

Leukemia – 20-Year Comparative Survival and Mortality Analysis by Age, Sex, Race, Cohort Entry Time-Period, Disease Duration, Major Subtypes and Other Histologic Categories: A Systematic Review of 142,713 Cases for Diagnosis Years 1975-2022

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Leukemia is a broad term for a heterogenous group of hematologic malignancies that arise from the abnormal proliferation of leukocytes. It occurs most often in adults older than 55, but also is the most common cancer in children younger than 15, and accounts for more than 25% of cancer deaths in this age group. In this United States long term retrospective population-based analysis of 143,713 microscopically confirmed leukemia cases, mortality and survival study, 1975-2022, data is derived from the NCI Surveillance, Epidemiology and End-Results Programs, SEER*Stat software versions 8.4.5 and SEER*Stat 9.0.40.0, and, SEER Registry – Incidence - SEER Research Data, 8 Registries, Nov 2024 Sub (1975-2022). This comparative cohort entry time-period analysis is intended to provide age-adjusted epidemiologic, demographic, short and long-term survival and mortality data for convenient reference by all physicians, scientists, insurance underwriters, and others interested in cancer mortality follow-up.

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Key words: Leukemia, non-cutaneous malignancy, Disease classification, anatomic location, nodal and extra nodal subdivision, age and sex stratification, incidence and prevalence trends, short and long-term survival and mortality, SEER Cancer Registry, NCI Surveillance Epidemiology & End Results Program.

Received: August 17, 2025

Accepted: August 20, 2025

Prologue, Background and Importance.—The history of leukemia¹⁻³ is a remarkable story of scientific discovery and medical advancement. The early history of leukemia reaches back 200 years to Peter Cullen in 1811 who described a case of ‘*splenitis acutus*’ with unexplainable milky blood. In 1845, Rudolph Virchow, a German medical student, noted a reversal of white and red blood cell balance in the bloodstream, and he introduced the name of the disease as ‘*leukamia*’ in 1847. However, it was Henry Fuller in 1846 who performed the first microscopic diagnosis of a leukemia patient during life. Paul Erlich’s work went on to influence the classification of leukemia and helped classify the disease into acute and chronic forms. These distinctions laid the foundation for the

modern understanding of the natural history, diagnosis & treatment of leukemia, divided into four major (cellular) subtypes:

1. Acute lymphoid (lymphocytic) leukemia (ALL), also known as acute lymphoblastic leukemia,
2. Acute myeloid (myelocytic) leukemia (AML), also known as acute myeloblastic leukemia,
3. Chronic lymphoid (lymphocytic) leukemia (CLL),
4. Chronic myeloid (myelocytic) leukemia (CML), also known as chronic myelogenous leukemia.

In the modern era, Yang and associates⁴ using National Cancer Institute Surveillance,

Epidemiology, and End Results (SEER) database, studied secular trends in the incidence and survival of all leukemia types in the United States from 1975 to 2017 and found that the overall incidence of leukemia steadily increased from 12.39/100 000 in 1975 to 14.65/100 000 in 2011, and then began to decline in recent years (13.73/100 000 in 2017), with average annual percent changes (APC) of 0.350 ($P < 0.001$). The 5-year relative survival rate of leukemia patients significantly improved from 33.2% prior to 1975 to 66.1% in 2012 (APC = 1.980, $P < 0.001$).

The current importance and nature of the leukemia threat in the United States is highlighted in seer.cancer.gov/statistics-network/explorer/.⁵

- Estimated new cases in 2025: 66,890
- % of all new cases: 3.3%
- Estimated deaths in 2025: 23,540
- % of all cancer deaths: 3.8%
- 5-Year Relative Survival, 2015-2021: 67.8%
- Age-adjusted incidence rates, M&F, 2018-2022: 14.4/100,000/year
- Age-adjusted death rates, M&F, 2019-2023: 5.8/100,000/year
- Prevalence in 2023 – leukemia patients in the US: 536,245 alive patients
- M&F lifetime risk of development, 2018-21 data: 3.5%

This study is a long-term retrospective 20-year population-based analysis of 142,713 leukemia patients in the United States comparing survival and mortality by age, sex, race, cohort entry time-period (1975-1999 and 2000-2022), disease duration, major subtypes and selected variant categories (Hairy cell and B cell) using SEER 8 patient registry (Ref 8) and SEER*Stat software program.^{6,7}

Objectives.—Analyze and determine the burden of leukemia – short- and long-term mortality (MR & EDR) and survival (SR), mean observed and expected mortality rates (q and q') with corresponding excess deaths (MR & EDR) and cumulative relative survival-SR – in two cohort entry time-periods 1975-99 & 2000-22 on 142,713 patients drawing upon the National Cancer Institute (NCI)

SEER (Surveillance, Epidemiology, End Results) research data, 8 registries, 1975-2022⁸ for convenient reference by all physicians, scientists, insurance underwriters, and others interested in cancer mortality follow-up.

Methods.—The National Cancer Institute SEER program, with its government-issued, deidentified, public-use database since 1973 remains an excellent resource because its cancer information has remained consistent over time and does not require institutional review board approval based on guidelines from the National Human Research Protections Advisory Committee.

General methods of life table methodology and display of standard life tables are described in previous articles in this series published in the *Journal of Insurance Medicine*. Only microscopically confirmed cases were included. Excluded were all death certificate only and those alive with no survival time. For mortality analysis by age, sex, race/ethnicity, stage, grade, disease-duration, and investigative time-period, period analysis⁹ which provides more up-to-date estimates of long-term survival rates than do conventional methods, and observed mean annual mortality rates q^{10} with corresponding excess mortality and survival indices used to compare the short-and-long-term impact of each risk variable on prognostic outcomes (mean aggregate annual outcomes) as displayed in the 0-1, 1-2, 2-5, 0-5, 5-10, 15, and 15-20 interval-years of disease-duration and clinical follow-up in both analytic time-periods, 1975-1999 and 2000-2022. Observed & derived mean annual mortality & survival indices are presented using pertinent period United States Life Tables as the basis of expected survival. Observed mortality rates (q) are weighted by the frequency of occurrence of death (d) in a defined population during a specified interval and observed mean mortality rate (q) is emphasized as the preferred and most important comparative measure of progress and prognosis in leukemia because of the mathematical relationship of the ratio of observed deaths to risk exposure (E) in person-years ($q = d/E$), irrespective of disease-duration. The quotient of the d/E ratio is definitively understood by its characterization as the

observed mortality rate q , and is typically expressed in decimal units of deaths per 1,000 individuals per year. As the quotient of the d/E ratio increases, the mortality rate q increases. Moreover, mortality rates are a better indicator of progress against cancer than incidence or survival because they are less affected by biases from changes in detection practice (see Welch, Ref. 8). Relative frequencies were tested from the 8 SEER registries and from the age-specific distributions.

Standard Medical-Actuarial Life Table Display: The basic feature of a population life table is the annual mortality rate (q). The methodology outlined by Robert J. Pokorski, MD (*J Ins Med* 1988)¹¹ is used to display cumulative exposures to the risk (E), observed & expected deaths (d & d'), quantify observed & expected mortality rates (q & q'), excess mortality (MR & EDR), and, cumulative observed, expected and relative survival (P , P' , SR) indices. These are displayed in truncated spreadsheet life tables within 5 or more disease-duration intervals of aggregate average annual groupings of data to 20 years. In this study, the traditional medical-actuarial risk assessment nomenclature for cumulative relative survival-SR ($100P/P'$) continues to be utilized to indicate short-and long-term patient survival. Disease free survival-DFS terminology, clinically useful as an outcome predictor for the cancer of interest¹² is not used here in the construction of medical-actuarial life tables. Further discussion of life table methodology and source articles are also given in Chapter 2 of the *Medical Risks: Patterns of Mortality and Survival* monographs of Richard B. Singer, MD,¹³ Lew & Gajewski Chapter 1 in *Medical Risks; Trends in Mortality by Age and Time Elapsed*,¹⁴ in addition to the text of Doctors Brackenridge, Croxson and MacKenzie – *Medical Selection of Life Risks*.¹⁵ Basis of expected survival: US Annual Life Tables 1970 through 2022; by age, sex, and race.

Statistical significance: Standard errors are shown for survival rates in the SEER survival tables. Actuarial method: Ederer II method is used for cumulative expected survival.

Ederer II method calculates the expected survival rates for patients under observation at each point of follow-up, so the matched individuals are at risk until the corresponding cancer patient dies or is censored.¹⁶ Confidence interval: Log (-Log ()) Transformation; the level is 95%. Poisson confidence intervals at the 95% level based on the number of observed deaths are used in this study but not displayed here in order to conserve space on the mortality tables.

Follow-up: Standard procedures were used at the SEER registries. According to the CDC-Journal of Registry Management – National Program of Cancer Registries, annual loss to follow-up (LTFU) was small, representing 4.2% of all patients and 7.6% of alive patients. There was the usual annual decrement due to cases coming to the end of follow-up.

Results.—Leukemia age-adjusted frequency distributions and mean age determinations by race and sex, incidence & prevalence epidemiologic data are presented. Short and long-term mortality and survival indices are displayed and discussed in 10 standard life tables.

Incidence and Trends: Since 1975, the incidence of leukemia has increased slightly. In 1975, the incidence rate was 12.7 per 100,000 population, and in 2020, it was 13.9 per 100,000 population. Rates are per 100,000 and are age-adjusted to the 2000 US Std Population (20 age groups - Census P25-1130) (See Chart A).

SEER Incidence Rates by Sex and Type: In 2016-2020, 58.4% of the new cases of leukemia occurred in males. Incidence rates for all types of leukemia are higher among males than among females:

- ALL – 2.1 per 100,000 for males, 1.6 per 100,000 for females
- AML – 5.0 per 100,000 for males, 3.4 per 100,000 for females
- CLL – 6.3 per 100,000 for males, 3.3 per 100,000 for females
- CML – 2.5 per 100,000 for males, 1.5 per 100,000 for females

SEER Long-Term Trends in SEER Age-Adjusted Incidence Rates, 1975-2022: By Sex, Delay-adjusted SEER Incidence Rate, All Races/Ethnicities, Ages <15 (See Chart B).

SEER Prevalence: People Alive with Leukemia (US Prevalence) on January 1, 2022: By Sex, All Races/Ethnicities, All Ages, ≤ 30 Years Since Diagnosis.¹⁷

- Female: 214,434 Percent U.S. cohort population: 0.1
- Male: 288,595 Percent US cohort population: 0.2

SEER Case Statistics: According to site and morphology, site recode ICD-O-3/WHO 2008 defines leukemia cases selected for SEER registry research data. Cases were excluded if there was no FU (diagnosis by autopsy or death certificate) or if there was a second primary cancer. There was a total of 142,713 leukemia cases in the SEER 8 Data Registry (Incidence - SEER Research Data, 8 Registries, Nov 2024 Sub – 1975-2022) using SEER*Stat 8.4.5 and 9.0.40.0 statistical software *frequency* database. These cases were divided as follows, first according to quinquennial age groups to 0-90+ years. Then, mean ages-x were calculated by sex and race for total leukemia and by type of leukemia. There were 108,252 cases accessible in the SEER*Stat *survival* database (75.9% of the total of 142,713) available for medical-actuarial mortality and survival analysis useful for the construction of life Tables 1-10 displayed in this analysis (See Chart C).

