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LEUKEMIA & LYMPHOMA SOCIETY®

fighting blood cancers

facts 2014-2015

Caesar, leukemia survivor

Gloria, myeloma survivor

Jude, lymphoma survivor

Virginia, leukemia survivor

LLS exists to find cures and ensure access to the most appropriate treatments for all blood cancer patients. www.lls.org

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Executive Summary

Facts 2014-2015 is an update of current data available for leukemia, lymphoma, myeloma and myelodysplastic syndromes* (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 2014-2015 provides updates from The American Cancer Society's *Cancer Facts and Figures 2014* for estimated new blood cancer cases and estimated deaths due to blood cancers. The incidence, prevalence and mortality data in *Facts 2014-2015* reflect the statistics from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program, *Cancer Statistics Review (CSR) 1975-2011.* The SEER *Cancer Statistics Review* was published online in April 2014 and updated in September 2014 (www.seer.cancer.gov). Incidence rates by state are provided by the North American Association of Central Cancer Registries Cancer in North America, 2007-2011 (www.naaccr.org).

Facts 2014-2015 also provides current and accurate information about symptoms, risk factors and treatment. *About Blood Cancer Therapy* on page 2 provides an overview of the therapies used to treat individuals with these diseases.

**Data specified for "leukemia, lymphoma and myeloma" do not include data for myelodysplastic syndromes.*

Highlights From *Facts 2014-2015*

New Cases

Approximately every 3 minutes one person in the United States is diagnosed with a blood cancer.

- An estimated combined total of 156,420 people in the US are expected to be diagnosed with leukemia, lymphoma or myeloma in 2014.
- New cases of leukemia, lymphoma and myeloma are expected to account for 9.4 percent of the estimated 1,665,540 new cancer cases diagnosed in the US in 2014.

Incidence

Incidence rates are the number of new cases in a given year, not counting the pre-existing cases. The incidence rates are usually presented as a specific number per 100,000 population.

Overall incidence rates per 100,000 population reported in 2014 for leukemia, lymphoma and myeloma are close to or the same as data reported in 2013: leukemia 13.0, 2014 vs 12.8, 2013; non-Hodgkin lymphoma (NHL) 19.7, 2014, same as 2013; Hodgkin lymphoma (HL) 2.7, 2014 vs 2.8, 2013; myeloma 6.1, 2014 vs 5.9, 2013.

Leukemia (26.9 percent), neoplasms of the brain and other nervous tissue (17.7 percent), HL (6.9 percent), NHL (6.3 percent) and soft tissue (6.3 percent) are the most common types of cancer in children, adolescents and young adults younger than 20 years.

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 outcomes of all current therapies and, as a result, may underestimate survival to a small degree. Figure 1 shows the five-year relative survival rates for leukemia, lymphoma and myeloma during 1960-1963, 1975-1977 and 2004-2010.

Five-Year Relative Survival Rates by Year of Diagnosis
1960-1963 vs 1975-1977 vs 2004-2010

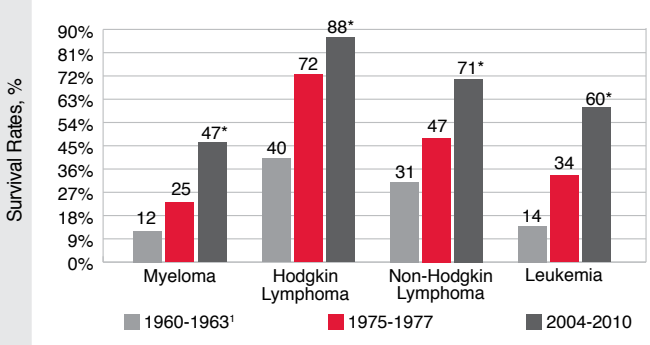

Figure 1. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

*The difference in rates between 1975-1977 and 2004-2010 is statistically significant ($P < .05$).

[1]Survival rate among whites (only data available).

An estimated 1,185,053 people in the US are either living with, or are in remission from, leukemia, lymphoma or myeloma.

Deaths

Approximately every 10 minutes, someone in the US dies from a blood cancer. This statistic represents nearly 152 people each day or more than six people every hour.

- Leukemia, lymphoma and myeloma are expected to cause the deaths of an estimated 55,350 people in the US in 2014.

- These diseases are expected to account for 9.4 percent of the deaths from cancer in 2014, based on the estimated total of 585,720 cancer deaths.
- In general, the likelihood of dying from most types of leukemia, lymphoma or myeloma decreased from 2000 to 2011 (the most recent data available).

Leukemia

- There are an estimated 327,520 people living with, or in remission from, leukemia in the US.
- In 2014, 52,380 people are expected to be diagnosed with leukemia.
- In 2014, 24,090 people are expected to die from leukemia.
- Approximately 33 percent more males are living with leukemia than females. More males than females are diagnosed with leukemia and die of leukemia.

Hodgkin and Non-Hodgkin Lymphoma

- There are an estimated 761,659 people living with, or in remission from, lymphoma in the US.
- For HL, an estimated 177,526 people are living with the disease or are in remission.
- For NHL, an estimated 584,133 people are living with the disease or are in remission.
- In 2014, there are expected to be 79,990 new cases of lymphoma diagnosed in the US (9,190 cases of HL, 70,800 cases of NHL).
- In 2014, 20,170 people are expected to die from lymphoma (1,180 from HL, 18,990 from NHL).
- NHL is the seventh most common cancer in the US, and age-adjusted incidence rose by 77.3 percent from 1975 to 2011.

Myeloma

- There are an estimated 95,874 people either living with, or in remission from, myeloma in the US.
- In 2014, 24,050 people are expected to be diagnosed with myeloma.
- The median age at diagnosis is 69 years; myeloma is seldom diagnosed in people under age 45.
- In 2014, approximately 11,090 people are expected to die from myeloma.
- From 1975 to 2011, the incidence of myeloma increased by 36.1 percent.
- The incidence of myeloma in black males and females was 120 percent greater than myeloma incidence in white males and females in 2011.
- Overall, mortality from myeloma has been decreasing slightly from 1995 to 2011 (the most recent data available).

Myelodysplastic Syndromes

- There were an estimated 14,778 new cases of myelodysplastic syndromes (MDS) diagnosed each year from 2007 to 2011.
- The estimated overall incidence rate of MDS is 4.9 cases per 100,000 population. White males have the highest MDS incidence rates (6.9 per 100,000 population).
- A possible cause of MDS (and acute myeloid leukemia) is repeated exposure to benzene. About half of the exposure to benzene in the US results from smoking tobacco or from exposure to tobacco smoke.
- Therapy-related MDS accounts for less than 2 percent of all cases.

About Blood Cancer Therapy

Leukemia, Hodgkin lymphoma (HL), non-Hodgkin lymphoma (NHL), myeloma, myelodysplastic syndromes (MDS) and myeloproliferative neoplasms (MPNs) are types of cancer that can affect the bone marrow, the blood cells, the lymph nodes and other parts of the lymphatic system. These diseases are related in the sense that they may all 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 cells, white cells and platelets. The disease process can lead to severe anemia, bleeding, an impaired ability to fight infection, or death. Figure 2 shows the percentage of estimated new cases for leukemia, lymphoma and myeloma in 2014.

Estimated New Cases (%) of
Leukemia, Lymphoma, and Myeloma, 2014*

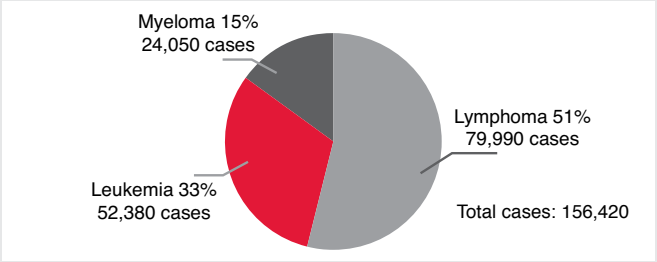

Figure 2. Source: *Cancer Facts & Figures, 2014.* American Cancer Society; 2014.

*Total percentage does not add up to 100% due to rounding in the calculation of individual percentages.

Drug and Radiation Therapy

The dramatic improvement in blood cancer treatment that began during the latter part of the 20th century is largely the result of chemotherapy. Research has led to the growing understanding of the many subtypes for each of the blood cancers, and the differences in therapy required based on subtype. Thus, accurate diagnosis of the leukemia, lymphoma, myeloma, MDS or MPN subtype is critical. In the past decade, several new drugs (and new uses for established drugs) have greatly improved rates of blood cancer cure and remission. These drugs are often combined with chemotherapy. Combination therapy may result in certain cancer cells being less resistant to treatment. People living with some types and stages of cancer may also benefit from treatment with radiation. When radiation therapy (RT) is used to treat a type of blood cancer, it is usually part of a treatment plan that includes drug therapy. The type of radiation (called "ionizing radiation") that is used for RT is the same type that is used for diagnostic x-rays, but it is given in higher doses. Current methods of delivering RT are improved, so there is less "scatter" of radiation to nearby healthy tissues. In addition, radio-labeled monoclonal antibodies (radioimmunotherapy, RIT), a treatment that combines radiation therapy with immunotherapy (see page 5), is used to treat some types of NHL.

Newer classes of drugs include: Bcr-Abl tyrosine kinase inhibitors such as imatinib mesylate (Gleevec®), dasatinib (Sprycel®), nilotinib (Tasigna®) and bosutinib (Bosulif®); histone deacetylase inhibitors (HDACs) such as vorinostat (Zolinza®); hypomethylating or demethylating agents such as azacitidine (Vidaza®) and decitabine (Dacogen®); immunomodulators such as lenalidomide (Revlimid®), pomalidomide (Pomalyst®) and thalidomide (Thalomid®); monoclonal antibodies such as rituximab (Rituxan®); antibody-drug conjugates such as brentuximab vedotin (Adcetris®); and proteasome inhibitors such as bortezomib (Velcade®) and carfilzomib (Kyprolis®). More than 50 individual drugs are used to treat people with blood cancers, and a number of potential new therapies are under study in clinical trials. Many of the drugs are used to treat several types of blood cancer.

These are some of the US Food and Drug Administration (FDA) approved drug therapies for blood cancers.

Alemtuzumab (Campath®) is indicated as a single agent for chronic lymphocytic leukemia (CLL) treatment.

All-trans-*retinoic acid* (ATRA, Tretinoin) in combination with chemotherapy (anthracycline antibiotics) has significantly improved the remission rate and duration of remission for people with acute promyelocytic leukemia (APL), a type of acute myeloid leukemia (AML). Arsenic trioxide (Trisenox®) also adds to the drugs available to treat this type of AML. Trisenox is indicated for people who have relapsed disease or are resistant to treatment with chemotherapy and ATRA.

Asparaginase Erwinia chrysanthemi (Erwinaze®) is a chemotherapy drug approved to treat patients with acute lymphoblastic leukemia (ALL) who have developed a hypersensitivity to *Escherichia coli (E coli)* derived asparaginase and pegaspargase chemotherapy drugs that are used to treat ALL. Pegaspargase (Oncaspar®) is an *E coli*-derived drug approved to treat patients with ALL.

Belinostat (Beleodaq®) is a histone deacetylase inhibitor indicated for the treatment of patients with relapsed or refractory peripheral T-cell lymphoma (PTCL).

Azacitidine (Vidaza®) and decitabine (Dacogen®) are two drugs that are indicated for all types of MDS. These drugs may help the marrow function more normally and may reduce the need for blood transfusions in some individuals with MDS.

Bendamustine (Treanda®) is a chemotherapeutic agent that is approved to treat CLL and indolent B-cell NHL that has progressed during or within six months of treatment with rituximab (Rituxan®) or a rituximab-containing regimen.

Blinatumomab (Blincyto™) is a bispecific CD19-directed CD3 T-cell engager indicated for the treatment of Philadelphia chromosome-negative relapsed or refractory B cell precursor ALL.

