer cases for 2019 using a model based on incidence data from 49 states and the District of Columbia for the years from 1995 to 2015. That incidence data met the NAACCR's high-quality data standard for incidence. This method considers geographic variations in sociodemographic and lifestyle factors, medical settings and cancer screening behaviors as predictors of incidence, and also accounts for expected delays in case reporting. The ACS projected the estimated number of US cancer deaths by fitting the number of cancer deaths from 1995 to 2016 to a statistical model that forecasts the number of deaths expected to occur in 2019. The estimated number of cancer deaths for each state is calculated similarly, using state-level data. For both US and state estimates, data on the number of deaths are obtained from the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC).

In instances where 2019 incidence count estimates are not available from the ACS, actual national incidence counts were obtained using the United States Cancer Statistics (USCS) public use database, which contains cancer incidence for the entire US for 2001 to 2015, sourced from the CDC's National Program for Cancer Registries (NPCR) and SEER. National incidence counts are presented as a yearly average of the 5 most recent years of US incidence available.

Definitions

Age-adjusted rate is an incidence or death rate that has been adjusted to reduce the bias of age in the makeup of the populations that are being compared, thereby providing a more reliable rate for comparison. Incidence or death rates can be adjusted for any demographic factor or any combination of factors, such as age (the most common), sex and race.

Incidence is the number of newly diagnosed cases either for a specific cancer, or for all cancers combined, during a specific time period. When expressed as a rate, it is the number of new cases per standard unit of population during the time period. Incidence rates can be calculated based on a number of factors, such as age, race or sex.

Prevalence is the estimated number of people alive on a certain date in a population who previously had a diagnosis of the disease. It includes new cases (incidence) and preexisting cases, and is a function of both past incidence and survival. Prevalence may be calculated in a number of different ways, especially in looking at populations in which individuals have had more than one type of cancer. In some prevalence

statistics, only the first diagnosed cancer counts. Thus, if a person is initially diagnosed with melanoma and later develops leukemia, his or her survival with leukemia may not be counted in leukemia prevalence statistics. Therefore, prevalence numbers reported may vary depending upon the method used to determine them. In this report, complete prevalence is reported as defined by SEER as "an estimate of the number of persons (or the proportion of population) alive on a specified date who had been diagnosed with the given cancer, no matter how long ago that diagnosis was." This publication is using the "40-year limited duration" prevalence figures, based on the "first invasive tumor for each cancer site diagnosed during the previous 40 years (1975-2014)," as per SEER Table 1.22. The specified date is January 1, 2015, for the prevalence estimates. The prevalence counts in *Facts 2018-2019* are adjusted for race, sex and age.

Relative survival rate is an estimate of the percentage of patients who would be expected to survive the effects of the cancer. This rate is calculated by adjusting the observed survival rate so that the effects of causes of death other than those related to the cancer in question are removed. The relative survival rate is a comparison of survival to that of a person who is free of the disease. ("Observed survival" is the actual percentage of patients still alive at some specified time after diagnosis of cancer. It considers deaths from all causes, cancer or otherwise.)

Remission is when signs of a disease disappear. This usually follows treatment. The words "complete" and "partial" are sometimes used to further define the term "remission." Complete remission means that all evidence of the disease is gone. Partial remission means that the disease is markedly improved by treatment, but residual evidence of the disease is present.

About The Leukemia & Lymphoma Society

The Leukemia & Lymphoma Society has helped millions impacted by cancer throughout our 70-year history, funding research to advance breakthroughs and providing lifesaving support and advocacy for patients.

- LLS has invested nearly $1.3 billion in research over our 70-year history, leading to breakthroughs in cancer treatment.
- LLS is the leading source of free blood cancer information, education and support, and helps patients navigate their cancer treatment, access quality care and find clinical trials.
- LLS advocates for policy changes to break down the barriers that stand between patients and the care they need.

Research

Over the past 70 years, LLS has invested more than $1.3 billion in research to advance therapies and save lives. We provide funding across the continuum, from basic research through clinical trials—from bench to bedside. LLS research grants have funded many of today's most promising advances, including targeted therapies and immunotherapies. Our funding supports the training of the next generation of first-rate cancer researchers.