Cancer Case Characteristics: Frequency distributions and mean ages by age, sex, race, major subtypes and other histologic types, and number of entrants available for mortality & survival analysis are displayed in Chart A above. The total number of leukemia patients, male and female combined, was 142,713 cases. Male cases of leukemia outnumbered females, 57.8% to 42.2%. The proportion of young patients under age 25 showed striking differences among the four principal types of leukemia. For purposes of comparison, age-adjusted diagnostic frequency distributions by type, sex and race, 1975-2022, are displayed in Figures 1-6.

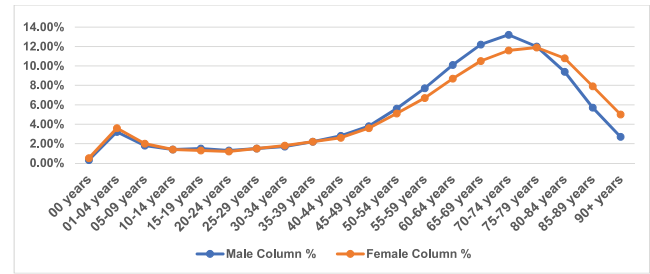


Figure 1. Leukemia frequency age & sex, 1975-2022.

As seen in Figures 1 & 2, leukemia frequency at diagnosis shows a bimodal distribution:

- Children (all races and both sexes), ages 00-19 years, leukemia diagnostic frequency zenith – 01-04 years (4809 cases-3.4%):
 - Male child mean age: ≈3.2 years
 - Female child mean age: ≈3.6 years
- Adults, ages 20-90+ years:
 - Male diagnostic frequency zenith – 70-74 years (10,981 cases-70.2%); Male mean age: 58.8 years
 - Female diagnostic frequency zenith – 75-79 years (7188 cases-76.3%); Female mean age: 57.7 years

Almost 70% of cases (10,674) of acute lymphoid leukemia were less than age 35 (Figure 2), but only 0.3% (145 cases) of the chronic form (Figure 3).

As shown in Table A, the mean age was also under 25 for acute lymphoid leukemia, but in the range of 60 to 70 years for the other principal types, a much more typical range for cancer sites in general. Age distributions in the mortality tables are accordingly varied, and sexes are

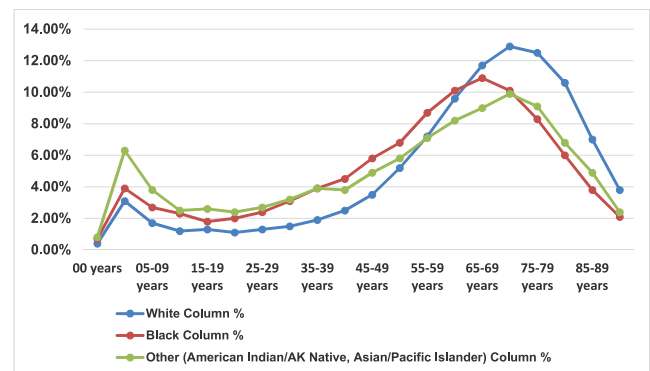


Figure 2. Leukemia frequency age & race, 1975-2022.

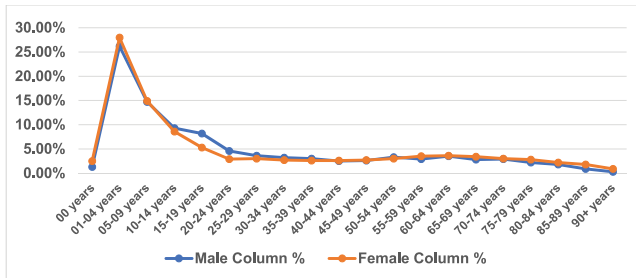


Figure 3. Acute lymphoid leukemia frequency age & sex, 1975-2022.

sometimes combined in the age groups. As in other sites, cases are excluded with no follow-up (diagnosed by death certificate or autopsy). In 10,674 acute lymphoid leukemia patients, almost 70% of the total of 15,302 cases, both sexes combined, occurred at ages younger than 35 years, with the apex of diagnostic occurrence at quinquennial ages 01-04 (28%).

RESULTS

Results are shown in Table 1 for the 1975-1999 cohort, male and female combined, for age groups 0-14, 15-34, 35-64, 65 up, but separately for all ages combined. Acute lymphoblastic leukemia (ALL) is the most common leukemia in the pediatric population (see Figures 1-3). Mortality ratios are extremely high in the youngest age groups because of the low expected rates, q' in children and young adults. In terms of EDR, excess mortality increased sharply with advancing age and tended to decrease with duration, although the maximum EDR occurred mostly in the first year at ages under 65. For example, average

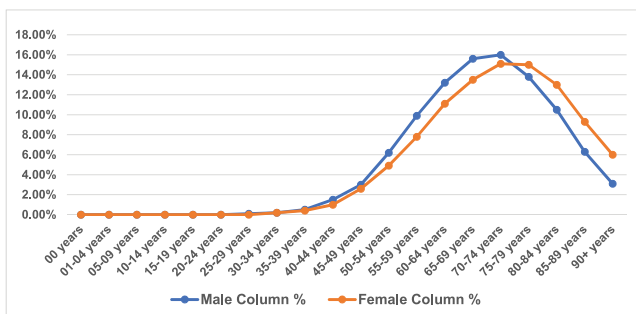


Figure 4. Chronic lymphoid leukemia frequency age & sex, 1975-2022.

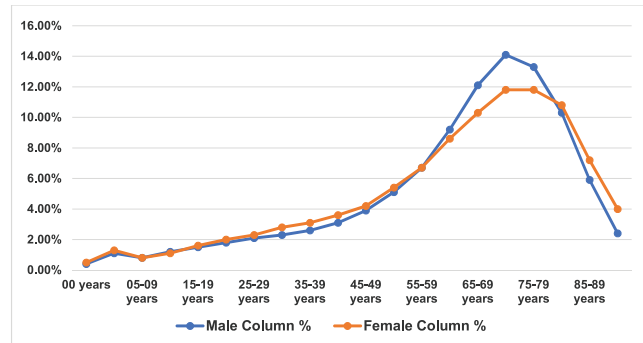


Figure 5. Acute myeloid leukemia frequency age & sex, 1975-2022.

EDR at duration 0-5 years rose from 26 per 1000 per year in children to 609 in adults age 65 up. When all ages were combined EDR was only slightly lower in females than in males. The prognosis improved with duration in children: EDR had fallen to 0.8 per 1000 at 15-20 years, an excess that was still significant at the 95% confidence level, despite its basis on only 8 deaths. This EDR at 15-20 years was associated with an MR of 187% in these young people who had reached an attained age of 15 to 20 years. There were 2,568 10-year survivors among the children, but this number dwindled progressively to only 26 survivors in the oldest age group, 65 and up, at 10 years. The 10-year survival ratio, SR, decreased from 85.2% in patients age 0-14 to 5.2% in those age 65 up.

Table 2 provides results up to 10 years duration for the 2000-2022 cohort by race as well as age and sex. Although still high, EDR values were substantially reduced below those for the corresponding age group in 1975-1999 except

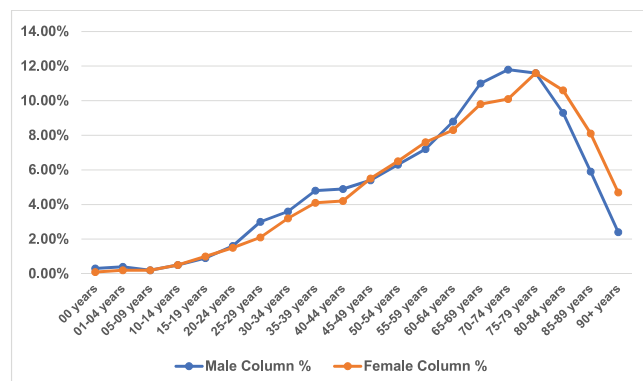


Figure 6. Chronic myeloid leukemia frequency age & sex, 1975-2002.

in patients age 65 up. Trend patterns of excess mortality by sex, age and duration were similar in the two cohorts. Excess mortality was about the same in non-whites as in whites. Children, ages 00-14 years, enjoy exceptionally favorable acute lymphoid leukemia relative survival with 97% SR in the 1st 0-1 durational interval to 90% at 20-years (see Figure 7).

Adults in the latest cohort (2000-22), M&F combined, ages 65 up, exhibit much diminished relative survival; 44% in the 1st disease duration (0-1 years) to 16% at 20 years; see Figure 8 below.

Results for this larger group, in the 1975-99 cohort, with a much higher mean age (66.2 years, both sexes combined), are shown in Table 3 with most cases occurring between the ages of 60-70. Excess mortality was lower than in the acute form, although trends by age, sex and duration were similar. Only two age groups are shown in Table 3, under 65 and 65 up. The average EDR of 40 for men under 65 at duration 0-5 years is best compared with the EDR of 345 in males and females in Table 1, because as seen in Figure 3, there were virtually no patients with the chronic form under age 35 (58 cases, 0.3% - male & female combined). The EDR of 79 in Table 3 for males age 65 up at duration 0-5 years and the corresponding 66 for older females are both much lower than the EDR of 609 in Table 1 for the matching age/duration cell, males and females combined. MR values are also much lower in Table 3 than in Table 1 – all under 500%, reflecting the absence of young patients in the chronic form of lymphoid leukemia.

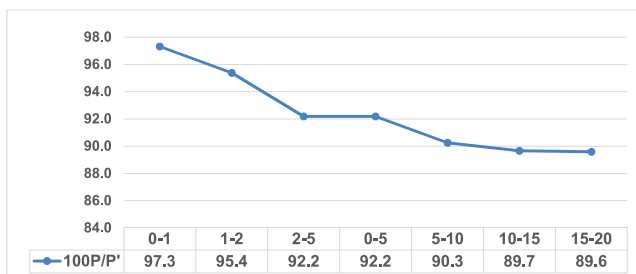


Figure 7. ALL, % relative survival (SR) M&F, children-ages 00-14, 2000-2022.

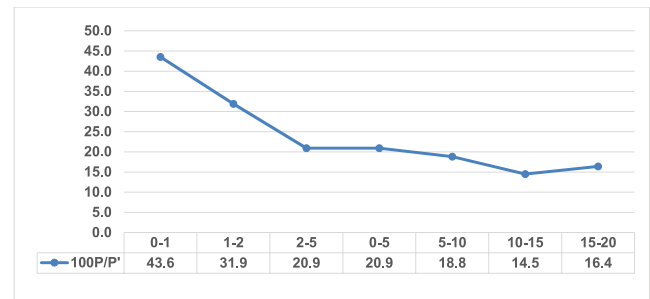


Figure 8. ALL, % relative survival (SR) M&F, adults ages 65 up, 2000-2022.