Bortezomib (Velcade®) is indicated to treat people with myeloma. It is also approved to treat people with mantle cell lymphoma (MCL). Velcade in combination with pegylated doxorubicin (Doxil®) offers an important option for treating people with relapsed or refractory myeloma.

Bosutinib (Bosulif®) is indicated for the treatment of adult patients with chronic, accelerated, or blast phase Ph+ chronic myeloid leukemia (CML) with resistance or intolerance to prior therapy.

Brentuximab vedotin (Adcetris®) is indicated to treat Hodgkin lymphoma (HL) after failure of autologous stem cell transplantation (ASCT) or after failure of at least two prior multi-agent chemotherapy regimens in patients who are not ASCT candidates, and to treat patients with systemic anaplastic large cell lymphoma (ALCL) after failure of at least one prior multi-agent chemotherapy regimen. This is the first new FDA-approved treatment for HL since 1977 and the first specifically indicated to treat ALCL.

Carfilzomib (Kyprolis®) is indicated for the treatment of patients with multiple myeloma who have received at least two prior therapies including bortezomib (Velcade®) and an immunomodulatory agent and have demonstrated disease progression on or within 60 days of completion of the last therapy.

Cladribine (Leustatin®) induces long-term remissions in nearly 90 percent of individuals with hairy cell leukemia (HCL) who are treated at diagnosis for only one week. Pentostatin (Nipent®) is another effective drug for people with HCL who do not respond to cladribine. There are other novel agents being studied for people with HCL.

Clofarabine (Clolar®) is approved to treat patients 1 to 21 years old with relapsed or refractory acute lymphoblastic leukemia (ALL) who have received at least two prior therapies.

Dasatinib (Sprycel®) is an approved oral drug for patients with newly diagnosed chronic-phase chronic myeloid leukemia (CML), for patients with CML who are no longer benefitting from, or did not tolerate, other treatment including imatinib mesylate (Gleevec®) and for patients with Philadelphia chromosome-positive acute lymphoblastic leukemia (Ph+ ALL) who no longer benefit from, or did not tolerate, other treatment.

Denileukin diftitox (Ontak®) is approved for the treatment of persistent or recurrent cutaneous T-cell lymphoma (CTCL) in patients whose malignant cells express the CD25 component of the interleukin-2 receptor.

Ibritumomab tiuxetan (Zevalin®) is a radioimmunotherapy (conjugated monoclonal antibody) approved to treat individuals with certain types of NHL (see *Immunotherapy* on page 5). Zevalin is administered as part of a therapeutic regimen indicated for the treatment of patients with previously untreated follicular NHL who achieve a partial or complete response to first-line chemotherapy, or of patients with relapsed or refractory, low-grade or follicular B-cell NHL.

Ibrutinib (Imbruvica™) is an oral drug indicated for the treatment of patients with chronic lymphocytic leukemia (CLL) who have received at least one prior therapy, CLL patients with 17p deletion and for patients with mantle cell lymphoma (MCL) who have received at least one prior therapy.

Idelalisib (Zydelig®) is a kinase inhibitor indicated for the treatment of patients with relapsed chronic lymphocytic leukemia (CLL), in combination with rituximab, in patients for whom rituximab alone would be considered appropriate therapy due to other comorbidities; relapsed follicular B-cell non-Hodgkin lymphoma (FL) in patients who have received at least two prior systemic therapies; and relapsed small lymphocytic lymphoma (SLL) in patients who have received at least two prior systemic therapies.

Imatinib mesylate (Gleevec®) is an oral drug indicated to treat newly diagnosed adult and pediatric patients with Philadelphia chromosome positive chronic myeloid leukemia (Ph+ CML) in chronic phase; to treat newly diagnosed pediatric patients with Ph+ acute lymphoblastic leukemia; patients with Philadelphia chromosome positive chronic myeloid leukemia (Ph+ CML) in blast crisis (BC), accelerated phase (AP), or in chronic phase (CP) after failure of interferon-alpha therapy; adult patients with relapsed or refractory Philadelphia chromosome positive acute lymphoblastic leukemia (Ph+ ALL); adult patients with myelodysplastic/ myeloproliferative (MDS/MPD) diseases associated with PDGFR (platelet-derived growth factor receptor) gene re-arrangements and adult patients with hypereosinophilic syndrome (HES) and/or chronic eosinophilic leukemia (CEL) who have the FIP1L1-PDGFRα fusion kinase (mutational analysis or FISH demonstration of CHIC2 allele deletion) and for patients with HES and/or CEL who are FIP1L1- PDGFRα fusion kinase negative or unknown.

Lenalidomide (Revlimid®) is approved in combination with dexamethasone to treat people with myeloma who have received at least one prior therapy. It is also indicated for the treatment of people with a specific subtype of MDS that results from a partial deletion of chromosome 5. Lenalidomide is also approved for the treatment of patients with mantle cell lymphoma (MCL) whose disease has relapsed or progressed after two prior therapies, one of which included bortezomib (Velcade®).

Mechlorethamine (Valchlor®) is a gel formulation of mechlorethamine, an alkylating agent which inhibits

rapidly proliferating cells; Valchlor is specifically indicated for the topical treatment of stage IA and IB mycosis fungoides-type cutaneous T-cell lymphoma in patients who have received prior skin-directed therapy.

Nilotinib (Tasigna®) is an oral therapy approved to treat newly diagnosed CML patients and patients who do not respond to Gleevec, develop resistance to it or cannot tolerate its side effects (see Imatinib mesylate).

Obinutuzumab (Gazyva™) is approved for use in combination with chlorambucil for the treatment of patients with previously untreated chronic lymphocytic leukemia (CLL).

Ofatumumab (Arzerra®) is approved for the treatment of patients with CLL that is refractory to fludarabine (Fludara®) and Campath.

Omacetaxine mepesuccinate (Synribo®) is approved for the treatment of adult patients with chronic or accelerated phase chronic myeloid leukemia (CML) with resistance and/or intolerance to two or more tyrosine kinase inhibitors.

Pomalidomide (Pomalyst®) is approved to treat patients with multiple myeloma who have received at least two prior therapies including lenalidomide and bortezomib and have demonstrated disease progression on or within 60 days of completion of the last therapy.

Ponatinib (Iclusig®) is approved to treat adult patients with T315I-positive chronic myeloid leukemia (CML) (chronic phase, accelerated phase, or blast phase) or T315I-positive Philadelphia chromosome positive acute lymphoblastic leukemia (Ph+ ALL). It is also approved for the treatment of adult patients with chronic phase, accelerated phase, or blast phase chronic myeloid leukemia or Ph+ ALL for whom no other tyrosine kinase inhibitor (TKI) therapy is indicated.

Pralatrexate (Folotyn®) is approved for the treatment of patients with relapsed or refractory peripheral T-cell lymphoma (PTCL). The National Comprehensive Cancer Network (NCCN) NHL Clinical Practice Guidelines and the Drug and Biologics Compendium includes Folotyn for the treatment of CTCL patients with mycosis fungoides and Sézary syndrome.

Rituximab (Rituxan®) is indicated for the treatment of patients with previously untreated follicular, CD20-positive, B-cell NHL in combination with first-line chemotherapy and, in patients achieving a complete or partial response to Rituxan in combination with chemotherapy, as single-agent maintenance therapy; with nonprogressing (including stable disease), low-grade, CD20-positive, B-cell NHL, as a single agent, after first-line CVP chemotherapy; with relapsed or refractory, low-grade or follicular, CD20-positive, B-cell NHL as a single agent; with previously untreated diffuse large B-cell, CD20-positive NHL in combination with CHOP or other anthracycline-based chemotherapy regimens; and with previously untreated and previously treated CD20-positive CLL in combination with fludarabine and cyclophosphamide.

Romidepsin (Istodax®) is approved for the treatment of PTCL in patients who have received at least one prior therapy and for CTCL in patients who have received at least one prior systemic therapy.

Ruxolitinib (Jakafi®) is an oral medication approved for the treatment of intermediate and high-risk myelofibrosis (MF), including primary myelofibrosis, post polycythemia vera myelofibrosis and post essential thrombocythemia myelofibrosis. It is also approved to treat patients with polycythemia vera who have had an inadequate response to or are intolerant of hydroxyurea.

Thalidomide (Thalomid®), in combination with dexamethasone, is approved to treat patients who have newly diagnosed multiple myeloma.

Vincristine sulfate liposome injection (Marqibo®) is indicated for the treatment of adult patients with Philadelphia chromosome-negative (Ph-) acute lymphoblastic leukemia (ALL) in second or greater relapse or whose disease has progressed following two or more anti leukemia therapies.

Vorinostat (Zolinza®) is an agent that is approved to treat patients with CTCL following two systemic therapies, and is also being studied to treat people who have MDS.

Immunotherapy. There have been numerous attempts by cancer researchers, spanning decades, to harness the immune system to destroy cancer cells. Advances in the field of immunology have led to greater understanding about how to manipulate the body's own defenses to improve outcomes for patients with blood cancers. Monoclonal antibody therapy and antibody drug conjugates, cancer vaccines and donor lymphocyte infusion (DLI) are types of immunotherapy. These therapies generally result in less severe short-term side effects than chemotherapy.

Monoclonal antibody therapies (mAbs) are laboratory-produced proteins that can be infused, when indicated, to treat individuals with certain blood cancers. These agents target specific antigens on the surface of cancer cells. The antigens are named by "cluster designation" (CD) and number. For example, the monoclonal antibody (mAb)

Rituxan targets the CD20 antigen on B lymphocytes. The mAb Campath is directed against the antigen CD52 found on T and B lymphocytes. A mAb can also be linked to a radioactive isotope to deliver radiation directly to the cancer cells. The conjugated mAb Zevalin is an example of this treatment. Adcetris is an example of an antibody drug conjugate that is made up of an anti-CD30 mAb attached by a linker to an agent called "monomethyl auristatin E" (MMAE). A number of potentially effective new monoclonal antibody therapies are being studied in clinical trials for several types of blood cancer.

Experimental vaccines are being studied to treat certain types of blood cancer. Cancer treatment vaccines under study are intended to induce an immune response against the cancer cells present in the individual.

Donor lymphocyte infusion may be used to treat people who have relapsed disease after stem cell transplantation for certain blood cancers, such as CML or myeloma. The infusion of the original stem cell donor's lymphocytes may induce another remission. This type of treatment is being studied intensively to learn more about the basis for this immune cell effect and to determine if donor lymphocyte infusion to prevent relapse would be beneficial for some patients with high risk of relapse after transplant.

Emerging Immunotherapies. Promising areas of research and emerging immunologic treatments also include tumor specific T-cell directed therapies, immune checkpoint targets and small molecule immunomodulatory drugs.

Gene Therapy. One approach to gene therapy (treatment that alters a gene's DNA or RNA expression) is to use agents that disable oncogenes and prevent the formation of corresponding oncoproteins. Oncoproteins cause the transformation to various types of cancer cells. For example, in CML treatment studies, researchers are trying to modify the *BCR-ABL* oncogene, which produces an oncoprotein that stimulates CML cell growth. (Note that the approved CML oral drug therapies Gleevec, Sprycel, Tasigna and Bosulif do not alter the oncogene. These drugs work by interfering with BCR-ABL tyrosine kinase [the CML oncoprotein] and blocking its effect on the cell.)

Another gene therapy approach called "gene transfer therapy" involves removing patients' cells, modifying them and then infusing the genetically engineered versions of the patients' own T cells back into their bodies following chemotherapy. This approach has been studied in a very small group of advanced CLL patients, showing sustained remissions of up to a year. Studies for this approach are ongoing for CD19-positive tumors, including some subtypes of CLL, NHL and ALL.

Risk-Adapted Therapy. Research is under way to identify biomarkers that may give doctors information about the type of therapy needed by different people who have different subtypes of the same broad diagnosis; for example, diffuse large B-cell lymphoma (DLBCL). Risk-adapted therapy may be viewed as "personalized medicine" that can be applied if there is enough information about the individual and/or the specific disease to tailor the treatment. Biomarkers may also be able to indicate which individuals have a higher-than-normal risk of developing specific long-term or late effects. Biomarkers can be high levels of certain substances in the body, such as antibodies or hormones, or genetic factors that increase susceptibility to certain effects.