Our **Research Grant programs** support scientific studies at academic centers throughout the world.

- The *Career Development Program (CDP)* provides stipends to investigators of exceptional promise in the early stages of their careers. CDP is stratified into two separately reviewed programs: basic or clinical research.
- The *Translational Research Program (TRP)* supports outstanding investigations likely to translate basic biomedical discoveries into safe and effective treatments. Awards are for an initial 3-year period. Renewals to support clinical trials are possible for an additional 2 years.
- The *Specialized Center of Research Program (SCOR)* encourages multidisciplinary academic investigations by teams of at least three research groups, regardless of their location.
- The *New Idea Award* seeks innovative approaches that can lead to significant improvements in clinical outcomes and changes to standards of care for blood cancer patients.
- The *Screen to Lead Program (SLP)* provides support for medicinal chemistry and/or drug target screening in blood cancers.

LLS creates partnerships with universities and biotechnology and pharmaceutical companies to get treatments to patients faster than ever—especially to patients with unmet medical needs.

Our **Therapy Acceleration Program® (TAP)** speeds the path of potentially better therapies into preclinical development and clinical trials. Working with academic investigators, medical centers, and biotechnology and pharmaceutical companies, TAP is increasing the likelihood that breakthrough treatments will be available to patients sooner. Three TAP programs have led to FDA-approved therapies in 2017-2018.

LLS has foundation partnerships with

- The MPN Research Foundation, to fund innovative grants to better understand and treat the range of myeloproliferative neoplasms (MPN)
- The International Waldenström's Macroglobulinemia (WM) Foundation, to fund research to improve quality of life and to better understand and treat WM and other B-cell malignancies
- The Rising Tide Foundation for Clinical Cancer Research, to fund novel immunotherapy and prevention research linked to clinical trials for all blood cancers
- The Babich Family Foundation/RUNX1 Research Program, to fund translational research seeking to control familial platelet disorder (FPD) leading to acute myeloid leukemia (AML)
- Dana-Farber Cancer Institute (DFCI). The Blood Cancer Research Partnership funds innovative clinical trials at DFCI coordinated with multiple community medicine treatment centers across the US
- Global T-Cell Lymphoma (TCL) Clinical Trials Network, an international network of community and university centers dedicated to accelerating scientific breakthroughs into effective care for patients with TCL
- The Sarah Cannon Research Institute, to fund an intensive research program in mantle cell lymphoma
- The Snowdome Foundation, to fund translational research on blood cancer in Australia.

Visit www.LLS.org or email researchprograms@LLS.org for information about LLS research grant programs.

Public Policy

LLS recognizes that finding cures is not enough; we must make sure that patients have access to the treatments they need to live longer, better, healthier lives. The LLS Office of Public Policy (OPP) is dedicated to removing barriers to care. The Office of Public Policy works directly with federal and state legislators and regulators in Washington, DC, and across the US, to advance public policies that ensure blood cancer patients have access to the care that they need. OPP works directly with the Administration, the US Congress, the Food and Drug Administration (FDA), the National Institutes of Health (NIH), the Centers for Medicare and Medicaid Services, and Health and Human Services (HHS) to accelerate approval of innovative treatments for blood cancer patients. The work of OPP is supported through a nationwide team of policy advocates who help drive public policies to ensure that patients have sustainable access to quality, affordable coordinated care.

The work of OPP helps to provide **access to better therapies**, faster. LLS is a strong voice in Washington, DC, and throughout the US, representing the healthcare and medical research interests of patients and families to policy makers at all levels of government. Our staff includes Federal and State Government, Regulatory Affairs and Policy Advocate professionals. We collaborate with our passionate and extensive Policy Advocate Network of volunteers—many individuals whose lives have been touched by a blood cancer. Currently, we are working at the federal, state and community levels to ensure that patients have affordable health insurance coverage and to remove barriers to access.

To learn more about OPP's work and how to get involved, visit www.LLS.org/policy-advocacy or text SPEAK to 698-66 to join the LLS Mobile Action Network.