Excess mortality was only slightly lower in the 2000-2022 cohort (Table 4). When matching sex/age/duration cells are compared, EDR values are lower in the 2000-2022 cohort. Trends by age, duration and sex were similar in the two cohorts. Ten-year SR values in the 2000-2022 cohort were in the range of 76.2% to 81.5% for males and females, all ages combined. Contrary to the results for the acute form of lymphoid leukemia, excess mortality was slightly higher in non-whites than in whites, in Table 4. Chronic lymphoid leukemia percent relative survival in the age 65 up age group, M&F combined, shows an indolent course from 95% in the 1st durational interval (0-1 years) to 54% in the 20-year disease duration interval as seen in Figure 9.

Age distribution permits division into three age groups for the acute form of myeloid leukemia in the 1975-1999 cohort (Table 5), when males and females are combined. AML is the most common and aggressive leukemia in

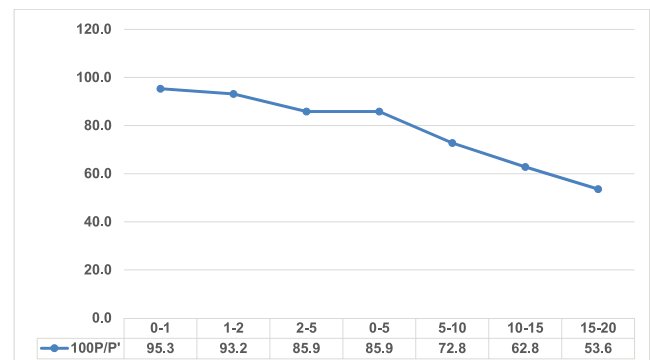


Figure 9. CLL, % relative survival (SR) M&F, ages 65 up, 2000-2022.

adults. Excess mortality is again extremely high, as it was in acute lymphoid leukemia. At duration 0-5 years, the average EDR increased from 256 per 1000 in patients under age 45 to 693 per 1000 in those age 65 up, as MR decreased from 18,371% to 1327%. The corresponding 5-year survival ratios decreased from 31.0% to only 3.1%, so there were few survivors even at 5 years; ages 65 up, 5997 of 6151 deceased (97.5%) at duration 0-5 years with advancing age. When all ages were combined, EDR values were somewhat lower in females than in males. Excess mortality did appear to decrease to relatively low levels in the few 10-year male & female survivors.

In the 2000-22 cohort (Table 6) EDR values were not as high as they were in 1975-99 in matching age/sex/duration cells. For males of all ages at duration 0-5 years EDR was 307 in 2000-22, versus 488 in 1975-99; in females the corresponding EDR values were 278 and 449, respectively. Age, sex and duration trends were similar to those in the 1975-99 cohort. Excess mortality was about the same in non-whites as in whites in Table 6. Acute myeloid leukemia SR is dismal at ages 65 up, M&F combined in the 2000-2022 cohort with relative survival falling from 29% in the 1st durational interval to 6% at 20-years and represents quite minimal improvement from 16% to 1% survival in the 1975-99 cohort (see Figure 10).

The chronic form of myeloid leukemia occurs mostly in patients in the older age groups (see Figure 6) and are greatly outnumbered by those in the acute form. Table 7

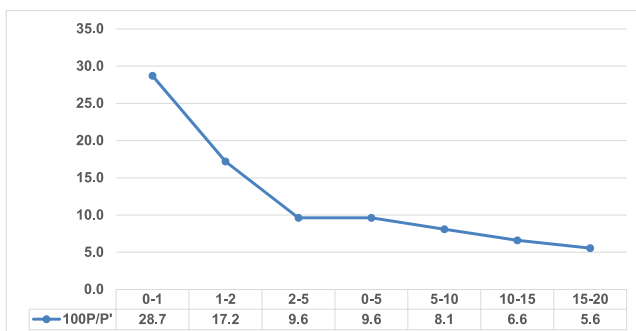


Figure 10. AML, % relative survival (SR) M&F, ages 65 up, 2000-2022.

displays mortality in the 1975-99 cohort of patients with chronic myeloid leukemia. Excess mortality was lower than it was in the acute form (Table 5), but not so low as it was in chronic lymphoid leukemia (Table 3). EDR again increases while MR decreases in the older age group. The highest EDR occurs in the second year of observation in males and female patients under age 65 (191 and 189, respectively), but the first year in the older patients (394 and 379, respectively). After its maximum, EDR decreases with duration, but high levels appear to persist after 10 years. There is no consistent difference in EDR between males and females. SR values at 10 years are about the same in both sexes, 16.2% for males and 15.8% for females.

From the results in Table 8, it appears that there has been some decrease in excess mortality from the 1975-1999 to the 2000-2022 cohort, when age/sex/duration cells are matched, but the differences are often relatively small. There is very little difference by race in overall excess mortality in the total 1975-2022 cohort. Nevertheless, CML percent relative survival in the age 65 up age group, M&F combined, shows a much more precipitous decline from 75% to 21% in 20 years disease duration than in chronic lymphoid leukemia for the same cohort entry time-period (2000-2022) as seen in Figure 11.

Results for other histological types of leukemia are summarized in Table 9, for all ages combined in each type. Excess mortality was very high in most of these types. At duration 0-5 years, the EDR averaged 398 per 1000 in monocytic leukemia, 438 in

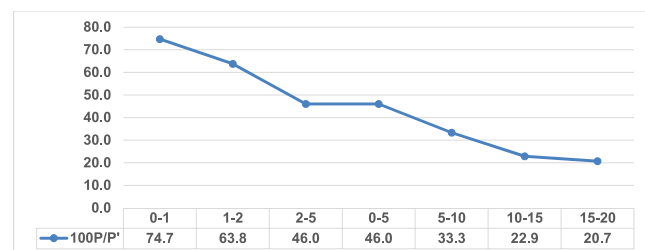


Figure 11. CML, % relative survival (SR) M&F, ages 65 up, 2000-2022.

leukemia NOS (not otherwise specified), precursor B-T cell lymphoblastic 99, and 483 in 2692 cases of other acute leukemias. Mortality was also very high in the rare aleukemic leukemia, with 1773 of 2581 cases (69%) terminating in death after 20 years and SR 27%. The sole histological form with the best prognosis was hairy cell leukemia: at duration 0-5 years EDR averaged 21 per 1000 and MR was only 111% at 10-20 years, with an EDR of 3.1. There were enough cases in the other large group, other leukemias (5,765 patients) to demonstrate modest excess mortality at duration 15-20 years: MR of 106%, EDR 2.0 per 1000 and SR 22.3% based on 148 deaths in 1,050 patient-years of exposure years: MR of 157%, based on 41 deaths in 1004 patient-years of exposure (Poisson 95% confidence interval).

Overall, leukemia subtype excess mortality-EDR declined and relative survival-SR improved with the passage of time. The lower three rows of Chart B below are not displayed in Table 10 to conserve space. However, acute myeloid leukemia (AML) and chronic myeloid leukemia (CML), male & female age groups, ages 65 up, display the most aggressive and threatening excess death rates (EDR) and lowest relative survival (SR) percentages of all major subgroups (See Chart D).

Summary: Leukemia Mortality & Survival Analytic Outcomes

Impact of Age, Sex, Race, Major Subtype

- Observed mortality rates q increase, but mortality ratios MR, excess death rates EDR, observed cumulative survival rate P and cumulative survival ratio- $100P/P'$ (% relative survival-SR) diminish with advancing age by race, sex and subtype.
- Mortality generally shows very high EDR and MR values up to 10 years, and lower but often significant excess mortality to 20 years.

Impact of Cohort Entry Time-Period

- Mortality including mortality rates q , MR and EDR diminish; observed cumulative survival rates P and interval percentages of relative survival SR improve with the succession of time from 1995-99 to 2000-22.
- With advances in chemotherapy, 10-year relative survival nearly doubled from 33% in the earlier 1975-99 cohort to 60% in the 2000-22 leukemia (all subtypes combined) cohort.

Disease Duration

- Overall, and by type, age, sex and race, with advancing leukemic disease durational intervals-of-persistence from 0-1 to 10-20 years, both excess mortality and relative survival simultaneously diminish.

COMMENTS AND CONCLUSION

Leukemia mortality, survival, and epidemiological material for this study have been drawn from:

- Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER Research Data, 8 Registries, Nov 2024 Sub (1975-2022)
- Surveillance Research Program, National Cancer Institute SEER*Stat software (www.seer.cancer.gov/seerstat) version 8.4.5.
- Surveillance Research Program, National Cancer Institute SEER*Stat software (www.seer.cancer.gov/seerstat) version 9.0.40.0.
- American Cancer Society. Cancer Facts & Figures 2025. Atlanta: American Cancer Society; 2025.
- "PDQ" – Adult Cancer Treatment Summaries-NCI; documents for the physician, on the treatment of leukemias.
- SEER*Explorer: An interactive website for SEER cancer statistics [Internet]. Surveillance Research Program, National Cancer Institute; 2025 Apr 16. [cited 2025 Jun 30]. Available

from: <https://seer.cancer.gov/statistics-network/explorer/>.

- Other references cited below (19-22).

Leukemia is a complex heterogeneous group of hematologic malignancies that arise from the abnormal proliferation of leukocytes. There are many distinctive features for the leukemias as a collective cancer site. At diagnosis, they are already disseminated throughout the body. As a result, they are comparable only to the metastatic stage of most other cancers (except the lymphomas and multiple myeloma). They are regarded as “unstaged” although attempts have been made to stage some types. Nomenclature, classification, diagnosis and clinical course are exceedingly complex and varied. As a result, diagnosis and treatment are generally carried out at tertiary medical centers, with their facilities and the expertise of multi-disciplinary interprofessional medical teams. For the principal types, the fourfold division into acute and chronic forms of lymphoid and myeloid leukemia are used, but have included some other histological types listed in the SEER selection criteria. Other terms are also used, such as childhood acute lymphoblastic leukemia, to show the degree of cell maturation.

Mortality and epidemiological features have been described. Mortality generally shows very high annual EDR and MR values up to 10 years, and lower but often significant excess mortality to 20 years. However, advances in chemotherapy nearly doubled 10-year survival from 33% in the earlier 1975-99 cohort to 60% in the 2000-22 cohort. Treatment is very specific according to diagnostic type and phase of the disease. Chronic lymphoid leukemia often has an initial indolent and asymptomatic course in older adults, and especially with improved durational interval survivals in the late cohort, 2000-22, watchful waiting only may be exercised as an optional treatment modality. More invasive methods, such as intrathecal chemotherapy and bone marrow transplant,

supplement regular chemotherapy protocols in specific situations. With many clinical trials in progress, treatment and prognosis remain in a fluid state for the leukemias.