Stem Cell Transplantation

The purpose of stem cell transplantation, for the treatment of patients with certain blood cancers, is to restore the function of the marrow. The patient's marrow may be impaired due to the blood cancer and/or cancer treatment. Between 1970, when the International Bone Marrow Transplant Registry (IBMTR) began tracking data, and today, the number of successful stem cell transplants for people with blood cancer has increased from hundreds to several thousand each year. The main types of stem cell transplantation are autologous transplantation and allogeneic transplantation. The decision to do a transplant, and whether the transplant should be autologous or allogeneic, depends on the type of blood cancer, the health and age of the individual, the choice(s) of other effective treatment options and the availability of a stem cell donor.

Autologous Stem Cell Transplantation involves the use of a patient's own stem cells. The stem cells are collected from marrow or blood and then frozen. The thawed cells are returned to the patient after he or she has received intensive chemotherapy and/or radiation therapy for his or her underlying disease. Autologous transplantation requires that an individual have sufficient numbers of healthy stem cells in the marrow or blood. Drugs such as plerixafor (Mozobil®), administered with a white cell growth factor (see *Quality of Life, Palliative Care and Psychosocial Distress Screenings*, page 7), may be given to move stem cells from the marrow to the blood for collection and subsequent autologous transplantation.

Allogeneic Stem Cell Transplantation involves the use of donor stem cells. The stem cells are most often collected from the circulating blood, but may be collected from the marrow. The donated stem cells can come from a related or unrelated donor. Siblings have the potential

to match the patient most closely, because the patient and the donor received their genes from the same parents. However, siblings do not always have closely matched tissue types. About 70 percent of patients who need an allogeneic stem cell transplant do not have a suitable donor in their family. Unrelated donors may be found by searching registries of volunteer donors for an individual who is identical or very similar in tissue type to the patient. The National Marrow Donor Program (NMDP) provides patients with access to more than 10.5 million potential donors and nearly 185,000 available cord-blood units through its registry and through its agreements with international cooperative registries. Transplant doctors can test to determine the degree of compatibility before a decision is made to use a particular donor. Compatibility is assessed by laboratory tests that identify the tissue type of donor and recipient. Patients who need a transplant, but have not found a matched donor within the family or the volunteer donor registry have the option of umbilical cord blood or haploidentical transplantation. Retrospective studies have shown no substantial differences in outcomes for these two options.

Before an allogeneic transplant, patients receive high doses of chemotherapy and sometimes radiation therapy. A reduced-intensity allogeneic transplant involves using less intense conditioning treatment to prepare for the transplant compared to that for a standard allogeneic transplant. With a full-intensity allogeneic transplant, the pretransplant treatment destroys most of the cancer cells. A reduced-intensity allogeneic transplant relies on the donor immune cells to fight the disease. Reduced-intensity allogeneic transplants may be an option for certain patients who are older, who have major organ complications or are otherwise not healthy or strong enough to undergo standard allogeneic transplantation. However, reduced-intensity allogeneic transplants do carry many of the same risks as standard allogeneic transplants.

Quality of Life, Palliative Care and Psychosocial Distress Screening

Care for people with blood cancer includes providing good quality of life. Palliative care improves the quality of life of patients and their families facing the challenges associated with a cancer diagnosis, through the early identification and thorough assessment to prevent and manage pain and other physical, psychosocial and spiritual issues.

Common physical side effects include hair loss, nausea, diarrhea and low blood cell counts. This is because rapidly dividing cells, such as hair follicle cells, cells that line the gastrointestinal tract and stem cells that produce blood and immune cells, are the most affected by cancer therapies. These and other treatment side effects can be managed with palliative care.

Psychosocial issues include depression, anxiety, a lack of information, a lack of skills, a lack of transportation or other challenges that disrupt work or school. Left unaddressed, psychosocial problems not only create or exacerbate suffering, but also interfere with treatment. Beginning in 2015 the American College of Surgeons' Commission on Cancer (CoC) will require healthcare providers to evaluate cancer patients for emotional and psychological distress and refer them to appropriate programs for assistance (www.facs.org/quality-programs/cancer/coc/standards/video/chap31/chap32). A joint task force of the American Psychosocial Oncology Society, the Association of Oncology Social Work and the Oncology Nursing Society has identified critical aspects that need to meet the CoC mandate, such as timing, method, tools, assessment or referral, and documentation of screening (www.apos-society.org/about/news/APOS.AOSW.ONS.StmtDistressScreening.16July13.pdf).

Survivorship

The risk of long-term effects of anticancer therapy has been recognized for years. To reduce the risks of therapy, treatments continue to evolve and the lowest effective doses of drugs and radiation are used. Regular medical follow-up is encouraged to enable doctors to assess the full effect of therapy, to detect and treat disease recurrence, and to identify and manage long-term or late effects (LTLEs). Survivors need physical examinations yearly or more often. Regular examinations include cancer screening and screening for LTLEs of treatment. Some studies indicate that few childhood survivors are aware of the kinds of therapy they received and only a small proportion receive care focused on the specific risks resulting from their prior cancer therapy.

There are tools and strategies for comanagement of cancer survivors among hematologist/oncologists and primary care providers. Survivorship programs that foster implementation of survivorship care plans and focus on life after cancer exist at a number of major hospitals around the country. Survivors do not necessarily need a cancer specialist for routine checkups and screening, but they do need to see doctors who understand their previous treatment and its risks. Coordination between specialists and primary care physicians is essential to provide the best care. Some treatment centers have follow-up clinics that provide a comprehensive, multidisciplinary approach to monitoring and supporting cancer survivors. Some follow-up clinics specialize in

pediatric cancer survivors; others follow both pediatric and adult cancer survivors.

- The American Society of Clinical Oncology (ASCO) Cancer Survivorship Compendium has tools and resources for oncology providers to implement or improve survivorship care within their practices (www.asco.org/practice-research/cancer-survivorship).
- The Children's Oncology Group has established Long-Term Follow-Up Guidelines for Survivors of Childhood, Adolescent and Young Adult Cancers (www.survivorshipguidelines.org). These guidelines were developed as a collaborative effort of the Nursing Discipline and the Late Effects Committee and are maintained and updated by the Children's Oncology Group's Long-Term Follow-Up Guidelines Core Committee and its associated Task Forces. The purpose of these guidelines is to provide recommendations for screening and management of late effects that may potentially arise as a result of therapeutic exposures used during treatment for pediatric malignancies.
- The National Comprehensive Cancer Network (NCCN) has Guidelines for Survivorship (www.nccn.org/professionals/physician_gls/f_guidelines.asp#survivorship) that cover anxiety and depression, cognitive function, exercise, fatigue, immunizations and infections, pain, sexual function, and sleep disorders. The NCCN Guidelines include a sample assessment tool with two to three questions on each of the key criteria covered in the guidelines.

Leukemia

"Leukemia" is the term used to describe the four major types of leukemia (see Tables 1 and 2).

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

Table 1. 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.

Living With Leukemia

An estimated 327,520 people in the US are either living with, or are in remission from, leukemia.

ALL and 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 cells and white cells. Anemia, a deficiency of red cells, develops in virtually all people who have leukemia. The lack of normal white cells impairs the body's ability to fight infections. A shortage of platelets results in bruising and easy bleeding.

CLL and CML usually progress slowly compared to acute types of leukemia. The slower disease progression 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, 2011	
Type	Prevalence
Acute Lymphoblastic Leukemia	68,728
Chronic Lymphocytic Leukemia	126,299
Acute Myeloid Leukemia	37,726
Chronic Myeloid Leukemia	33,990

Table 2. Source: Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov). Prevalence database: "US Estimated 36-Year L-D Prevalence Counts on 1/1/2011". National Cancer Institute, DCCPS, Surveillance Research Program, Data Modeling Branch, released April 2014, based on the November 2013 SEER data submission.

New Cases

An estimated 52,380 new cases of leukemia are expected to be diagnosed in the US in 2014. (See Figure 3 and Table 3.) Cases of acute leukemia are expected to account for 14.7 percent more cases than chronic leukemia.

Estimated Proportion of New Cases (%) in 2014 for Types of Leukemia, Adults and Children*

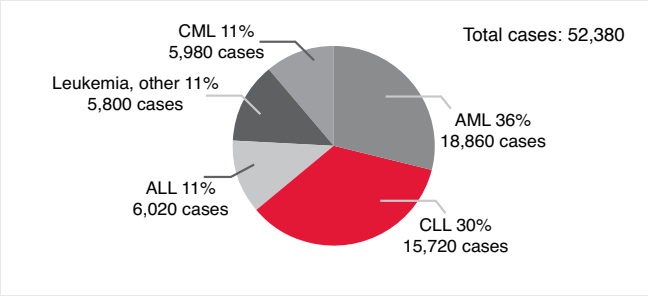

Figure 3. Source: *Cancer Facts & Figures, 2014.* American Cancer Society; 2014.

*Total is less than 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.
- In 2014, leukemia is expected to strike approximately 12 times as many adults (47,666) as children, adolescents and young adults younger than 20 years (4,103).
- The most common types of leukemia in adults are AML and CLL.
- The most common type of leukemia in children, adolescents and young adults younger than 20 years is ALL.
- In 2011, the latest year for which data are available, ALL accounted for 75.8 percent of the new leukemia cases in children, adolescents and young adults younger than 20 years.
- Most cases of CML occur in adults. In 2011, the latest year for which data are available, about 3.1 percent of new cases of leukemia in children, adolescents and young adults younger than 20 years are CML. Approximately 1 percent of all cases of CML are in adolescents and young adults ages 15 to 19 years.

Total Estimated Number of New Leukemia Cases in the United States for 2014

Type	Total	Male	Female
Acute Lymphoblastic Leukemia	6,020	3,140	2,880
Chronic Lymphocytic Leukemia	15,720	9,100	6,620
Acute Myeloid Leukemia	18,860	11,530	7,330
Chronic Myeloid Leukemia	5,980	3,130	2,850
Other Leukemia	5,800	3,200	2,600
Total Estimated New Cases	52,380	30,100	22,280

Table 3. Source: *Cancer Facts & Figures 2014.* American Cancer Society; 2014.

Incidence

Between 1975 and 2011, the incidence of AML has remained consistent overall.

Gender. Incidence rates for all types of leukemia are higher among males than among females. In 2014, males are expected to account for approximately 57 percent of the new cases of leukemia.

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

- Leukemia incidence is highest among non-Hispanic whites (13.9 per 100,000 population); incidence is lowest among Asian and Pacific Islander populations (7.6 per 100,000 population) and American Indian and Alaska Native populations (7.3 per 100,000 population).
- While incidence rates for all types of cancer combined are 2.5 percent higher among blacks* than among whites, leukemia rates are higher among whites than among other races or ethnicities.
- From 2002 to 2011, incidence rates for leukemia have declined only in Asian/Pacific Islander populations.
- Leukemia rates are higher for children and adolescents who are white, Hispanic, Asian, Pacific Islander, American Indian and Alaska Native than for black children and adolescents.
- In children, adolescents and young adults less than 20 years, leukemia rates are highest among Hispanics.

**Note: The incidence rate for all types of cancer among blacks in the SEER 18 region, from 2007 to 2011, was 480.8 per 100,000 population, averaging about 200,037 cases per year. As reported in* Cancer Facts & Figures for African Americans 2013-2014, *the American Cancer Society estimated that about 176,620 of the expected nearly 1.7 million new cancer cases in 2014 would be diagnosed in blacks.*

Children, Adolescents and Young Adults. From 2007 to 2011, leukemia represented 26.9 percent of all of the types of cancer occurring among children, adolescents and young adults younger than 20 years.