Education and Support Services

LLS is the leading source of free blood cancer information, education and support. To help ensure access to the latest treatments and survivorship care, and improve quality of life, staff and volunteers provide assistance and resources to patients, caregivers and healthcare professionals nationally and in communities through our chapters across the US and Canada.

- **Personalized disease and treatment information and support.** Our Information Specialists are master's level oncology professionals who provide free one-on-one assistance to patients, families and healthcare providers. These Specialists offer personalized guidance for coping with a blood cancer diagnosis, current disease and treatment information, and referral to financial and support resources within LLS and beyond.

  Information Specialists can be contacted at (800) 955-4572, Monday through Friday, from 9 am to 9 pm Eastern Time, or by visiting www.LLS.org/InformationSpecialists.
- **Clinical Trial Support Center (CTSC).** When appropriate, patients and caregivers can work one-on-one with an LLS Clinical Trial Nurse Navigator who will conduct a comprehensive clinical trial search and personally assist them throughout the entire clinical trial process. Clinical Trial Nurse Navigators are registered nurses with expertise in blood cancers. To speak with a CTSC nurse navigator at no cost, call the Information Specialists or visit www.LLS.org/CTSC.
- **Assistance with financial burdens.** The Leukemia & Lymphoma Society (LLS) offers financial assistance to help individuals with blood cancer.

  Our *Co-Pay Assistance Program* has provided over $500 million to date to help patients pay for co-payments and health insurance premiums. Eligibility for this program is based on fund availability for specific blood cancer diagnoses and financial need criteria. A current list of funds by blood cancer diagnosis is available at www.LLS.org/copay or at (877) 557-2672.

The *LLS Patient Aid Program* provides financial assistance to blood cancer patients in active treatment. Eligible patients will receive a one-time $100 stipend to help offset expenses. Visit www.LLS.org/PatientAid or call (866) 446-7377.

Our *Susan Lang Pay-it-Forward Patient Travel Assistance Program* provides financial assistance to patients diagnosed with a blood cancer who struggle to pay for treatment-related transportation and/or lodging costs. Qualified patients, who meet program eligibility criteria, receive an annual stipend to help cover these expenses. Patient assistance is based upon available funding. Visit www.LLS.org/travel or call (844) 565-2269.

The *Urgent Need Program*, established in partnership with Moppie's Love, helps pediatric and young adult blood cancer patients, or adult blood cancer patients who are enrolled in clinical trials, with acute financial need. The program provides a $500 grant to assist with non-medical expenses, including utilities, rent, mortgage, food, lodging, dental care, child care, elder care and other essential needs. Visit www.LLS.org/UrgentNeed or call (866) 446-7377.

- **Information booklets.** Free disease, treatment and support booklets in English, Spanish and several other languages are available through our Information Specialists and LLS chapters, and can be downloaded and ordered at www.LLS.org/booklets.
- **Education programs.** LLS provides free education programs online and in local communities for patients, caregivers and healthcare professionals.

  Programs and videos for patients and caregivers feature experts who share the latest disease, treatment and research updates, including information about survivorship. These programs are available via telephone, Web and in person. Visit www.LLS.org/programs and www.LLS.org/EducationVideos.

  LLS also offers free continuing education programs online and in person for nurses, social workers and physicians. Visit www.LLS.org/ProfessionalEd.
- **Nutrition consultations.** LLS offers free one-on-one nutrition consultations to patients and caregivers by phone or email with a registered dietitian who has expertise in oncology nutrition. Visit www.LLS.org/nutrition.
- **Podcasts.** Our podcast series for patients and caregivers, *The Bloodline with LLS*, features patients, caregivers, advocates, doctors and other healthcare professionals who discuss diagnosis, treatment options, quality-of-life concerns, treatment side effects, doctor-patient communication and other important survivorship topics. For more information and to subscribe, visit www.LLS.org/TheBloodline.

  Our podcast series for healthcare professionals (HCPs), *Treating Blood Cancers*, provides up-to-date and accurate information on diagnosis, treatment and survivorship to educate HCPs.
- **Connection with other blood cancer survivors.** LLS has created many opportunities for peer-to-peer support.