Additional multiple genetic and environmental etiologic insights, multifactorial epidemiologic risk factors, data perspectives, and treatment advances are referenced.¹⁹⁻²²

Grateful appreciation to Dr. Richard Bunker Singer, MD (1914-2010), indemnity industry icon, friend, mentor and scholar, for his medical risk appraisal and life expectancy wisdom and insights.

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Chart A. SEER Male & Female Age-Specific Leukemia Incidence Rates at Diagnosisⁱ

Age at Diagnosis	Female			Male		
	Rate per 100,000	Lower 95% C.I.	Upper 95% C.I.	Rate per 100,000	Lower 95% C.I.	Upper 95% C.I.
<1	4.0	3.4	4.7	4.1	3.5	4.7
1-4	8.4	8.0	8.9	10.0	8.5	10.5
5-9	4.1	3.9	4.4	4.9	4.7	5.2
10-14	3.3	3.1	3.6	4.2	3.9	4.4
15-19	2.7	2.5	2.9	4.6	4.3	4.8
20-24	2.7	2.5	2.9	3.7	3.5	4.0
25-29	2.8	2.6	3.0	3.6	3.4	3.8
30-34	3.3	3.0	3.5	4.3	4.0	4.5
40-44	5.7	5.4	6.0	7.2	6.8	7.5
50-54	11.1	10.6	11.5	15.9	15.4	16.5
60-64	22.5	21.8	23.1	36.1	35.3	36.9
70-74	43.3	42.3	44.4	76.9	75.3	78.4
80-84	68.7	66.8	70.7	134.5	131.3	137.7
85+	77.0	75.0	79.0	144.8	141.2	148.5

ⁱ SEER*Explorer: An interactive website for SEER cancer statistics [Internet]. Surveillance Research Program, National Cancer Institute; 2025 Apr 16. [cited 2025 Jun 22]. Available from: <https://seer.cancer.gov/statistics-network/explorer/>. Data source(s): SEER Incidence Data, November 2024 Submission (1975-2022), SEER 21 registries.

Chart B. Annual Percent Change (APC) Estimates: (From Regression Line Segment Trends)

Sex	Year Range	APC (%)	Lower 95% C.I.	Upper 95% C.I.	P-Value	Direction
Female	1975–2022	0.5	0.3	0.8	<0.01	↑
Male	1975–2022	0.6	0.4	0.8	<0.01	↑
<i>Average Annual Percent Change (AAPC) Estimates: (Recent 3 and 10 Year Trends)</i>						
Female	2013–2022	0.5	0.3	0.8	<0.01	↑
	2018–2022	0.5	0.3	0.8	<0.01	↑
Male	2013–2022	0.6	0.4	0.8	<0.01	↑
	2018–2022	0.6	0.4	0.8	<0.01	↑

Table 1. Acute Lymphoid Leukemia, 1975-1999, Age and Sex

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000		Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/p'
			Observed d	Expected d'		Observed q	Expected q'	Observed P	Expected p'	
						M&F, Ages 00-14				
0-1	2,948	2,947.0	136	0.88	15,383	0.0461	0.0003	0.9539	0.9997	95.4
1-2	2,810	2,809.5	78	0.84	9,254	0.0278	0.0003	0.9274	0.9994	92.8
2-5	2,731	7,981.5	148	2.39	6,181	0.0185	0.0003	0.8769	0.9985	87.8
0-5	2,948	13,738.0	362	4.12	8,783	0.0264	0.0003	0.8769	0.9985	87.8
5-10	2,568	12,582.5	82	5.52	1,486	0.0065	0.0004	0.8488	0.9963	85.2
10-15	2,457	12,152.5	39	8.74	446	0.0032	0.0007	0.8353	0.9927	84.1
15-20	2,389	4,758.0	8	4.28	187	0.0017	0.0009	0.0000	0.0000	#DIV/0!
						M&F, Ages 15-34				
0-1	1,056	1,053.5	260	1.26	20,566	0.2468	0.0012	0.7532	0.9988	75.4
1-2	791	790.5	217	0.95	22,876	0.2745	0.0012	0.5464	0.9976	54.8
2-5	573	1,487.0	176	1.78	9,863	0.1184	0.0012	0.3783	0.9940	38.1
0-5	1,056	3,331.0	653	4.00	16,336	0.1960	0.0012	0.3783	0.9940	38.1
5-10	395	1,837.5	47	2.31	2,033	0.0256	0.0013	0.3332	0.9878	33.7
10-15	345	1,693.0	15	2.50	599	0.0089	0.0015	0.3187	0.9805	32.5
15-20	330	1,628.0	6	3.12	192	0.0037	0.0019	0.3129	0.9711	32.2
						M&F, Ages 35-64				
0-1	838	837.5	409	5.36	7,631	0.4884	0.0064	0.5116	0.9936	51.5
1-2	428	427.5	167	2.61	6,404	0.3906	0.0061	0.3118	0.9875	31.6
2-5	260	645.0	95	4.27	2,226	0.1473	0.0066	0.1979	0.9680	20.4
0-5	838	1,910.0	671	12.24	5,484	0.3513	0.0064	0.1979	0.9680	20.4
5-10	165	709.0	40	5.76	695	0.0564	0.0081	0.1495	0.9291	16.1
10-15	123	588.5	13	6.38	204	0.0221	0.0108	0.1336	0.8797	15.2
15-20	109	506.0	18	7.47	241	0.0356	0.0148	0.1115	0.8165	13.7
						M&F, Ages 65 up				
0-1	600	600.0	484	37.26	1,299	0.8067	0.0621	0.1933	0.9379	20.6
1-2	116	116.0	51	5.14	992	0.4397	0.0443	0.1083	0.8964	12.1
2-5	65	145.0	39	7.32	533	0.2690	0.0505	0.0433	0.7640	5.7
0-5	600	861.0	574	49.72	1,154	0.6667	0.0577	0.0433	0.7640	5.7
5-10	26	109.0	10	8.07	124	0.0917	0.0740	0.0267	0.5167	5.2
10-15	16	69.0	6	7.03	85	0.0870	0.1019	0.0167	0.3007	5.5
15-20	10	31.0	6	3.37	178	0.1935	0.1086	0.0051	0.1746	2.9

Table 1. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths			Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate			Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'	Observed q		Expected q'	Observed P	Expected P'				
Male, All Ages													
0-1	3,515	3,513.0	826	28.46	2,903	0.2351	0.0081	0.7649	0.9919	77.1			
1-2	2,685	2,683.5	420	6.17	6,805	0.1565	0.0023	0.6452	0.9896	65.2			
2-5	2,262	6,221.0	431	10.22	4,219	0.0693	0.0016	0.5222	0.9848	53.0			
0-5	3,515	12,417.5	1,677	44.84	3,740	0.1351	0.0036	0.5222	0.9848	53.0			
5-10	1,829	8,653.5	169	12.80	1,321	0.0195	0.0015	0.4738	0.9775	48.5			
10-15	1,647	8,070.0	53	15.63	339	0.0066	0.0019	0.4585	0.9681	47.4			
15-20	1,580	7,754.5	43	16.44	262	0.0055	0.0021	0.4460	0.9578	46.6			
Female, All Ages													
Duration	l	E	d	d'	MR	q	q'	P	P'			100P/P'	
0-1	2,554	2,551.0	554	17.60	3,147	0.2172	0.0069	0.7828	0.9931	78.8			
1-2	1,994	1,993.0	238	3.59	6,634	0.1194	0.0018	0.6893	0.9913	69.5			
2-5	1,754	4,929.5	261	5.44	4,794	0.0529	0.0011	0.5867	0.9880	59.4			
0-5	2,554	9,473.5	1,053	26.63	3,954	0.1112	0.0028	0.5867	0.9880	59.4			
5-10	1,488	7,087.0	113	7.36	1,535	0.0159	0.0010	0.5419	0.9829	55.1			
10-15	1,357	6,657.5	39	7.32	533	0.0059	0.0011	0.5262	0.9775	53.8			
15-20	1,307	6,423.0	21	7.71	272	0.0033	0.0012	0.5177	0.9717	53.3			

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 2. Acute Lymphoid Leukemia (ALL), 2000-2022, Age, Sex and Race

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected P'	
M&F, Ages 00-14											
Duration	l	E	d	d'	MR	q	q'	EDR	P	P'	100P/P'
0-1	4,370	4,262.5	116	1.70	6,804	0.0272	0.0004	26.8	0.9728	0.9996	97.3
1-2	4,039	3,938.0	79	0.79	10,030	0.0201	0.0002	19.9	0.9532	0.9994	95.4
2-5	3,758	10,214.5	119	2.04	5,825	0.0117	0.0002	11.5	0.9207	0.9988	92.2
0-5	4,370	18,415.0	314	4.54	6,923	0.0171	0.0002	16.8	0.9207	0.9988	92.2
5-10	3,030	12,581.0	58	2.96	1,958	0.0046	0.0002	4.4	0.9004	0.9976	90.3
M&F, Ages 15-34											
Duration	l	E	d	d'	MR	q	q'	EDR	P	P'	100P/P'
0-1	1,487	1,432.0	206	1.29	15,984	0.1439	0.0009	143.0	0.8561	0.9991	85.7
1-2	1,171	1,133.5	126	1.02	12,351	0.1112	0.0009	110.3	0.7609	0.9982	76.2
2-5	970	2,458.5	131	2.61	5,019	0.0533	0.0011	52.2	0.6488	0.9950	65.2
0-5	1,487	5,024.0	463	4.92	9,412	0.0922	0.0010	91.2	0.6488	0.9950	65.2
5-10	656	2,508.5	32	3.28	975	0.0128	0.0013	11.4	0.6107	0.9885	61.8
M&F, Ages 35-64											
Duration	l	E	d	d'	MR	q	q'	EDR	P	P'	100P/P'
0-1	1,559	1,515.5	413	8.03	5,142	0.2725	0.0053	267.2	0.7275	0.9947	73.1
1-2	1,059	1,019.5	237	5.61	4,227	0.2325	0.0055	227.0	0.5584	0.9892	56.4
2-5	743	1,764.0	177	10.83	1,634	0.1003	0.0061	94.2	0.4117	0.9709	42.4
0-5	1,559	4,299.0	827	24.47	3,380	0.1924	0.0057	186.7	0.4117	0.9709	42.4
5-10	418	1,544.5	52	12.13	429	0.0337	0.0079	25.8	0.3482	0.9328	37.3
M&F, Ages 65 up											
Duration	l	E	d	d'	MR	q	q'	EDR	P	P'	100P/P'
0-1	721	710.5	414	29.91	1,384	0.5827	0.0421	540.6	0.4173	0.9579	43.6
1-2	286	277.5	81	9.27	874	0.2919	0.0334	258.5	0.2955	0.9259	31.9
2-5	188	406.0	69	14.07	491	0.1700	0.0346	135.3	0.1742	0.8335	20.9
0-5	721	1,394.0	564	53.25	1,059	0.4046	0.0382	366.4	0.1742	0.8335	20.9
5-10	81	285.5	19	12.32	154	0.0665	0.0432	23.4	0.1256	0.6663	18.8
Male, All Ages											
Duration	l	E	d	d'	MR	q	q'	EDR	P	P'	100P/P'
0-1	2,181	2,114.5	572	60.47	946	0.2705	0.0286	241.9	0.5514	0.9714	56.8
1-2	1,476	1,427.5	258	36.40	709	0.1807	0.0255	155.2	0.4144	0.9466	43.8
2-5	1,121	2,715.5	214	71.11	301	0.0788	0.0262	52.6	0.2574	0.8742	29.4
0-5	2,181	6,257.5	1,044	167.99	621	0.1668	0.0268	140.0	0.2574	0.8742	29.4
5-10	676	2,507.5	65	81.01	80	0.0259	0.0323	-6.4	0.1680	0.7399	22.7