- Leukemia is the most common cancer in children, adolescents and young adults less than 20 years old.
- In 2014, about 4,103 children, adolescents and young adults less than 20 years old are expected to be diagnosed with leukemia throughout the US.
- About 33 percent of estimated cancer cases in children and adolescents younger than 15 years are leukemia.

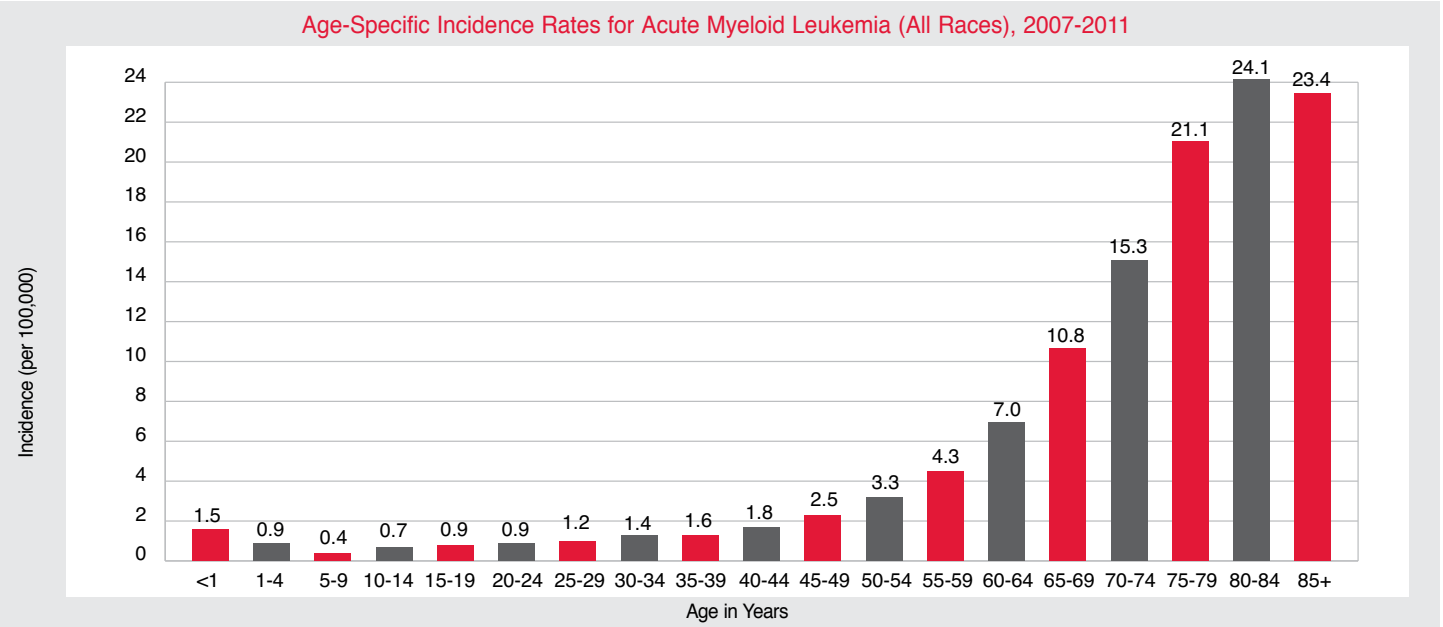

Figure 4. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

- In the 18 SEER regions of the US, representing 27.8 percent of the population, from 2007 to 2011 there were 5,599 children, adolescents and young adults under the age of 20 years diagnosed with leukemia, including 4,231 diagnosed with ALL.
- ALL is the most common cancer in children and adolescents 1 to 16 years old.
- The incidence of ALL among 1- to 4-year-olds is eight times greater than the rate for young adults 20 to 24 years.
- From 1975 to 2011, incidence rates increased for childhood and adolescent ALL and AML.
- ALL incidence is higher in children and adolescents younger than 15 years than it is in people ages 15 years through young adulthood.
- AML incidence is lower in children and adolescents from 5 to 14 years than in persons 15 years through young adulthood.
- From 2007 to 2011, among 15- to 19-year-olds, ALL incidence was twice that of AML.
- In 25- to 29-year-olds, AML incidence was 50 percent higher than that of ALL.

Adults. CLL, AML and CML are most prevalent in the seventh, eighth and ninth decades of life. Incidence begins to increase significantly among people with

- CLL – at age 50 years and older
- AML – at age 50 years and older (see Figure 4)
- CML – at age 65 years and older.

Signs and Symptoms

Signs of acute leukemia may include easy bruising or bleeding (because of platelet deficiency), paleness or easy fatigue (because of anemia), recurrent minor infections or poor healing of minor cuts (because of an inadequate white cell count). These signs 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 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

Leukemia strikes males and females of all ages. 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 AML. Automobile exhaust and industrial emissions account for about 20 percent of the total national benzene exposure. About half of US benzene exposure 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 treatment for leukemia is to bring about a complete remission. Complete remission means that there is no evidence of disease and the individual returns to good health with normal blood and marrow cells. Relapsed leukemia indicates return of the cancer

cells and the return of disease signs and symptoms. For acute leukemia, a complete remission that lasts five years after diagnosis often indicates long-term survival. Treatment centers report increasing numbers of people with leukemia who are in complete remission at least five years after diagnosis of their disease.

Survival

Relative survival rates vary according to a person's age at diagnosis, gender, race and type of leukemia. The overall five-year relative survival rate for leukemia has more than quadrupled since 1960. From 1960 to 1963, the five-year relative survival rate among whites (only data available) with leukemia was 14 percent. From 1975 to 1977, the five-year relative survival rate for the total population with leukemia was 34.2 percent, and from 2004 to 2010, the overall relative survival rate was 60.3 percent (see Figure 5; percentages in Figure 5 are rounded to the nearest integer). Thirty-three percent more males than females are living with leukemia.

From 2004 to 2010, the five-year relative survival rates overall were

- CML – 59.9 percent
- CLL – 83.5 percent
- AML – 25.4 percent overall and 66.3 percent for children and adolescents younger than 15 years
- ALL – 70 percent overall, 91.8 percent for children and adolescents younger than 15 years, and 93 percent for children younger than 5 years.

Five-Year Relative Survival Rates for All Ages, All Types of Leukemia, 1975-2010

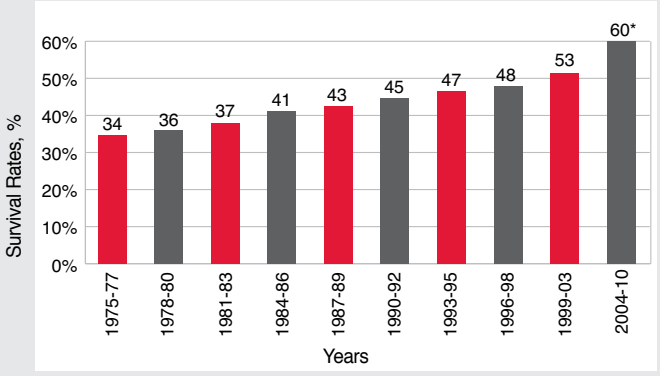

Figure 5. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

* The difference in rates between 1975-1977 and 2004-2010 is statistically significant ($P < .05$).

Figure 6 shows that childhood ALL five-year survival rates have improved significantly over the past five decades. Most children, adolescents and young adults younger than 20 years who have ALL are expected to become five-year survivors of the disease. However, significant treatment-related long-term morbidity and mortality for childhood cancer has been well established by several studies. Long-term treatment-related effects among ALL and other childhood cancer survivors may include any subsequent cancer, cardiac disease, pulmonary disease or other causes.

Five-Year Relative Survival Rates for Acute Lymphoblastic Leukemia in Children under 15, Diagnosed 1964-2010

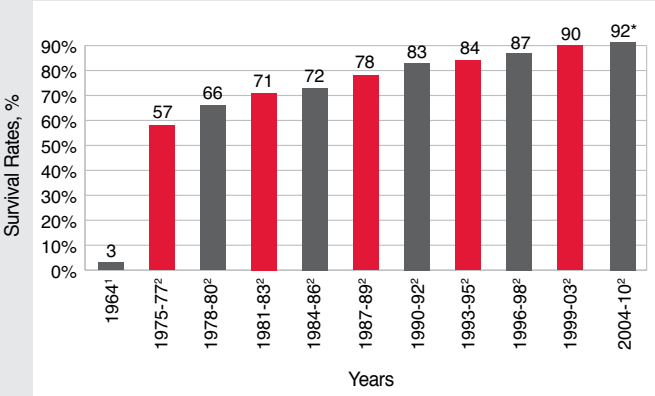

Figure 6. Sources: 1. Zuelzer WW. Implications of long-term survivals in acute stem cell leukemia of childhood treated with composite cyclic therapy. *Blood.*1964;24:477-494. 2. *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

* The difference in rates between 1975-1977 and 2002-2008 is statistically significant ($P < .05$).

Deaths

Approximately 24,090 deaths (14,040 males and 10,050 females) in the US are expected to be attributed to leukemia in 2014. Estimated deaths for the four major types of leukemia in 2014 are

- AML – 10,460 deaths
- CLL – 4,600 deaths
- ALL – 1,440 deaths
- CML – 810 deaths.

For other unclassified forms of leukemia, an additional 6,780 deaths in 2014 are estimated. In general, mortality from leukemia decreased from 1975 to 2011 (the latest year for which these data are available).

Estimated Deaths (All Age-groups) from All Types of Leukemia, 2014

Type	Total	Male	Female
Acute Lymphoblastic Leukemia	1,440	810	630
Chronic Lymphocytic Leukemia	4,600	2,800	1,800
Acute Myeloid Leukemia	10,460	6,010	4,450
Chronic Myeloid Leukemia	810	550	260
Other Leukemia	6,780	3,870	2,910
Total	24,090	14,040	10,050

Table 4. Source: *Cancer Facts & Figures 2014.* American Cancer Society; 2014.

Gender. In 2007-2011, leukemia was the fifth most common cause of cancer deaths in men and the sixth most common in women in the US. In 2014, the estimated number of deaths attributed to leukemia in the US is nearly 40 percent higher for males than for females. In 2014, deaths from leukemia are expected to be distributed by gender as shown in Table 4.

Race and Ethnicity. For leukemia, the highest rate of deaths from 2007 to 2011 was in non-Hispanic whites at 7.4 per 100,000 population, followed by whites at 7.3 per 100,000 population and blacks at 6.0 per 100,000 population.

From 2007 to 2011, black males between the ages of 30 and 59 years had a higher death rate from leukemia than white males.

- As reported in *Cancer Facts & Figures for African Americans 2013-2014*, the American Cancer Society estimated that approximately 1,930 blacks (1,040 males and 890 females) are expected to die from leukemia.
- Leukemia is the seventh most common cause of cancer deaths in black males and the eighth most common in black females.

Children, Adolescents and Young Adults. The leukemia death rate for children and adolescents younger than 15 years in the US has declined by 81 percent from 1969 to 2011. Death rates for all types of cancer for children, adolescents and young adults younger than 20, including acute lymphoblastic leukemia, declined from 1975 to 2011. Despite this decline, leukemia causes more deaths than any other cancer among children, adolescents and young adults younger than 20 years.

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 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.

Living With Lymphoma

An estimated total of 761,659 individuals in the US population are either living with, or in remission from, lymphoma.

- There are 177,526 people living with Hodgkin lymphoma (active disease or in remission).
- There are 584,133 people living with non-Hodgkin lymphoma (active disease or in remission).

Hodgkin Lymphoma. Hodgkin lymphoma (HL) represents 11.5 percent of all types of lymphoma diagnosed in 2014. 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 lymphoma tissues.

Non-Hodgkin Lymphoma. Non-Hodgkin lymphoma (NHL) represents a diverse group of diseases 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. NHL is the seventh most common cause of cancer deaths in both males and females.

New Cases

About 79,990 people living in the US are expected to be diagnosed with lymphoma in 2014 (9,190 cases of HL and 70,800 cases of NHL). The incidence of HL is consistently lower than that of NHL. Table 5 shows estimated new cases of lymphoma in 2014, by gender.