  Weekly online chats are moderated by a licensed social worker; the chats give cancer patients and caregivers the opportunity to reach out, share information, and provide support to one another in a structured, online setting. For more information, visit www.LLS.org/chat.

  The *Patti Robinson Kaufmann First Connection Program* gives patients and caregivers the opportunity to talk about their experiences one-on-one with someone who has "been through it," and obtain valuable information about the community resources available to support them. Visit www.LLS.org/FirstConnection.

  LLS Community is a one-stop virtual meeting place for talking with other patients and caregivers, receiving the latest blood cancer resources and information, and getting personalized support from trained LLS staff. To join, visit www.LLS.org/community.

  Support groups in local communities throughout LLS chapters provide mutual support and offer the opportunity to discuss anxieties and concerns with others who share the same experiences. To find out if there is a support group near you, visit www.LLS.org/ChapterFind to contact your chapter.
- **Blood Cancer Conferences.** LLS Blood Cancer Conferences are free, in-person, educational events where blood cancer patients, caregivers and their families can learn more about the latest disease-specific breakthroughs, current treatments and survivorship information from local and national experts. Visit www.LLS.org/bcc for a list of these upcoming regional events.
- **Myeloma Link.** *Myeloma Link* is a special program designed to connect African American communities to information, expert myeloma care, treatment and support, as African Americans are at twice the risk for myeloma as whites. This unique community-based program is currently being implemented in select cities around the US. Visit www.LLS.org/MyelomaLink to learn more.

Visit www.LLS.org/PatientSupport for access to up-to-date disease, treatment and support information.

Citations and Acknowledgements

Citations

Cancer Facts & Figures 2019. Atlanta, GA: American Cancer Society; 2019.

Cancer Facts & Figures for African Americans 2019-2021. Atlanta, GA: American Cancer Society; 2019.

Copeland G, Green D, Firth R, et al, eds. *Cancer in North America: 2011-2015. Volume Two: Registry-Specific Cancer Incidence in the United States and Canada.* Springfield, IL: North American Association of Central Cancer Registries, Inc; June 2018. https://www.naaccr.org/wp-content/uploads/2018/06/CINA2017.v2.incidence.pdf.

Haque R, Shi J, Chung J, et al, eds. Medication adherence, molecular monitoring, and clinical outcomes in patients with chronic myelogenous leukemia in a large HMO. *Journal of the American Pharmacists Association*. 2017;57;303-310.

Noone, AM, Howlader N, Krapcho M, et al (eds). SEER Cancer Statistics Review, 1975-2015, National Cancer Institute. Bethesda, MD, https://seer.cancer.gov/csr/1975_2015/, based on November 2017 SEER data submission, posted to the SEER web site, April 2018.

National Program of Cancer Registries and Surveillance, Epidemiology, and End Results SEER*Stat Database: NPCR and SEER Incidence – U.S. Cancer Statistics 2001-2015 Public Use Research Database, United States Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute. Released June 2018, based on the November 2017 submission. www.cdc.gov/cancer/uscs/public-use.

Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2017 Sub (1973-2015 varying) - Linked To County Attributes - Total U.S., 1969-2016 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released April 2018, based on the November 2017 submission.

Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality- All COD, Aggregated With State, Total U.S. (1969-2015) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, released December 2017. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).

Benzene. Toxic Substances Portal. Agency for Toxic Substances & Disease Registry. https://www.atsdr.cdc.gov/PHS/PHS.asp?id=37&tid=14. Accessed March 24, 2019.

Zuelzer WW. Implications of long-term survival in acute stem cell leukemia of childhood treated with composite cyclic therapy. *Blood.* 1964;24:477-494.

Acknowledgements

Control and Population Sciences, National Cancer Institute, the North American Association of Central Cancer Registries and Rebecca Siegel, MPH, Director, Surveillance Information, American Cancer Society, for providing statistical assistance. Data compilation services were provided by Information Management Services, Inc.

Notes

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The mission of The Leukemia & Lymphoma Society (LLS) is to cure leukemia, lymphoma, Hodgkin's disease and myeloma, and improve the quality of life of patients and their families. Find out more at www.LLS.org.

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