Table 2. Continued

Duration Start-End t to t+ch t	No. Alive at Start <i>l</i>	Exposure Pt.-Yrs <i>E</i>	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed <i>d</i>	Expected <i>d'</i>		Observed <i>q</i>	Expected <i>q'</i>	Excess (<i>q-q'</i>)	Observed <i>P</i>	Expected <i>P'</i>	
Female, All Ages											
Duration	<i>l</i>	<i>E</i>	<i>d</i>	<i>d'</i>	MR	<i>q</i>	<i>q'</i>	<i>P</i>	<i>P'</i>		100P/P'
0-1	1,586	1,543.5	461	39.98	1,153	0.2987	0.0259	0.5622	0.9741		57.7
1-2	1,040	1,003.0	186	22.77	817	0.1854	0.0227	0.4107	0.9520		43.1
2-5	780	1,913.0	163	48.81	334	0.0852	0.0255	0.2784	0.8811		31.6
0-5	1,586	4,459.5	810	111.55	726	0.1816	0.0250	0.2784	0.8811		31.6
5-10	479	1,831.0	38	64.57	59	0.0208	0.0353	0.2226	0.7346		30.3
White Race, All Ages											
Duration	<i>l</i>	<i>E</i>	<i>d</i>	<i>d'</i>	MR	<i>q</i>	<i>q'</i>	<i>P</i>	<i>P'</i>		100P/P'
0-1	2,888	2,807.5	802	82.26	975	0.2857	0.0293	0.5450	0.9707		56.1
1-2	1,925	1,859.5	318	48.90	650	0.1710	0.0263	0.4096	0.9452		43.3
2-5	1,476	3,610.5	291	100.99	288	0.0806	0.0280	0.2677	0.8682		30.8
0-5	2,888	8,277.5	1,411	232.15	608	0.1705	0.0280	0.2677	0.8682		30.8
5-10	906	3,436.5	81	129.89	62	0.0236	0.0378	0.1967	0.7137		27.6
Black Race, All Ages											
Duration	<i>l</i>	<i>E</i>	<i>d</i>	<i>d'</i>	MR	<i>q</i>	<i>q'</i>	<i>P</i>	<i>P'</i>		100P/P'
0-1	265	260.0	78	9.52	820	0.3000	0.0366	0.5482	0.9634		56.9
1-2	177	171.5	47	5.87	801	0.2741	0.0342	0.3783	0.9305		40.7
2-5	119	272.0	29	10.35	280	0.1066	0.0381	0.2222	0.8269		26.9
0-5	265	703.5	154	25.74	598	0.2189	0.0366	0.2222	0.8269		26.9
5-10	64	225.5	10	9.92	101	0.0443	0.0440	0.1507	0.6600		22.8
Other Race (AI-AN, API), All Ages											
Duration	<i>l</i>	<i>E</i>	<i>d</i>	<i>d'</i>	MR	<i>q</i>	<i>q'</i>	<i>P</i>	<i>P'</i>		100P/P'
0-1	1,179	1,147.0	175	4.36	4,015	0.1526	0.0038	0.8474	0.9962		85.1
1-2	940	910.0	81	2.09	3,870	0.0890	0.0023	0.7720	0.9939		77.7
2-5	799	2,090.5	75	3.91	1,919	0.0359	0.0019	0.6931	0.9884		70.1
0-5	1,179	4,147.5	331	10.36	3,195	0.0798	0.0025	0.6931	0.9884		70.1
5-10	583	2,275.5	24	4.29	559	0.0105	0.0019	0.6597	0.9790		67.4

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 3. Chronic Lymphoid Leukemia (CLL), 1975-1999, Age and Sex

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected p'	
Male, Ages 00-64											
0-1	3,421	3,419.0	166	43.42	382	0.0486		0.0127	0.9514	0.9873	96.4
1-2	3,251	3,251.0	148	43.89	337	0.0455		0.0135	0.9081	0.9740	93.2
2-5	3,103	8,816.5	520	134.02	388	0.0590		0.0152	0.7559	0.9301	81.3
0-5	3,421	15,486.5	834	221.33	377	0.0539		0.0143	0.7559	0.9301	81.3
5-10	2,582	11,124.0	869	211.21	411	0.0781		0.0190	0.5011	0.8444	59.3
10-15	1,707	7,265.0	541	184.83	293	0.0745		0.0254	0.3421	0.7414	46.1
15-20	1,164	5,042.0	360	172.23	209	0.0714		0.0342	0.2362	0.6221	38.0
Male, Ages 65 up											
0-1	5,446	5,444.0	967	365.29	265	0.1776		0.0671	0.8224	0.9329	88.2
1-2	4,475	4,474.0	559	294.39	190	0.1249		0.0658	0.7197	0.8715	82.6
2-5	3,914	10,197.0	1,427	704.24	203	0.1399		0.0691	0.4571	0.7027	65.0
0-5	5,446	20,115.0	2,953	1,363.92	217	0.1468		0.0678	0.4571	0.7027	65.0
5-10	2,481	9,271.0	1,351	711.04	190	0.1457		0.0767	0.2079	0.4693	44.3
10-15	1,124	4,268.0	590	403.41	146	0.1382		0.0945	0.0986	0.2833	34.8
15-20	532	1,914.0	314	232.34	135	0.1641		0.1214	0.0401	0.1465	27.4
Female, Ages 00-64											
0-1	1,730	1,728.5	59	12.10	488	0.0341		0.0070	0.9659	0.9930	97.3
1-2	1,668	1,668.0	65	12.51	520	0.0390		0.0075	0.9282	0.9856	94.2
2-5	1,603	4,630.5	184	39.90	461	0.0397		0.0086	0.8216	0.9602	85.6
0-5	1,730	8,027.0	308	64.51	477	0.0384		0.0080	0.8216	0.9602	85.6
5-10	1,416	6,450.5	317	74.39	426	0.0491		0.0115	0.6372	0.9057	70.4
10-15	1,094	4,765.5	294	79.10	372	0.0617		0.0166	0.4660	0.8323	56.0
15-20	799	3,563.0	194	87.73	221	0.0544		0.0246	0.3528	0.7339	48.1
Female, Ages 65 UP											
0-1	4,425	4,425.0	676	239.84	282	0.1528		0.0542	0.8472	0.9458	89.6
1-2	3,749	3,746.0	382	200.04	191	0.1020		0.0534	0.7608	0.8953	85.0
2-5	3,361	9,027.5	1,021	506.17	202	0.1131		0.0561	0.5291	0.7527	70.3
0-5	4,425	17,198.5	2,079	946.05	220	0.1209		0.0550	0.5291	0.7527	70.3
5-10	2,327	9,170.5	1,121	586.60	191	0.1222		0.0640	0.2739	0.5388	50.8
10-15	1,201	4,603.0	597	369.60	162	0.1297		0.0803	0.1371	0.3522	38.9
15-20	596	2,189.5	333	235.13	142	0.1521		0.1074	0.0599	0.1974	30.4

Table 3. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000		Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Observed P	Expected P'	
Male, All Ages										
0-1	8,867	8,863.0	1,133	408.58	277	0.1278	0.0461	0.8722	0.9539	91.4
1-2	7,726	7,725.0	707	338.36	209	0.0915	0.0438	0.7924	0.9121	86.9
2-5	7,017	19,013.5	1,947	838.42	232	0.1024	0.0441	0.5724	0.7967	71.8
0-5	8,867	35,601.5	3,787	1,585.36	239	0.1064	0.0445	0.5724	0.7967	71.8
5-10	5,063	20,395.0	2,220	922.51	241	0.1089	0.0452	0.3211	0.6315	50.8
10-15	2,831	11,533.0	1,131	588.16	192	0.0981	0.0510	0.1927	0.4852	39.7
15-20	1,696	6,956.0	674	404.65	167	0.0969	0.0582	0.1159	0.3591	32.3
Female, All Ages										
0-1	6,155	6,153.5	735	251.68	292	0.1194	0.0409	0.8806	0.9591	91.8
1-2	5,417	5,414.0	447	212.77	210	0.0826	0.0393	0.8079	0.9214	87.7
2-5	4,964	13,658.0	1,205	546.33	221	0.0882	0.0400	0.6113	0.8151	75.0
0-5	6,155	25,225.5	2,387	1,010.78	236	0.0946	0.0401	0.6113	0.8151	75.0
5-10	3,743	15,621.0	1,438	660.96	218	0.0921	0.0423	0.3761	0.6561	57.3
10-15	2,295	9,368.5	891	448.98	198	0.0951	0.0479	0.2298	0.5124	44.8
15-20	1,395	5,752.5	527	323.01	163	0.0916	0.0562	0.1426	0.3833	37.2
Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.										