New Cases of Lymphoma by Gender, 2014

Type	Total	Male	Female
Hodgkin Lymphoma	9,190	5,070	4,120
Non-Hodgkin Lymphoma	70,800	38,270	32,530
Total	79,990	43,340	36,650

Table 5. Source: *Cancer Facts & Figures 2014.* American Cancer Society; 2014.

Incidence

Gender. Incidence rates for HL and NHL tend to be higher among males than among females.

- NHL is the sixth most common cancer in both males and females in the US.
- The age-adjusted incidence of NHL rose by 77.3 percent from 1975 to 2011, an average annual percentage increase of 2.1 percent.

Age-specific incidence rates, by gender, for NHL are as follows:

- At ages 20 to 24 years, 3.1 per 100,000 males and 1.9 per 100,000 females
- By ages 60 to 64 years, 51.8 per 100,000 males and 37.2 per 100,000 females.

Race and Ethnicity. From ages 15 to 19 years, more non-Hispanic whites are diagnosed with HL than adolescents and young adults of other races or ethnic groups. In children and adolescents younger than 15 years, American Indian, Alaska Native, Asian and Pacific Islander populations have the lowest rates of HL.

In children, adolescents and young adults younger than 20 years,

- Lymphoma is most commonly diagnosed in non-Hispanic whites (2.71 per 100,000 population) and whites (2.52 per 100,000 population), followed by non-Hispanic blacks (2.17 per 100,000 population) and blacks (2.09 per 100,000 population) and Hispanics (2.01 per 100,000 population).
- Lymphoma is least commonly diagnosed among American Indian and Alaska Native children, adolescents and young adults (0.75 per 100,000 population).
- The highest incidence rates of NHL are in non-Hispanic white adolescents and young adults ages 15 to 19 years (1.97 per 100,000 population) and white adolescents and young adults ages 15 to 19 years (1.79 per 100,000 population).

Blacks, from the early-20s to the mid-40s, have higher incidence rates of NHL than whites. However, beginning at age 45 years, whites generally have considerably higher incidence rates of NHL than blacks.

NHL is the fifth most common cancer in Hispanics, constituting 5 percent of all types of cancer cases in Hispanics. Among women, Hispanics have the second highest incidence rates of NHL after whites.

Children, Adolescents and Young Adults. Lymphoma (HL, 6.9 percent; NHL, 6.3 percent) is the third most common cancer in children, adolescents and young adults younger than 20 years.

- In 2014, lymphoma will account for 10 percent (HL, 4 percent; NHL, 6 percent) of all cancers expected to be diagnosed in children, adolescents and young adults younger than 15 years. The number of cases expected to be diagnosed in children, adolescents and young adults younger than 15 years is 620 for NHL and 380 for HL.
- The incidence of HL among children, adolescents and young adults under 20 years was 1.2 per 100,000 population in 2007-2011.
- Older children and adolescents are more commonly diagnosed with HL than younger children.
- In 2007 to 2011, 2.5 cases of NHL per 100,000 population occurred in 20- to 24-year-old individuals.
- The lymphoma rates (HL and NHL), for the years 2002 to 2011, were higher for the 20- to 24-year-old age-group (7.7 per 100,000 population) than for the 15- to 19-year-old age-group (5.1 per 100,000 population).
- From 2002-2011, lymphoma incidence increased in people ages 15 to 19 and 25 to 34 years and decreased in people ages 20 to 24 and 35 to 39 years.

Adults. HL incidence rates are lower in adults in their middle years than in young adults. Incidence increases in people between 55 and 84 years (see Figure 7). The incidence of NHL increases with age (see Figure 8).

- From age 20 to 24 years the rate of NHL is about 2.5 cases per 100,000 population.
- From age 60 to 64 years the rate increases more than 17 times to 44.2 cases per 100,000 population.
- From age 80 to 84 years the rate increases more than 47 times to 119.7 cases per 100,000 population.

Signs and Symptoms

A common early sign of HL or NHL is a painless enlargement of one or more lymph nodes. However, enlarged lymph nodes may 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.

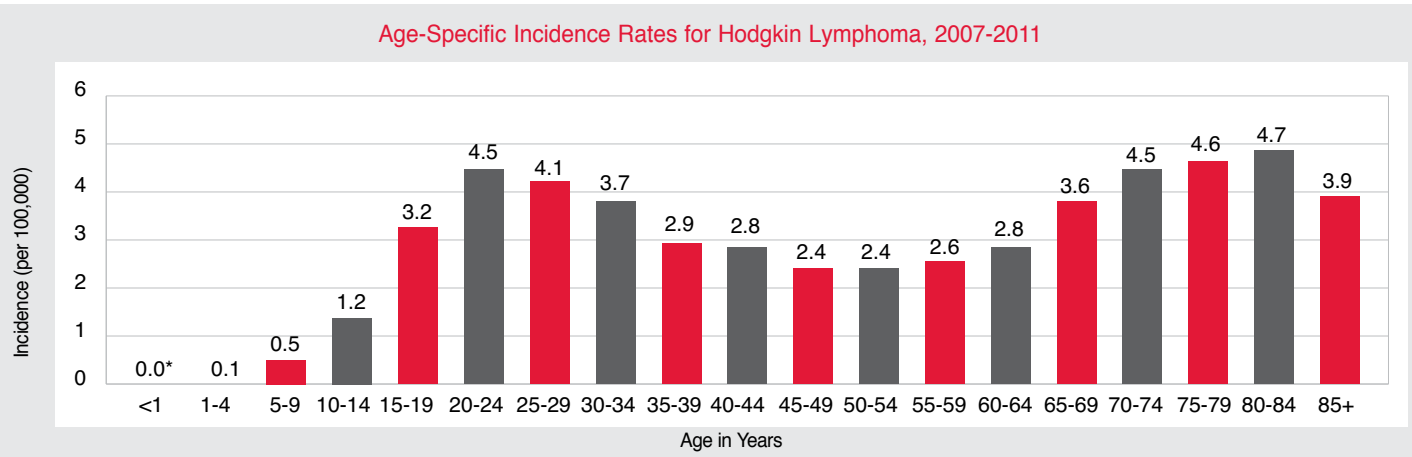

Figure 7. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.
*<16 cases for each age and time interval, SEER 18 areas.

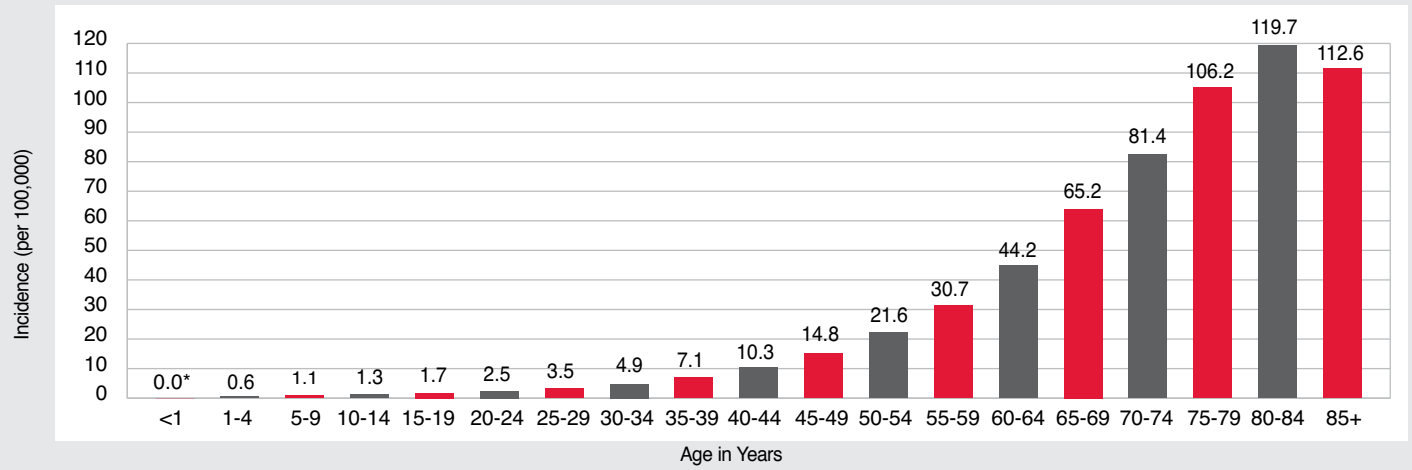

Figure 8. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.
*<16 cases for each age and time interval, SEER 18 areas.

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. Most cases of HL occur in people who do not have identifiable risk factors; most people with identifiable risk factors do not develop 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 later development of NHL. These risk factors explain only a small proportion of cases.

Treatment

Cure is the goal of treatment for people who have HL. "Involved field" radiation therapy with chemotherapy (sometimes called "combined modality therapy") has been the most common treatment approach for HL. Involved field radiation therapy targets the evident HL cell masses, and chemotherapy is used to kill

neighboring lymphoma cells. Clinical trials are under way comparing chemotherapy with radiation to chemotherapy-only to treat patients with stage IA and IIA nonbulky HL.

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 not often the sole or 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 five-year relative survival rate for people with HL has more than doubled, from 40 percent in whites from 1960 to 1963 (only data available) to 87.7 percent for all races from 2004 to 2010.
- The five-year relative survival rate is 93.7 percent for all people with HL who were less than 45 years old at diagnosis.

The five-year relative survival rate for people with NHL has risen from 31 percent in whites from 1960 to 1963 (only data available) to 71.4 percent for all races from 2004 to 2010.

Race and Ethnicity. Table 6 shows the HL and NHL five-year relative survival rates, rounded to the nearest integer, for all races and for blacks and for whites, spanning four decades.

Trends in Five-Year Relative Survival Rates by Race for Hodgkin Lymphoma and Non-Hodgkin Lymphoma

Hodgkin Lymphoma	1975-1977	1981-1983	1990-1992	2004-2010
All Races	72%	74%	82%	88%*
Whites	72%	75%	83%	88%*
Blacks	70%	72%	74%	85%*
Non-Hodgkin Lymphoma	**1975-1977**	**1981-1983**	**1990-1992**	**2004-2010**
All Races	47%	51%	51%	71%*
Whites	47%	51%	52%	73%*
Blacks	48%	49%	42%	63%*

Table 6. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.
* The difference between 1975-1977 and 2004-2010 is statistically significant ($P < .05$).

Children, Adolescents and Young Adults. Five-year relative survival is 97.1 percent for HL in adolescents and young adults ages 15 to 19 years. Five-year relative survival is 97.6 percent for HL in children and adolescents younger than 15 years.

In children, adolescents and young adults younger than 20 years, five-year relative survival for NHL is 83.9 percent. This represents a significant improvement in the rate of recovery. As recently as the mid-1970s, most children and adolescents with NHL did not survive five years after they were diagnosed.

Subsequent Primary Cancers. The growing US cancer survivor population has special needs for medical follow-up. Efforts are under way to provide information about survivors' risks for developing multiple primary cancers. The information will help physicians and patients discuss the risks and any established prevention and screening guidelines. Tables 7 and 8 show the observed to-expected ratio (O/E) for subsequent primary cancer development in HL and NHL survivors (see *Notes and Definitions*, page 24). Subsequent cancers among HL survivors have been well studied because of the high long-term survival rates and the relatively young age at diagnosis for many with this disease. NHL represents a broad range of diseases, with varying risk factors and treatments; the relative risk for subsequent cancers depends on the NHL subtype and the treatment. The SEER data show that as a group, survivors of NHL have an increased O/E for developing subsequent cancers (O/E = 1.22), but their risk is lower than the risk of HL survivors (O/E = 2.14).