Table 4. Chronic Lymphoid Leukemia (CLL), 2000–2022, Age, Sex and Race

Duration Start-End t to t+ch t	No. Alive at Start <i>l</i>	Exposure Pt.-Yrs <i>E</i>	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed <i>d</i>	Expected <i>d'</i>		Observed <i>q</i>	Expected <i>q'</i>	Excess (q-q')	Observed <i>P</i>	Expected <i>P'</i>	
Male, Ages 00-64											
0-1	5,870	5,706.0	140	54.78	256	0.0245	0.0096	0.9755	0.9904	98.5	
1-2	5,402	5,256.0	110	53.61	205	0.0209	0.0102	0.9551	0.9803	97.4	
2-5	5,000	13,512.0	340	157.49	216	0.0252	0.0117	0.8840	0.9463	93.4	
0-5	5,870	24,474.0	590	265.88	222	0.0241	0.0109	0.8840	0.9463	93.4	
5-10	3,876	15,035.5	586	228.05	257	0.0390	0.0152	0.7237	0.8755	82.7	
Male, Ages 65 up											
0-1	8,745	8,493.0	801	436.54	183	0.0943	0.0514	0.9057	0.9486	95.5	
1-2	7,440	7,211.0	528	373.53	141	0.0732	0.0518	0.8394	0.8995	93.3	
2-5	6,454	16,369.0	1,380	916.40	151	0.0843	0.0560	0.6426	0.7561	85.0	
0-5	8,745	32,073.0	2,709	1,726.47	157	0.0845	0.0538	0.6426	0.7561	85.0	
5-10	4,066	14,151.0	1,419	955.77	148	0.1003	0.0675	0.3726	0.5290	70.4	
Female, Ages 00-64											
0-1	3,152	3,066.5	36	18.09	199	0.0117	0.0059	0.9883	0.9941	99.4	
1-2	2,945	2,857.5	29	18.00	161	0.0101	0.0063	0.9783	0.9878	99.0	
2-5	2,741	7,454.0	117	54.24	216	0.0157	0.0073	0.9330	0.9664	96.5	
0-5	3,152	13,378.0	182	90.33	201	0.0136	0.0068	0.9330	0.9664	96.5	
5-10	2,212	8,950.5	212	87.61	242	0.0237	0.0098	0.8284	0.9193	90.1	
Female, Ages 65 up											
0-1	6,263	6,097.5	571	289.02	198	0.0936	0.0474	0.9064	0.9526	95.2	
1-2	5,361	5,207.5	363	248.92	146	0.0697	0.0478	0.8432	0.9071	93.0	
2-5	4,691	12,016.0	872	629.44	139	0.0726	0.0524	0.6713	0.7713	87.0	
0-5	6,263	23,321.0	1,806	1,167.38	155	0.0774	0.0501	0.6713	0.7713	87.0	
5-10	3,069	10,950.0	956	685.27	140	0.0873	0.0626	0.4216	0.5552	75.9	
Male, All Ages											
Duration	<i>l</i>	<i>E</i>	<i>d</i>	<i>d'</i>	MR	<i>q</i>	<i>q'</i>	<i>P</i>	<i>P'</i>	100P/P'	
0-1	14,615	14,199.0	941	491.29	192	0.0663	0.0346	0.9337	0.9654	96.7	
1-2	12,842	12,467.0	638	427.62	149	0.0512	0.0343	0.8859	0.9323	95.0	
2-5	11,454	29,881.0	1,720	1,074.36	160	0.0576	0.0360	0.7403	0.8351	88.7	
0-5	14,615	56,547.0	3,299	1,993.27	166	0.0583	0.0352	0.7403	0.8351	88.7	
5-10	7,942	29,186.5	2,005	1,184.33	169	0.0687	0.0406	0.5158	0.6773	76.2	

Table 4. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected P'	
Female, All Ages											
0-1	9,415	9,164.0	607	306.99	198	0.0662	0.0335	0.9338	0.9665	96.6	
1-2	8,306	8,065.0	392	266.95	147	0.0486	0.0331	0.8884	0.9345	95.1	
2-5	7,432	19,470.0	989	684.56	144	0.0508	0.0352	0.7593	0.8392	90.5	
0-5	9,415	36,699.0	1,988	1,258.50	158	0.0542	0.0343	0.7593	0.8392	90.5	
5-10	5,281	19,900.5	1,168	773.32	151	0.0587	0.0389	0.5604	0.6872	81.5	
White, 1975-2022, All Ages											
0-1	35,784	35,203.5	3,129	1,362.38	230	0.0889	0.0387	0.9111	0.9613	94.8	
1-2	31,494	30,946.0	2,008	1,166.66	172	0.0649	0.0377	0.8520	0.9251	92.1	
2-5	28,390	75,726.5	5,409	2,947.07	184	0.0714	0.0389	0.6811	0.8211	83.0	
0-5	35,784	1,41,876.0	10,546	5,476.10	193	0.0743	0.0386	0.6811	0.8211	83.0	
5-10	20,402	79,101.5	6,324	3,335.39	190	0.0799	0.0422	0.4475	0.6609	67.7	
Black, Other, Unknown, 1975-2022, All Ages											
0-1	1,798	1,759.5	184	62.46	295	0.1046	0.0355	0.8954	0.9645	92.8	
1-2	1,537	1,505.5	114	52.24	218	0.0757	0.0347	0.8276	0.9310	88.9	
2-5	1,360	3,476.5	298	127.61	234	0.0857	0.0367	0.6323	0.8320	76.0	
0-5	1,798	6,741.5	596	242.31	246	0.0884	0.0359	0.6323	0.8320	76.0	
5-10	885	3,158.5	335	126.76	264	0.1061	0.0401	0.3568	0.6772	52.7	

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 5. Acute Myeloid Leukemia (AML), 1975-1999, Age and Sex

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000		Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/p'
			Observed d	Expected d'		Observed q	Expected q'	Observed P	Expected P'	
0-1	2,893	2,889.5	1,147	4.33	M&F, Ages 00-44 26,464 24,063 7,157 18,371 1,093 354	0.3970 0.3128 0.0975 0.2571 0.0177 0.0095	0.0015 0.0013 0.0014 0.0014 0.0016 0.0027	0.6030 0.4144 0.3078 0.3078 0.2818 0.2561	0.9985 0.9972 0.9931 0.9931 0.9851 0.9589	60.4 41.6 31.0 31.0 28.6 26.7
1-2	1,739	1,739.0	544	2.26						
2-5	1,195	3,139.0	306	4.28						
0-5	2,893	7,767.5	1,997	10.87						
5-10	879	4,187.0	74	6.77						
10-20	797	7,605.0	72	20.35						
0-1	3,036	3,035.0	1,900	30.65	M&F, Ages 45-64 6,198 4,244 1,918 4,664 470 184	0.6260 0.4032 0.1844 0.4592 0.0532 0.0347	0.0101 0.0095 0.0096 0.0098 0.0113 0.0188	0.3740 0.2232 0.1248 0.1248 0.0955 0.0671	0.9899 0.9805 0.9524 0.9524 0.8994 0.7407	37.8 22.8 13.1 13.1 10.6 9.1
1-2	1,134	1,133.5	457	10.77						
2-5	676	1,611.0	297	15.48						
0-5	3,036	5,779.5	2,654	56.90						
5-10	375	1,653.5	88	18.72						
10-20	286	2,448.5	85	46.15						
0-1	6,151	6,148.0	5,206	365.81	M&F, Ages 65 up 1,423 1,142 695 1,327 302 141	0.8468 0.5218 0.3290 0.7494 0.1668 0.1184	0.0595 0.0457 0.0473 0.0565 0.0553 0.0839	0.1532 0.0733 0.0241 0.0241 0.0101 0.0026	0.9405 0.8975 0.7747 0.7747 0.5804 0.2279	16.3 8.2 3.1 3.1 1.7 1.2
1-2	939	939.0	490	42.91						
2-5	449	915.0	301	43.30						
0-5	6,151	8,002.0	5,997	452.01						
5-10	148	515.5	86	28.50						
10-20	61	380.0	45	31.90						
0-1	6,607	6,603.0	4,597	242.99	Male, All Ages 1,892 2,317 1,341 1,876 399 205	0.6962 0.4102 0.1714 0.5159 0.0386 0.0208	0.0368 0.0177 0.0128 0.0275 0.0097 0.0102	0.3038 0.1792 0.1049 0.1049 0.0866 0.0702	0.9632 0.9462 0.9110 0.9110 0.8679 0.7833	31.5 18.9 11.5 11.5 10.0 9.0
1-2	2,002	2,001.5	821	35.43						
2-5	1,180	2,841.5	487	36.33						
0-5	6,607	11,446.0	5,905	314.75						
5-10	684	3,082.5	119	29.81						
10-20	556	5,036.0	105	51.31						
0-1	5,473	5,469.5	3,656	157.52	Female, All Ages 2,321 3,247 1,574 2,318 530 205	0.6684 0.3702 0.1477 0.4695 0.0394 0.0180	0.0288 0.0114 0.0094 0.0203 0.0074 0.0087	0.3316 0.2088 0.1323 0.1323 0.1085 0.0904	0.9712 0.9601 0.9337 0.9337 0.8996 0.8235	34.1 21.8 14.2 14.2 12.1 11.0
1-2	1,810	1,810.0	670	20.63						
2-5	1,140	2,823.5	417	26.50						
0-5	5,473	10,103.0	4,743	204.66						
5-10	718	3,273.5	129	24.34						
10-20	588	5,397.5	97	47.20						

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 6. Acute Myeloid Leukemia (AML), 2000-2022, Age, Sex and Race

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000		Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Observed P	Expected P'	
0-1	3,447	3,364.5	629	4.37	M&F, Ages 00-44	0.1870	0.0013	0.8130	0.9987	81.4
1-2	2,653	2,571.0	362	3.09	14,381	0.1408	0.0012	0.6985	0.9975	70.0
2-5	2,127	5,588.5	212	7.23	11,733	0.0379	0.0013	0.6242	0.9936	62.8
0-5	3,447	11,524.0	1,203	14.68	2,934	0.1044	0.0013	0.6242	0.9936	62.8
5-10	1,584	6,355.0	74	11.27	8,192	0.0116	0.0018	0.5890	0.9847	59.8
0-1	4,360	4,254.5	1,682	31.91	657	M&F, Ages 45-64	0.0075	0.6047	0.9925	60.9
1-2	2,467	2,396.5	551	17.97	5,271	0.3953	0.0075	0.4657	0.9851	47.3
2-5	1,775	4,422.0	358	36.76	3,066	0.2299	0.0083	0.3647	0.9605	38.0
0-5	4,360	11,073.0	2,591	86.64	974	0.0810	0.0078	0.3647	0.9605	38.0
5-10	1,131	4,322.0	138	45.87	2,990	0.2340	0.0106	0.3114	0.9099	34.2
0-1	15,720	15,395.5	7,970	435.69	301	M&F, All Ages	0.0283	0.4823	0.9717	49.6
1-2	7,101	6,891.5	1,727	91.66	1,829	0.5177	0.0133	0.3614	0.9588	37.7
2-5	4,955	12,124.0	1,046	118.20	1,884	0.2506	0.0097	0.2795	0.9313	30.0
0-5	15,720	34,411.0	10,743	645.55	885	0.0863	0.0188	0.2795	0.9313	30.0
5-10	3,103	11,969.5	313	110.34	1,664	0.3122	0.0092	0.2457	0.8889	27.6
0-1	8,610	8,426.5	4,454	257.85	284	Male, All Ages	0.0306	0.4714	0.9694	48.6
1-2	3,789	3,681.0	999	57.79	1,727	0.5286	0.0157	0.3435	0.9542	36.0
2-5	2,574	6,250.5	578	74.63	1,729	0.2714	0.0119	0.2607	0.9208	28.3
0-5	8,610	18,358.0	6,031	390.28	774	0.0925	0.0213	0.2607	0.9208	28.3
5-10	1,577	6,030.5	170	68.36	1,545	0.3285	0.0113	0.2269	0.8694	26.1
0-1	7,110	6,969.0	3,516	177.71	249	Female, All Ages	0.0255	0.4955	0.9745	50.8
1-2	3,312	3,210.5	728	34.03	1,979	0.5045	0.0106	0.3831	0.9642	39.7
2-5	2,381	5,873.5	468	43.81	2,139	0.2268	0.0075	0.3024	0.9430	32.1
0-5	7,110	16,053.0	4,712	255.55	1,068	0.0797	0.0159	0.3024	0.9430	32.1
5-10	1,526	5,939.0	143	42.00	1,844	0.2935	0.0071	0.2683	0.9099	29.5