Observed-to-Expected Ratio for Developing Subsequent Primary Cancer after Hodgkin Lymphoma (HL) by Age at Diagnosis of HL, SEER 1973-2011								
Second Primary Site	Birth to 19 (N=3,413)	20 to 39 (N=11,673)	40 to 59 (N=5,167)	60 and older (N=3,868)	All Ages (N=24,121)	All Ages		
						Observed	Expected	EAR**
Lung and Bronchus	7.82*	5.00*	3.03*	1.78*	2.95*	520	176	11.39
Female Breast	10.28*	3.08*	1.28	0.99	2.45*	474	194	20.02
Non-Hodgkin Lymphoma	6.19*	6.58*	6.28*	4.88*	5.99*	360	60	9.94
Acute Non-Lymphocytic Leukemia (ANLL)	24.93*	14.70*	14.94*	5.77*	12.40*	148	12	4.51
All Sites Excluding Non-Melanoma Skin	6.02*	2.77*	1.89*	1.35*	2.14*	3,039	1,420	53.64

Table 7. Source: *Surveillance, Epidemiology and End Results (SEER)* Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 9 Regs Research Data, Nov 2013 Sub (1973-2011) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total US, 1969-2012 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2014, based on the November 2013 submission.

**P*< .05

**EAR=Estimated absolute risk (see *Notes and Definitions*, page 24.)

Observed-to-Expected Ratio for Developing Subsequent Primary Cancer after Non-Hodgkin Lymphoma (NHL) by Age at Diagnosis of NHL, SEER 1973-2011								
Second Primary Site	Birth to 19 (N=2,641)	20 to 39 (N=11,181)	40 to 59 (N=33,493)	60 and older (N=65,167)	All Ages (N=112,482)	All Ages		
						Observed	Expected	EAR**
Lung and Bronchus	0	2.10*	1.57*	1.22*	1.32*	2,181	1,647	7.06
Hodgkin Lymphoma	4.45*	9.52*	9.39*	4.75*	6.83*	191	28	2.15
Acute Non-Lymphocytic Leukemia (ANLL)	17.45*	12.01*	6.71*	2.84*	4.00*	384	96	3.81
Melanoma of the Skin	1.6	1.19	1.37*	1.34*	1.34*	491	367	1.64
Kaposi Sarcoma	0	14.55*	15.27*	2.15*	10.02*	132	13	1.57
All Sites Excluding Non-Melanoma Skin	4.24*	2.00*	1.40*	1.12*	1.22*	13,302	10,862	32.26

Table 8. Source: *Surveillance, Epidemiology and End Results (SEER)* Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 9 Regs Research Data, Nov 2013 Sub (1973-2011) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total US, 1969-2012 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2014, based on the November 2013 submission.

**P*< .05

**EAR=Estimated absolute risk (see *Notes and Definitions*, page 24.)

Deaths

In 2014, an estimated 20,170 members of the US population are expected to die from lymphoma (18,990 NHL and 1,180 HL), as shown in Table 9. Overall, death rates have been declining for people with HL since 1975.

Gender. In males, death rates for HL have been declining by 1.2 percent per year, on average, since 2000, and in females death rates for HL have been declining 2.6 percent per year, on average, since 2000.

NHL is the seventh most common cause of cancer death in both males and females in the US.

Estimated Deaths from Hodgkin Lymphoma and Non-Hodgkin Lymphoma, by Gender, 2014			
Type	Total	Male	Female
Hodgkin Lymphoma	1,180	670	510
Non-Hodgkin Lymphoma	18,990	10,470	8,520
Total	20,170	11,140	9,030

Table 9. Source: *Cancer Facts & Figures 2014.* American Cancer Society; 2014.

Race and Ethnicity. NHL is the seventh most common cause of cancer death in Hispanic males and Hispanic females.

Children, Adolescents and Young Adults. For children, adolescents and young adults under 20 years, death rates for all types of cancers combined declined from 1975 to 2011, including for HL and NHL.

Myeloma

Myeloma is a cancer of the plasma cells (a type of white cell). Plasma cells are found primarily in the marrow. About 90 percent of people with myeloma have disease involving multiple sites at the time of diagnosis. 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 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.

Living With Myeloma

An estimated 95,874 people in the US are living with, or in remission from, myeloma.

New Cases

An estimated 24,050 new cases of myeloma (13,500 males and 10,550 females) are expected to be diagnosed in the US in 2014.

Incidence

Gender. The incidence rate for the years 2007 to 2011 was 57.1 percent higher in males (7.7 per 100,000 population) than in females (4.9 per 100,000 population).

Race and Ethnicity. From 2007 to 2011, myeloma was the tenth most commonly diagnosed cancer among black males and the ninth most commonly diagnosed cancer among black females.

- The median age at diagnosis for blacks is 65 years.
- Blacks have more than twice the incidence rate (12.2 per 100,000 population) of myeloma than whites (5.6 per 100,000 population).
- Black males who are 55 years and older have higher myeloma incidence rates than black females and white males and females who are age 55 years and older.
- The highest incidence rates are found in black males who are ages 80 to 84 (98.0 per 100,000 population).

Age. Figure 9 shows the age-specific incidence rates for myeloma for 2007-2011.

Age-Specific Incidence Rates for Myeloma, 2007-2011

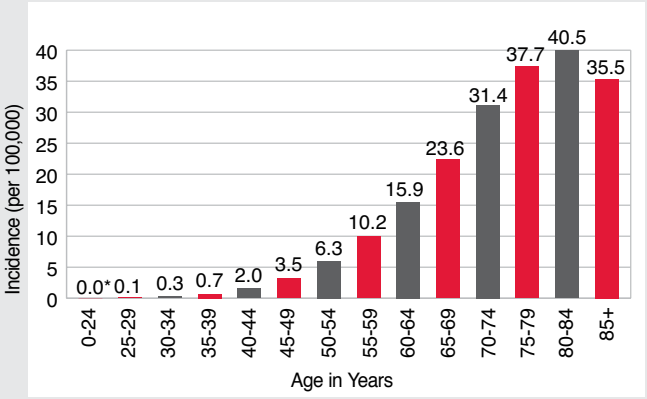

Figure 9. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011*. National Cancer Institute; 2014.

*<16 cases for each age and time interval, SEER 18 areas.

Signs and Symptoms

The first symptom of myeloma is often bone pain from the effects of myeloma cells 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 have no symptoms, or they may tire more easily and feel weak.

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 major roles.

Treatment

The goals of treatment for people with myeloma are to reduce symptoms, to slow disease progression and to provide prolonged remissions. 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 five-year relative survival in people with myeloma has improved significantly since the 1960s.

- Five-year relative survival has increased from 12 percent in 1960-1963 (for whites, only data available) to 46.7 percent from 2004 to 2010 (for all races and ethnicities).
- Five-year survival from 2004 to 2010 is highest for black females (49.2 percent) compared to 43.5 percent for black males, 48.6 percent for white males and 44.6 percent for white females.
- The three-year survival rate as of January 1, 2011, is 60 percent (for all races and ethnicities).

Deaths

Approximately 11,090 deaths from myeloma are anticipated in 2014.

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 2007 to 2011.

Race and Ethnicity. As reported in *Cancer Facts & Figures for African Americans 2013-2014*, the American Cancer Society estimated that approximately 3 percent of all cancer-related deaths among blacks are expected to be caused by myeloma.

- The mortality rate for myeloma from 2007 to 2011 for black males was nearly double the rate for white males (7.7 per 100,000 population vs 4.0 per 100,000 population).
- For black females, the mortality rate from myeloma was more than twice the rate for white females (5.3 per 100,000 population vs 2.5 per 100,000 population).
- The US median age at death from myeloma is 75 years. It is 71 years for blacks and 75 years for Hispanics.

Myelodysplastic Syndromes

Myelodysplastic syndromes (MDS) are 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 MDS, blasts often constitute more than 5 percent of the cells. (A person with acute myeloid leukemia [AML] has more than 20 percent blasts 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.

Living With Myelodysplastic Syndromes

The most common MDS subtype is refractory anemia with excess blasts (RAEB), 13.3 percent, followed by refractory anemia (RA), 9.7 percent.

- People diagnosed with MDS, not otherwise specified (MDS NOS) constitute 58.4 percent of all MDS cases.
- People diagnosed with therapy-related MDS constitute less than 2 percent of all reported cases.

New Cases

For the five-year period from 2007 to 2011 there were approximately 73,888 new cases of MDS throughout the US, averaging an estimated 14,778 cases per year.

Incidence

The overall incidence rate of MDS is 4.9 cases per 100,000 population (see Table 10).

Gender. In the US, for the five-year period from 2007 to 2011, approximately 41,291 MDS cases were diagnosed in males (averaging 8,258 per year) and approximately 32,597 MDS cases were diagnosed in females (averaging 6,519 per year). The overall incidence rates of MDS by gender are 6.7 per 100,000 in males and 3.8 per 100,000 in females.

Race and Ethnicity. White males have the highest incidence rates (6.9 per 100,000 population), while the lowest rates occur among American Indian and Alaska Native females (2.8 per 100,000 population) and Asian and Pacific Islander females (2.9 per 100,000 population).

Age. According to SEER data for 2007 to 2011, MDS is most commonly diagnosed in males ages 80 years and older.

Myelodysplastic Syndromes Incidence Rates, 2007-2011 (Rates per 100,000 population)

By Race	Rate
All Races	4.9
White	5.1
Black	4.1
Asian/Pacific Islander	3.9
American Indian/Alaska Native*	3.0
Hispanic**	3.6
By Age	**Rate**
Ages <40	0.2
Ages 40-49	0.8
Ages 50-59	2.5
Ages 60-69	9.9
Ages 70-79	30.3
Ages 80+	58.0

Table 10. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

*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

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

MDS may be a primary diagnosis, or the diagnosis may be secondary to treatment with chemotherapy and radiation therapy for certain other types of cancer. Most people with MDS have primary MDS, which usually has 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 exposure to benzene in the US 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.

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 (used alone or in combination) include transfusion; a watch-and-wait strategy; administration of blood cell growth factors; drug therapy with newer agents; or chemotherapy of the type used to treat AML.

Survival

The SEER program only recently began maintaining statistics for MDS. Prevalence and mortality statistics were not reported by SEER for MDS in 2014 at the time of this publication.

Deaths

Mortality rates were not reported by SEER for MDS in 2014 at the time of this publication.

Incidence Rates: Leukemia, Lymphoma, Myeloma and Myelodysplastic Syndromes

Tables 11, 12 and 13 show incidence rates for leukemia, HL, NHL, myeloma and MDS using data figures from 2007 to 2011 (the most recent available). Rates are per 100,000 population and are age-adjusted to the 2000 US Standard population.

Incidence Rates by Gender, All Races, per 100,000 Population, 2007-2011

Type	Total	Male	Female
Leukemia	13.0	16.7	10.2
Non-Hodgkin Lymphoma	19.7	23.9	16.3
Hodgkin Lymphoma	2.7	3.1	2.4
Myeloma	6.1	7.7	4.9
Myelodysplastic Syndromes	4.9	6.7	3.8

Table 11. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

Incidence Rates by Gender, for Blacks, per 100,000 Population, 2007-2011

Type	Total	Male	Female
Leukemia	10.0	12.9	8.0
Non-Hodgkin Lymphoma	14.3	17.4	11.9
Hodgkin Lymphoma	2.7	3.1	2.3
Myeloma	12.2	14.8	10.5
Myelodysplastic Syndromes	4.1	5.1	3.6

Table 12. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

Incidence Rates by Gender, for Whites, per 100,000 Population, 2007-2011

Type	Total	Male	Female
Leukemia	13.7	17.5	10.7
Non-Hodgkin Lymphoma	20.6	24.9	17.2
Hodgkin Lymphoma	2.9	3.3	2.6
Myeloma	5.6	7.2	4.3
Myelodysplastic Syndromes	5.1	6.9	3.8

Table 13. Source: *SEER (Surveillance, Epidemiology and End Results) Cancer Statistics Review, 1975-2011.* National Cancer Institute; 2014.

Estimated New Cases and Estimated Deaths by State

Estimated New Cases of Blood Cancers by Site, by State, 2014				
State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	690	990	400	130
Alaska	100	140	*	*
Arizona	950	1,320	400	160
Arkansas	480	660	230	100
California	5,650	7,770	2,530	970
Colorado	870	1,060	340	140
Connecticut	610	920	290	120
Delaware	150	220	80	*
Dist. of Columbia	60	100	50	*
Florida	3,810	5,050	1,710	590
Georgia	1,370	1,820	760	280
Hawaii	220	300	90	*
Idaho	290	360	110	*
Illinois	2,180	2,890	990	390
Indiana	1,060	1,480	480	200
Iowa	640	800	240	100
Kansas	490	650	200	80
Kentucky	790	1,070	340	120
Louisiana	720	960	360	130
Maine	310	380	120	50
Maryland	800	1,210	480	150
Massachusetts	1,140	1,600	470	250
Michigan	1,830	2,500	840	310
Minnesota	1,050	1,240	390	160
Mississippi	410	560	250	70
Missouri	1,040	1,430	470	180
Montana	200	260	80	*
Nebraska	330	440	140	50
Nevada	440	550	160	80
New Hampshire	250	350	100	*
New Jersey	1,560	2,250	760	330
New Mexico	370	400	150	60
New York	3,460	4,720	1,700	660
North Carolina	1,550	2,110	840	280
North Dakota	130	160	50	*
Ohio	1,890	2,860	890	360
Oklahoma	660	850	280	100
Oregon	640	960	290	140
Pennsylvania	2,420	3,420	1,090	450
Rhode Island	180	250	80	50
South Carolina	790	1,030	430	120
South Dakota	160	200	60	*
Tennessee	1,040	1,470	510	190
Texas	4,190	5,030	1,820	690
Utah	390	490	150	70
Vermont	110	160	50	*
Virginia	1,080	1,640	570	240
Washington	1,250	1,710	510	190
West Virginia	330	480	150	60
Wisconsin	1,150	1,410	470	180
Wyoming	90	120	*	*
United States	52,380	70,800	24,050	9,200

Table 14. Source: American Cancer Society, Inc. The sum of the state estimates may not equal the US total due to rounding. Numbers are rounded to the nearest 10.

*Fewer than 50 cases.

Estimated Deaths from Blood Cancers by Site, by State, 2014				
State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	410	310	220	*
Alaska	*	*	*	*
Arizona	500	390	230	*
Arkansas	270	200	110	*
California	2,510	2,000	1,150	160
Colorado	330	240	140	*
Connecticut	290	220	130	*
Delaware	70	60	*	*
Dist. of Columbia	*	*	*	*
Florida	1,760	1,430	750	90
Georgia	620	460	280	*
Hawaii	90	80	*	*
Idaho	130	90	60	*
Illinois	1,020	780	450	50
Indiana	550	440	240	*
Iowa	280	230	110	*
Kansas	260	200	120	*
Kentucky	370	300	160	*
Louisiana	330	260	170	*
Maine	130	100	50	*
Maryland	390	300	230	*
Massachusetts	510	400	240	*
Michigan	910	720	410	50
Minnesota	460	340	200	*
Mississippi	250	180	110	*
Missouri	540	390	250	*
Montana	90	70	*	*
Nebraska	140	130	70	*
Nevada	190	140	70	*
New Hampshire	100	80	60	*
New Jersey	630	510	300	50
New Mexico	140	110	60	*
New York	1,440	1,110	670	90
North Carolina	720	560	400	50
North Dakota	60	*	*	*
Ohio	990	810	470	60
Oklahoma	320	270	140	*
Oregon	320	280	150	*
Pennsylvania	1,200	1,010	510	70
Rhode Island	90	60	*	*
South Carolina	360	280	190	*
South Dakota	70	50	*	*
Tennessee	540	440	260	*
Texas	1,530	1,230	700	100
Utah	150	120	70	*
Vermont	50	*	*	*
Virginia	570	460	300	*
Washington	540	430	220	*
West Virginia	170	160	80	*
Wisconsin	550	400	240	*
Wyoming	70	*	*	*
United States	24,090	18,990	11,090	1,180

Table 15. Source: American Cancer Society, Inc. The sum of the state estimates may not equal the US total due to rounding. Numbers are rounded to the nearest 10.

*Fewer than 50 cases.

Five-Year Incidence and Mortality Cases by State, 2007-2011

Five-Year Blood Cancer Incidence Cases by State, 2007-2011

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	3,096	4,252	1,605	582
Alaska	337	511	143	77
Arizona	3,507	5,363	1,632	688
Arkansas	1,686	2,797	916	389
California	22,323	33,814	10,064	4,686
Colorado	3,295	4,515	1,318	699
Connecticut	2,782	4,225	1,270	617
Delaware	634	989	329	136
Dist. of Columbia	279	495	241	119
Florida	14,285	21,313	6,735	2,530
Georgia	5,258	8,027	3,144	1,233
Hawaii	874	1,361	384	137
Idaho	1,194	1,531	472	208
Illinois	8,519	13,085	4,044	1,857
Indiana	4,280	6,780	2,039	960
Iowa	2,633	3,968	1,092	469
Kansas	2,173	2,958	895	389
Kentucky	3,255	4,839	1,398	583
Louisiana	2,816	4,577	1,483	671
Maine	1,276	1,726	464	209
Maryland	3,496	5,336	1,896	836
Massachusetts	4,557	7,324	2,215	1,078
Michigan	7,326	11,298	3,531	1,483
Minnesota	4,431	6,460	1,674	846
Mississippi	1,722	2,691	1,128	365
Missouri	3,998	6,143	1,894	778
Montana	829	1,095	340	148
Nebraska	1,311	2,007	586	285
Nevada	1,757	2,236	573	313
New Hampshire	990	1,559	436	233
New Jersey	6,616	10,145	3,244	1,442
New Mexico	1,358	1,686	522	226
New York	15,558	22,979	7,950	3,272
North Carolina	6,174	9,290	3,473	1,271
North Dakota	596	788	215	101
Ohio	7,291	12,131	3,678	1,598
Oklahoma	2,722	3,767	1,109	484
Oregon	2,453	3,991	1,082	566
Pennsylvania	10,237	16,205	4,793	2,138
Rhode Island	772	1,215	336	197
South Carolina	2,817	4,062	1,634	590
South Dakota	584	866	274	110
Tennessee	4,208	6,440	2,039	834
Texas	14,788	20,663	7,102	3,004
Utah	1,463	2,125	619	349
Vermont	449	753	208	105
Virginia	4,248	7,147	2,358	1,029
Washington	4,844	7,282	1,989	967
West Virginia	1,564	2,272	647	269
Wisconsin	5,008	6,461	2,052	933
Wyoming	371	492	150	77
United States	209,040	314,035	99,415	43,166

Table 16. Source: *Cancer in North America: 2007-2011,Volume Two: Registry-specific Cancer Incidence in the United States and Canada.*

*Fewer than 50 cases.

Five-Year Blood Cancer Mortality Cases by State, 2007-2011

State	Leukemia	Non-Hodgkin Lymphoma	Myeloma	Hodgkin Lymphoma
Alabama	1,917	1,642	1,031	100
Alaska	156	144	64	^
Arizona	2,135	1,988	1,003	106
Arkansas	1,231	1,102	570	66
California	11,641	10,580	5,459	710
Colorado	1,480	1,271	686	79
Connecticut	1,409	1,249	604	78
Delaware	336	297	189	16
Dist. of Columbia	163	145	154	10
Florida	8,100	7,377	3,735	418
Georgia	2,768	2,318	1,481	153
Hawaii	423	444	197	17
Idaho	541	498	251	32
Illinois	4,810	4,269	2,250	220
Indiana	2,631	2,360	1,213	111
Iowa	1,324	1,280	617	65
Kansas	1,238	1,075	569	56
Kentucky	1,690	1,595	792	78
Louisiana	1,637	1,468	858	109
Maine	588	573	261	37
Maryland	1,886	1,670	1,102	92
Massachusetts	2,471	2,224	1,213	134
Michigan	4,072	3,841	2,037	218
Minnesota	2,238	1,987	979	107
Mississippi	1,147	903	543	53
Missouri	2,485	2,171	1,198	122
Montana	413	350	192	16
Nebraska	693	690	343	46
Nevada	795	682	338	53
New Hampshire	495	426	248	25
New Jersey	3,226	2,934	1,577	188
New Mexico	652	555	303	36
New York	7,022	6,423	3,353	437
North Carolina	3,307	2,870	1,863	183
North Dakota	306	226	143	^
Ohio	4,852	4,666	2,358	265
Oklahoma	1,511	1,383	711	80
Oregon	1,490	1,399	755	95
Pennsylvania	5,889	5,495	2,689	282
Rhode Island	447	364	183	26
South Carolina	1,586	1,407	925	91
South Dakota	359	309	160	11
Tennessee	2,496	2,267	1,272	136
Texas	7,261	6,339	3,419	425
Utah	657	575	337	27
Vermont	237	232	112	22
Virginia	2,620	2,420	1,497	153
Washington	2,432	2,217	1,098	114
West Virginia	906	839	413	49
Wisconsin	2,508	2,190	1,165	128
Wyoming	237	167	91	^
United States	112,914	101,896	54,601	6,091

Table 17. Source: *Surveillance, Epidemiology, and End Results* (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2011) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released July 2014. 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, 2007-2011

Five-Year Leukemia Incidence Cases By State, 2007-2011

State	Leukemia	Acute Lymphocytic Leukemia	Chronic Lymphocytic Leukemia	Acute Myeloid Leukemia	Chronic Myeloid Leukemia
Alabama	3,096	304	1,017	942	320
Alaska	337	47	104	107	49
Arizona	3,507	552	927	1,095	418
Arkansas	1,686	181	494	514	205
California	22,323	3,552	7,033	6,533	2,709
Colorado	3,295	401	1,143	823	401
Connecticut	2,782	280	1,049	761	353
Delaware	634	55	225	181	87
Dist. of Columbia	279	41	97	67	32
Florida	14,285	1,637	4,500	4,321	1,801
Georgia	5,258	692	1,490	1,690	679
Hawaii	874	112	228	308	123
Idaho	1,194	126	482	276	170
Illinois	8,519	988	2,612	2,763	1,140
Indiana	4,280	482	1,367	1,394	553
Iowa	2,633	239	1,088	688	350
Kansas	2,173	227	725	602	279
Kentucky	3,255	312	1,210	933	427
Louisiana	2,816	307	813	863	436
Maine	1,276	98	553	349	152
Maryland	3,496	380	1,017	1,094	392
Massachusetts	4,557	483	1,548	1,391	528
Michigan	7,326	736	2,579	2,194	920
Minnesota	4,431	397	1,821	1,080	609
Mississippi	1,722	195	472	570	215
Missouri	3,998	391	1,175	1,269	528
Montana	829	65	356	225	102
Nebraska	1,311	125	508	350	159
Nevada	1,757	238	628	475	148
New Hampshire	990	106	412	265	105
New Jersey	6,616	711	2,422	1,854	797
New Mexico	1,358	158	508	337	178
New York	15,558	1,482	6,287	4,199	1,834
North Carolina	6,174	695	2,100	1,830	828
North Dakota	596	45	286	147	52
Ohio	7,291	770	2,029	2,371	868
Oklahoma	2,722	275	867	715	319
Oregon	2,453	289	805	759	271
Pennsylvania	10,237	1,018	3,545	3,135	1,288
Rhode Island	772	68	269	223	100
South Carolina	2,817	309	916	845	366
South Dakota	584	53	242	165	62
Tennessee	4,208	467	1,466	1,295	451
Texas	14,788	2,295	4,448	3,810	2,004
Utah	1,463	221	537	399	165
Vermont	449	42	173	137	60
Virginia	4,248	552	1,260	1,361	462
Washington	4,844	525	1,979	1,248	586
West Virginia	1,564	134	560	469	225
Wisconsin	5,008	466	1,926	1,333	635
Wyoming	371	42	138	97	47
United States	209,040	24,366	70,436	60,852	25,988

Table 18. Source: Cancer in North America: 2007-2011,Volume Two: Registry-specific Cancer Incidence in the United States and Canada