Table 6. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected P'	
0-1	12,362	12,133.5	6,408	376.14	White, All Ages	0.5281	0.0310	497.1	0.4719	0.9690	48.7
1-2	5,497	5,342.0	1,340	79.06	1,704	0.5281	0.0148	236.0	0.3535	0.9547	37.0
2-5	3,847	9,425.0	842	102.37	1,695	0.2508	0.0109	78.5	0.2706	0.9242	29.3
0-5	12,362	26,900.5	8,590	557.57	823	0.0893	0.0207	298.6	0.2706	0.9242	29.3
5-10	2,393	9,293.5	259	94.23	1,541	0.3193	0.0101	17.7	0.2358	0.8781	26.9
0-1	3,358	3,262.0	1,562	59.04	Black, Other, Unknown, All Ages	0.4788	0.0181	460.7	0.5212	0.9819	53.1
1-2	1,604	1,549.5	387	12.86	2,646	0.2498	0.0083	241.5	0.3910	0.9738	40.2
2-5	1,108	2,699.0	204	16.00	3,009	0.0756	0.0059	69.7	0.3136	0.9568	32.8
0-5	3,358	7,510.5	2,153	87.90	1,275	0.2867	0.0117	275.0	0.3136	0.9568	32.8
5-10	710	2,676.0	54	16.15	2,449	0.0202	0.0060	14.1	0.2841	0.9280	30.6

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 7. Chronic Myeloid Leukemia (CML), 1975-1999, Age and Sex

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected P'	
						Male, Ages 00-64					
0-1	1,909	1,907.0	358	14.68	2,438	0.1877	0.0077	180.0	0.8123	0.9923	81.9
1-2	1,547	1,546.5	307	11.60	2,647	0.1985	0.0075	191.0	0.6511	0.9849	66.1
2-5	1,239	3,080.0	543	24.87	2,184	0.1763	0.0081	168.2	0.3653	0.9611	38.0
0-5	1,909	6,533.5	1,208	51.15	2,362	0.1849	0.0078	177.1	0.3653	0.9611	38.0
5-10	692	2,725.5	284	22.60	1,257	0.1042	0.0083	95.9	0.2150	0.9219	23.3
10-20	405	3,333.0	137	32.94	416	0.0411	0.0099	31.2	0.1417	0.8336	17.0
						Male, Ages 65 up					
0-1	1,714	1,714.0	793	117.92	672	0.4627	0.0688	393.9	0.5373	0.9312	57.7
1-2	921	921.0	301	58.76	512	0.3268	0.0638	263.0	0.3617	0.8718	41.5
2-5	620	1,369.0	403	88.94	453	0.2944	0.0650	229.4	0.1260	0.7116	17.7
0-5	1,714	4,004.0	1,497	265.63	564	0.3739	0.0663	307.5	0.1260	0.7116	17.7
5-10	215	616.5	163	44.00	370	0.2644	0.0714	193.0	0.0301	0.4894	6.2
10-20	51	207.0	45	18.40	245	0.2174	0.0889	128.5	0.0035	0.1747	2.0
						Female, Ages 00-64					
0-1	1,244	1,241.5	194	5.21	3,721	0.1563	0.0042	152.1	0.8437	0.9958	84.7
1-2	1,045	1,044.0	202	4.59	4,397	0.1935	0.0044	189.1	0.6804	0.9914	68.6
2-5	841	2,147.0	337	10.32	3,267	0.1570	0.0048	152.2	0.4078	0.9771	41.7
0-5	1,244	4,432.5	733	20.12	3,643	0.1654	0.0045	160.8	0.4078	0.9771	41.7
5-10	504	1,980.5	219	11.48	1,907	0.1106	0.0058	104.8	0.2303	0.9489	24.3
10-20	282	2,265.5	93	17.30	537	0.0411	0.0076	33.4	0.1541	0.8778	17.6
						Female, Ages 65 up					
0-1	1,380	1,379.5	603	80.70	747	0.4371	0.0585	378.6	0.5629	0.9415	59.8
1-2	776	775.5	233	39.63	588	0.3005	0.0511	249.4	0.3937	0.8934	44.1
2-5	542	1,247.0	326	64.23	508	0.2614	0.0515	209.9	0.1564	0.7619	20.5
0-5	1,380	3,402.0	1,162	184.56	630	0.3416	0.0543	287.3	0.1564	0.7619	20.5
5-10	214	639.0	167	35.85	466	0.2613	0.0561	205.2	0.0344	0.5684	6.0
10-20	47	211.0	41	15.23	269	0.1943	0.0722	122.1	0.0044	0.2453	1.8

Table 7. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000		Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Observed P	Expected P'	
Male, All Ages										
0-1	3,623	3,621.0	1,151	132.53	868	0.3179	0.0366	0.6821	0.9634	70.8
1-2	2,468	2,467.5	608	70.32	865	0.2464	0.0285	0.5140	0.9359	54.9
2-5	1,859	4,449.0	946	113.69	832	0.2126	0.0256	0.2520	0.8664	29.1
0-5	3,623	10,537.5	2,705	316.54	855	0.2567	0.0300	0.2520	0.8664	29.1
5-10	907	3,342.0	447	66.68	670	0.1338	0.0200	0.1275	0.7855	16.2
10-15	456	2,005.5	116	30.25	383	0.0578	0.0151	0.0949	0.7282	13.0
15-20	337	1,534.5	66	21.09	313	0.0430	0.0137	0.0763	0.6794	11.2
Female, All Ages										
0-1	2,624	2,621.0	797	85.97	927	0.3041	0.0328	0.6959	0.9672	71.9
1-2	1,821	1,819.5	435	44.21	984	0.2391	0.0243	0.5295	0.9437	56.1
2-5	1,383	3,394.0	663	74.68	888	0.1953	0.0220	0.2755	0.8831	31.2
0-5	2,624	7,834.5	1,895	204.87	925	0.2419	0.0261	0.2755	0.8831	31.2
5-10	718	2,619.5	386	47.28	816	0.1474	0.0180	0.1272	0.8078	15.8
10-15	329	1,395.5	96	17.87	537	0.0688	0.0128	0.0901	0.7575	11.9
15-20	232	1,081.0	38	14.64	260	0.0352	0.0135	0.0753	0.7075	10.6
Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.										

Table 8. Chronic Myeloid Leukemia (CML), 1975-2022 & 2000-22, Age-Sex-Race

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths			Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected p'	
Male 2000-2022, Ages 00-64												
0-1	2,834	2,745.0	188	16.20	1,161	0.0685	0.0059	62.6	0.9315	0.9941	93.7	
1-2	2,468	2,388.5	132	14.57	906	0.0553	0.0061	49.2	0.8800	0.9880	89.1	
2-5	2,177	5,791.5	190	39.04	487	0.0328	0.0067	26.1	0.7966	0.9681	82.3	
0-5	2,834	10,925.0	510	69.80	731	0.0467	0.0064	40.3	0.7966	0.9681	82.3	
5-10	1,632	6,399.5	140	55.00	255	0.0219	0.0086	13.3	0.7128	0.9266	76.9	
Male 2000-2022, Ages 65 up												
0-1	2,241	2,185.0	646	117.12	552	0.2957	0.0536	242.1	0.7043	0.9464	74.4	
1-2	1,483	1,433.0	309	74.52	415	0.2156	0.0520	163.6	0.5525	0.8972	61.6	
2-5	1,074	2,427.0	416	130.95	318	0.1714	0.0540	117.4	0.3185	0.7589	42.0	
0-5	2,241	6,045.0	1,371	322.58	425	0.2268	0.0534	173.4	0.3185	0.7589	42.0	
5-10	496	1,534.5	199	94.89	210	0.1297	0.0618	67.8	0.1654	0.5466	30.3	
Female 2000-2022, Ages 00-64												
0-1	1,837	1,793.5	77	6.64	1,160	0.0429	0.0037	39.2	0.9571	0.9963	96.1	
1-2	1,673	1,614.0	54	6.13	880	0.0335	0.0038	29.7	0.9250	0.9925	93.2	
2-5	1,501	3,932.0	109	17.22	633	0.0277	0.0044	23.3	0.8509	0.9795	86.9	
0-5	1,837	7,339.5	240	29.99	800	0.0327	0.0041	28.6	0.8509	0.9795	86.9	
5-10	1,100	4,338.0	74	24.79	299	0.0171	0.0057	11.3	0.7796	0.9514	81.9	
Female 2000-2022, Ages 65 up												
0-1	1,580	1,540.5	441	76.25	578	0.2863	0.0495	236.8	0.7137	0.9505	75.1	
1-2	1,060	1,022.0	153	46.40	330	0.1497	0.0454	104.3	0.6069	0.9073	66.9	
2-5	831	1,959.0	258	96.32	268	0.1317	0.0492	82.5	0.4026	0.7798	51.6	
0-5	1,580	4,521.5	852	218.98	389	0.1884	0.0484	140.0	0.4026	0.7798	51.6	
5-10	441	1,417.5	168	82.50	204	0.1185	0.0582	60.3	0.2154	0.5730	37.6	
White 1975-2022, All Ages												
0-1	12,159	11,981.5	2,873	391.80	733	0.2398	0.0327	207.1	0.7602	0.9673	78.6	
1-2	8,931	8,759.5	1,444	227.75	634	0.1648	0.0260	138.8	0.6349	0.9422	67.4	
2-5	7,144	17,789.5	2,172	417.91	520	0.1221	0.0235	98.6	0.4318	0.8776	49.2	
0-5	12,159	38,530.5	6,489	1,037.45	625	0.1684	0.0269	141.5	0.4318	0.8776	49.2	
5-10	4,279	15,746.0	1,220	325.00	375	0.0775	0.0206	56.8	0.2924	0.7914	36.9	
10-15	2,109	7,922.5	370	149.24	248	0.0467	0.0188	27.9	0.2314	0.7199	32.1	
15-20	1,096	4,016.0	148	70.41	210	0.0369	0.0175	19.3	0.1913	0.6586	29.0	

Table 8. Continued

Duration Start-End t to t+ch t	No. Alive at Start <i>l</i>	Exposure Pt.-Yrs <i>E</i>	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed <i>d</i>	Expected <i>d'</i>		Observed <i>q</i>	Expected <i>q'</i>	Excess (<i>q-q'</i>)	Observed <i>P</i>	Expected <i>P'</i>	
Black, Other, Unknown 1975-2022, All Ages											
0-1	2,580	2,524.5	427	42.66	1,001	0.1691	0.0169	152.2	0.8309	0.9831	84.5
1-2	2,042	1,985.0	247	28.19	876	0.1244	0.0142	110.2	0.7275	0.9691	75.1
2-5	1,681	4,163.0	410	53.97	760	0.0985	0.0130	85.5	0.5349	0.9321	57.4
0-5	2,580	8,672.5	1,084	124.82	868	0.1250	0.0144	110.6	0.5349	0.9321	57.4
5-10	1,015	3,905.0	194	47.03	413	0.0497	0.0120	37.6	0.4183	0.8772	47.7
10-15	549	2,006.0	84	23.79	353	0.0419	0.0119	30.0	0.3368	0.8267	40.7
15-20	259	960.0	27	10.80	250	0.0281	0.0113	16.9	0.2905	0.7811	37.2

Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.