Five-Year Leukemia Mortality Cases By State, 2007-2011

State	Leukemia	Acute Lymphocytic Leukemia	Chronic Lymphocytic Leukemia	Acute Myeloid Leukemia	Chronic Myeloid Leukemia
Alabama	1,917	97	359	671	78
Alaska	156	12	31	63	13
Arizona	2,135	166	389	792	98
Arkansas	1,231	55	207	418	48
California	11,641	1,108	2,131	4,934	568
Colorado	1,480	107	289	627	76
Connecticut	1,409	67	278	597	58
Delaware	336	23	58	129	17
Dist. of Columbia	163	14	37	55	11
Florida	8,100	511	1,509	3,263	367
Georgia	2,768	162	471	941	141
Hawaii	423	30	37	180	20
Idaho	541	31	118	202	34
Illinois	4,810	245	953	1,837	191
Indiana	2,631	140	542	1,068	113
Iowa	1,324	84	346	592	80
Kansas	1,238	53	258	489	65
Kentucky	1,690	99	362	628	92
Louisiana	1,637	88	266	530	84
Maine	588	27	107	245	29
Maryland	1,886	88	348	722	107
Massachusetts	2,471	126	518	1,011	97
Michigan	4,072	201	880	1,673	176
Minnesota	2,238	121	515	1,001	96
Mississippi	1,147	67	172	364	37
Missouri	2,485	138	532	1,012	113
Montana	413	23	94	171	17
Nebraska	693	41	156	299	20
Nevada	795	53	104	318	43
New Hampshire	495	32	133	177	16
New Jersey	3,226	182	632	1,230	117
New Mexico	652	57	127	250	32
New York	7,022	447	1,407	2,979	277
North Carolina	3,307	171	707	1,370	163
North Dakota	306	21	86	131	13
Ohio	4,852	237	1,041	2,053	214
Oklahoma	1,511	79	318	573	63
Oregon	1,490	92	341	640	76
Pennsylvania	5,889	333	1,277	2,285	235
Rhode Island	447	23	101	188	20
South Carolina	1,586	86	297	691	85
South Dakota	359	18	97	126	14
Tennessee	2,496	153	588	987	110
Texas	7,261	643	1,193	2,866	358
Utah	657	44	128	253	29
Vermont	237	12	55	107	11
Virginia	2,620	136	539	1,005	115
Washington	2,432	201	596	1,153	112
West Virginia	906	40	211	343	43
Wisconsin	2,508	136	520	1,071	91
Wyoming	237	13	56	84	14
United States	112,914	7,133	22,517	45,394	5,097

Table 19. Source: *Surveillance, Epidemiology, and End Results* (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2011) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released July 2014. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).

Notes and Definitions

Notes

The data within *Facts 2014-2015* reflect the most recent statistics from The National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) Program, *Cancer Statistics Review (CSR) 1975-2011*. 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, 2014, and updated in May and September 2014. The next SEER *Cancer Statistics Review* is expected to be published online in the spring of 2015.

Incidence and mortality rates measure exactly what occurred and cover the entire period through the most recent year reported, 2011. However, in order to calculate survival rates, the most current year of data are not considered, because not enough time has passed to be included.

The SEER Program's CSR presents statistics by age, sex, race and ethnicity. These distinctions, while definitely useful, should not be thought of as absolute. 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.

The US does not have a nationwide reporting system or registry for blood cancer, so the exact number of cancer cases is not known. The data presented in the report are either an extrapolation from or estimate of the number of cases reported by the 18 SEER regions (or, in some cases, fewer than 18 SEER regions) and mortality data from the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC). These numbers are extrapolated to the entire 18 SEER regions by dividing the number of cancer cases or deaths in a specific region by the US Bureau of the Census population data for that region. Mortality data reflected in the 2014 referenced SEER report reflect data updates from the NCHS from 1969 to 2011, made available in 2014.

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 and region-specific health risks.

Data on American Indians and Alaska Natives (AI/AN) should be interpreted with care because the data reflect statistics from Indian Health Service (IHS) Contract Health Service Delivery Area (CHSDA) counties only. Many AI/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 myelodysplastic syndromes (MDS) data were included in the SEER statistics as separate entities beginning in 2007.

State level incidence rates presented in *Facts 2014-2015* are provided by the North American Association of Central Cancer Registries (NAACCR). NAACCR presents the most current five-year incidence rate for the US and Canada in the annual publication, *Cancer In North America*.

The American Cancer Society (ACS) projected 2014's estimated cancer cases using a model based on incidence data from 49 states and the District of Columbia for the years 1995-2010 that met the North American Association of Central Cancer Registries' (NAACCR) 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. ACS projected the estimated number of US cancer deaths in the US was calculated by fitting the number of cancer deaths from 1995 to 2010 to a statistical model that forecasts the number of deaths expected to occur in 2014. 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.

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 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 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." We are using the "36-year limited duration" prevalence figures, based on the "first invasive tumor for each cancer site diagnosed during the previous 36 years (1975-2010)," as per SEER Table 1.22. The specified date is January 1, 2011, for the prevalence estimates. The prevalence counts in this year's *Facts* publication 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.)

Observed-to-expected ratio (O/E) is the observed number of cancers in a population of cancer survivors divided by the number of cancers expected. The number of cancers expected is calculated using cancer rates from the general population and person-years-at-risk (see below) of the survivor population under study. The risk of developing subsequent cancers varies by the type of first cancer diagnosed, age at first diagnosis, environmental exposures, genetic factors, treatment and other factors.

Person-years-at-risk (PYAR) is counted from the date two months after the diagnosis of the first cancer (to exclude multiple primaries diagnosed at the same time) until the date of last known vital status or death, and allocated by age, sex, race and calendar year. All second and later (third, fourth, etc.) cancer diagnoses are included.

Estimated absolute risk (EAR) is calculated by subtracting the expected number of cancer cases from the observed number, dividing by the PYAR and multiplying by 10,000. The EAR represents the number of excess cancers per 10,000 PYAR (for example, a population of 10,000 cancer survivors followed for one year or 1,000 cancer survivors followed for 10 years).

About The Leukemia & Lymphoma Society

The Leukemia & Lymphoma Society (LLS) exists to find cures and ensure access to the most appropriate treatments for blood cancer patients. We are saving lives not someday, but today.

LLS funds research to advance more breakthrough therapies for blood cancer patients.

LLS is the voice for all blood cancer patients, and is working to ensure access to treatments for all blood cancer patients.

Despite progress, more than a third of blood cancer patients still do not survive five years after their diagnosis.

Research

Over the past 65 years, LLS has invested more than $1 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** supports 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* supports outstanding investigations likely to translate basic biomedical discoveries into safe and effective treatments. Awards are for an initial three-year period.
- *The Marshall A. Lichtman 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* provides support for medicinal chemistry and/or drug target screening in blood cancers.
- *Quest For Cures* funds research to identify and develop safer, more effective treatment paradigms for patients who have blood cancers.

LLS creates partnerships with universities, 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, biotechnology and pharmaceutical companies, TAP is increasing the likelihood that breakthrough treatments will be available to patients sooner.

Our ***Targets, Leads & Candidates Program™*** is an approach to venture philanthropy, involving partnerships with pharmaceutical and biotechnology companies. This program provides a framework for using company support to identify and fund priority blood cancer research in areas of significant unmet medical need.

Our ***Transforming CURES Initiative (TCI)–Intercepting Progression to Advanced Myeloid Blood Cancers***–is a program designed to advance the scientific and medical understanding of myeloid disease, and, ultimately, stop progression of certain types of blood cancers from early-stage malignancies to much more lethal states of disease.

LLS has foundation partnerships with

- The MPN Research Foundation, to fund innovative grants to better understand and treat the range of myeloproliferative neoplasms (MPNs).
- 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.

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

Patient Access, Advocacy and Policy

LLS recognizes that finding cures is not enough; we need to ensure that patients have access to the treatments they need to live longer, better, healthier lives. The LLS Access Team is dedicated to removing barriers to care through advocacy, public policy, as well as providing direct support, education, and information for patients and healthcare professionals. By providing our network of advocates a powerful voice, the Access Team drives policies that accelerate the development and approval of innovative treatments and ensure that patients have sustainable access to quality, affordable coordinated care. LLS is also the leading source of free blood cancer information, education and support, touching patients in their communities through our chapters across the US and Canada.

- **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 legislative and regulatory affairs experts and patient access professionals. We collaborate with our passionate and extensive Advocates Network of volunteers—many individuals whose lives have been touched by a blood cancer. Currently, we are working at federal, state and community levels to ensure that patients have affordable health insurance coverage and to remove barriers to access. To join the LLS Advocates Network, visit www.LLS.org/advocacy.

  LLS reaches out to communities across the country. We provide patients and families with support, resources, referrals and education programs to help all patients and survivors access the best treatment and follow-up care possible.

- **Assistance with financial burdens.** People with certain blood cancers who find it difficult or impossible to afford drug co-pays or health insurance premiums may be eligible for assistance from LLS. Our *Co-Pay Assistance Program* has provided more than $200 million to date to patients to help pay for co-pays and health insurance premiums. Eligibility for this program is based on fund availability for specific blood cancer diagnoses. A current list of funds by blood cancer diagnosis is available at www.LLS.org/copay or at (877) 557-2672.

- **Accurate, up-to-date information.** Our Information Specialists are master's level oncology professionals who provide a global connection for patients, families and healthcare professionals. The staff members offer guidance for coping with a blood cancer diagnosis and provide current disease information. Information Specialists also assist with customized clinical-trial searches and help patients and caregivers discuss the potential benefits of all their therapy options. Information Specialists can be contacted at (800) 955-4572, Monday through Friday, 9 a.m. to 9 p.m. ET or by visiting www.LLS.org/informationspecialists.

- **National Education Programs.** LLS provides free telephone and web education programs, where medical experts share the latest disease, treatment and research updates. We also offer free continuing education programs for nurses, social workers, and physicians. Visit www.LLS.org/programs and www.LLS.org/professionaled.

- **Connection with other blood cancer survivors.** LLS creates many opportunities for peer-to-peer support through online patient and caregiver forums, blogs, and facilitated chats. The *Patti Robinson Kaufmann First Connection Program* gives patients and family members the opportunity to share experiences with someone who has "been through it," and obtain valuable information about the community resources available to support them.

- **Free education materials.** Disease, treatment and support publications in English and Spanish are available through our Information Resource Center, LLS chapters and can be downloaded at www.LLS.org/publications.

Visit www.LLS.org for access to up-to-date disease, treatment and support information and mobile-web tools.

Notes

Citations and Acknowledgements

Citations

Cancer Facts & Figures 2014. Atlanta, GA: American Cancer Society; 2014.

Cancer Facts & Figures for African Americans 2013-2014. Atlanta, GA: American Cancer Society; 2013.

Howlader N, Noone AM, Krapcho M, Garshell J, Miller D, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). *SEER Cancer Statistics Review*, 1975-2011, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2011/, based on November 2013 SEER data submission, posted to the SEER Web site, April 2014.

Porter DL, Levine BL, Kalos M, Bagg A, June CH. Chimeric antigen receptor–modified T cells in chronic lymphoid leukemia. *New England Journal of Medicine.* 2011;365(8):725-733.

Surveillance, Epidemiology and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: NAACCR Incidence - CiNA+ in SEER*Stat 2007-2011, All Races, North American Association of Central Cancer Registries.

Toxicological profile for benzene. www.atsdr.cdc.gov/toxprofiles/tp3.pdf. Accessed September 30, 2014.

Velardi A. Haplo-BMT: which approach? *Blood.* 2013;121(5):719-720.

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

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LEUKEMIA & LYMPHOMA SOCIETY®
fighting blood cancers

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www.LLS.org

Our Mission:
Cure leukemia, lymphoma, Hodgkin's disease and myeloma, and improve the quality of life of patients and their families.

LLS is a nonprofit organization that relies on the generosity of individual, foundation and corporate contributions to advance its mission.

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