Table 9. Other Histologic Types of Leukemia, 1975-2022, All Ages

Duration Start-End t to t+ch t	No. Alive at Start I	Exposure Pt.-Yrs E	Number of Deaths			Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'	Observed q		Expected q'	Excess (q-q')	Observed P	Expected P'		
Acute Monocytic Leukemia												
0-1	1,747	1,739.5	1,104	49.92	2,211	0.6347	0.0287	606.0	0.3653	0.9713	37.6	
1-2	628	622.5	210	7.53	2,788	0.3373	0.0121	325.2	0.2421	0.9595	25.2	
2-5	407	1,022.5	100	10.08	992	0.0978	0.0099	87.9	0.1801	0.9316	19.3	
0-5	1,747	3,384.5	1,414	67.54	2,094	0.4178	0.0200	397.8	0.1801	0.9316	19.3	
5-10	272	1,196.5	35	10.55	332	0.0293	0.0088	20.4	0.1547	0.8913	17.4	
10-20	194	1364.0	28	12.14	231	0.0205	0.0089	11.6	0.1275	0.8129	15.7	
Precursor B-T cell Lymphoblastic Leukemia (and Burkett's)												
0-1	18,705	18,403.5	3,875	125.14	3,096	0.2106	0.0068	203.8	0.7894	0.9932	79.5	
1-2	14,227	13,981.5	1,464	41.94	3,490	0.1047	0.0030	101.7	0.7067	0.9902	71.4	
2-5	12,272	33,014.0	1,404	82.74	1,697	0.0425	0.0025	40.0	0.6221	0.9828	63.3	
0-5	18,705	65,399.0	6,743	249.83	2,699	0.1031	0.0038	99.3	0.6221	0.9828	63.3	
5-10	9,562	41,501.5	583	102.82	567	0.0140	0.0025	11.6	0.5807	0.9707	59.8	
10-20	7,166	54845.5	338	141.35	239	0.0062	0.0026	3.6	0.5470	0.9460	57.8	
0-20	18,705	1,61,746.0	7,664	494.00	1,551	0.0474	0.0031	44.2	0.5470	0.9460	57.8	
Aleukemic, Subleukemic and NOS												
0-1	2,581	2,528.5	996	106.96	931	0.3939	0.0423	351.6	0.6061	0.9577	63.3	
1-2	1,480	1,429.0	243	43.58	558	0.1700	0.0305	139.5	0.5031	0.9285	54.2	
2-5	1,135	2,843.5	248	82.93	299	0.0872	0.0292	58.1	0.3847	0.8498	45.3	
0-5	2,581	6,801.0	1,487	233.47	637	0.2186	0.0343	184.3	0.3847	0.8498	45.3	
5-10	722	2,686.0	173	77.18	224	0.0644	0.0287	35.7	0.2758	0.7344	37.5	
10-20	339	1776.5	113	54.61	207	0.0636	0.0307	32.9	0.1421	0.5349	26.6	
Leukemia, NOS												
0-1	3,630	3,615.0	2,518	186.90	1,347	0.6965	0.0517	644.8	0.3035	0.9483	32.0	
1-2	1,082	1,076.0	343	32.17	1,066	0.3188	0.0299	288.9	0.2067	0.9199	22.5	
2-5	727	1,815.0	249	44.13	564	0.1372	0.0243	112.9	0.1352	0.8553	15.8	
0-5	3,630	6,506.0	3,110	263.20	1,182	0.4780	0.0405	437.6	0.1352	0.8553	15.8	
5-20	458	4,191.0	200	78.24	256	0.0477	0.0187	29.1	0.0681	0.6479	10.5	

Table 9. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/p'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected p'	
Other Acute Leukemia											
0-1	2,692	2,677.0	1,941	119.39	1,626	0.7251	0.0446	680.5	0.2749	0.9554	28.8
1-2	721	715.0	228	12.16	1,876	0.3189	0.0170	301.9	0.1872	0.9392	19.9
2-5	481	1,144.0	165	13.68	1,206	0.1442	0.0120	132.3	0.1201	0.9067	13.2
0-5	2,692	4,536.0	2,334	145.23	1,607	0.5146	0.0320	482.5	0.1201	0.9067	13.2
5-20	272	2,551.5	69	21.92	315	0.0270	0.0086	18.5	0.0822	0.7973	10.3
Hairy cell Leukemia											
0-1	2,891	2,842.5	195	59.98	325	0.0686	0.0211	47.5	0.9314	0.9789	95.1
1-2	2,599	2,557.0	98	53.19	184	0.0383	0.0208	17.5	0.8957	0.9585	93.4
2-5	2,417	6,736.5	214	144.18	148	0.0318	0.0214	10.4	0.8134	0.8983	90.6
0-5	2,891	12,136.0	507	257.34	197	0.0418	0.0212	20.6	0.8134	0.8983	90.6
5-10	2,008	8,783.5	228	207.48	110	0.0260	0.0236	2.3	0.7128	0.7966	89.5
10-20	1,459	10,466.0	338	305.24	111	0.0323	0.0292	3.1	0.5123	0.5892	87.0
Other Leukemias											
0-1	5,765	5,658.0	1,320	196.90	670	0.2333	0.0348	198.5	0.7667	0.9652	79.4
1-2	4,231	4,142.0	581	125.50	463	0.1403	0.0303	110.0	0.6591	0.9360	70.4
2-5	3,472	8,986.5	756	253.50	298	0.0841	0.0282	55.9	0.5094	0.8592	59.3
0-5	5,765	18,786.5	2,657	575.90	461	0.1414	0.0307	110.8	0.5094	0.8592	59.3
5-10	2,401	9,955.5	424	260.22	163	0.0426	0.0261	16.5	0.4113	0.7526	54.7
10-15	1,574	6,577.0	240	183.49	131	0.0365	0.0279	8.6	0.3419	0.6531	52.3
15-20	1,050	4,412.5	148	139.06	106	0.0335	0.0315	2.0	0.2876	0.5558	51.7
Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.											

Table 10. 10-Year Differential Impact of Cohort Time-Period on EDR & SR

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths		Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'		Observed q	Expected q'	Excess (q-q')	Observed P	Expected P'	
0-1	46,028	46,000.5	17,052	1,605.42	Leukemia, 1975-1999	0.3707	0.0349	335.8	0.6293	0.9651	65.2
1-2	28,921	28911.0	5,027	818.18	1,062	0.1739	0.0283	145.6	0.5199	0.9378	55.4
2-5	23,874	63450.5	6,985	1,817.30	614	0.1101	0.0286	81.4	0.3675	0.8595	42.8
5-10	16,830	71545.0	5,411	1,961.09	384	0.0756	0.0274	48.2	0.2491	0.7482	33.3
10-20	11,341	89652.0	4,310	2,279.80	276	0.0481	0.0254	22.6	0.1539	0.5789	26.6
0-1	62,224	60,657.5	13,880	1,662.02	Leukemia, 2000-2022	0.2288	0.0274	201.4	0.7712	0.9726	79.3
1-2	45,211	43862.5	4,345	1,022.00	835	0.0991	0.0233	75.8	0.6948	0.9499	73.1
2-5	38,169	98439.0	5,666	2,353.53	425	0.0576	0.0239	33.7	0.5827	0.8834	66.0
5-10	26,355	100207.5	4,532	2,538.48	241	0.0452	0.0253	19.9	0.4626	0.7766	59.6
10-20	13,792	67571.5	2,805	1,813.70	179	0.0415	0.0268	14.7	0.3060	0.5903	51.8
0-1	23,027	23,015.5	3,620	768.72	Lymphoid Leukemia (Acute-Chronic-Other), 1975-1999	0.1573	0.0334	123.9	0.8427	0.9666	87.2
1-2	19,384	19377.0	1,966	604.56	471	0.1015	0.0312	70.3	0.7572	0.9364	80.9
2-5	17,404	47760.0	4,093	1,504.58	325	0.0857	0.0315	54.2	0.5790	0.8507	68.1
5-10	13,279	57033.0	4,158	1,747.94	272	0.0729	0.0306	42.3	0.3972	0.7282	54.6
10-20	9,065	70338.5	3,681	2,051.61	238	0.0523	0.0292	23.2	0.2351	0.5423	43.3
0-1	34,229	33,290.5	2,916	885.53	Lymphoid Leukemia (Acute-Chronic-Other), 2000-2022	0.0876	0.0266	61.0	0.9124	0.9734	93.7
1-2	29,436	28587.5	1,639	748.99	329	0.0573	0.0262	31.1	0.8601	0.9479	90.7
2-5	26,100	68380.0	3,353	1,877.66	219	0.0490	0.0275	21.6	0.7395	0.8718	84.8
5-10	18,603	70823.0	3,480	2,097.08	179	0.0491	0.0296	19.5	0.5744	0.7496	76.6
10-20	9,681	47156.0	2,180	1,491.64	166	0.0462	0.0316	14.6	0.3624	0.5422	66.8
0-1	20,148	20,134.5	11,438	698.67	Myeloid & Monocytic Leukemia (Acute-Chronic-Other), 1975-1999	0.5681	0.0347	533.4	0.4319	0.9653	44.7
1-2	8,683	8680.5	2,761	187.50	1,637	0.3181	0.0216	296.5	0.2945	0.9444	31.2
2-5	5,917	14352.0	2,669	272.81	1,473	0.1860	0.0190	167.0	0.1614	0.8921	18.1
5-10	3,224	13119.5	1,152	182.20	978	0.0878	0.0139	73.9	0.1036	0.8328	12.4
10-20	2,053	17486.5	552	195.22	632	0.0316	0.0112	20.4	0.0756	0.7442	10.2

Table 10. Continued

Duration Start-End t to t+ch t	No. Alive at Start l	Exposure Pt.-Yrs E	Number of Deaths			Mortality Ratio (%) 100d/d'	Mean Ann. Mortality Rate/1,000			Cumul. Surv. Rate		Cum. Surv. Ratio (%) 100P/P'
			Observed d	Expected d'	Excess (q-q')		Observed q	Expected q'	Observed P	Expected P'		
Myeloid & Monocytic Leukemia (Acute-Chronic-Other), 2000-2022												
0-1	25,575	25,012.0	10,021	690.33	1,452	0.4006	0.0276	373.0		0.5994	0.9724	61.6
1-1-2	14,428	13984.5	2,535	243.33	1,042	0.1813	0.0174	163.9		0.4907	0.9555	51.4
2-2-5	11,006	27410.0	2,123	418.28	508	0.0775	0.0153	62.2		0.3886	0.9127	42.6
5-10	7,085	26953.0	936	386.64	242	0.0347	0.0143	20.4		0.3270	0.8490	38.5
10-20	3,811	19052.5	564	289.08	195	0.0296	0.0152	14.4		0.2432	0.7262	33.5
Leukemia, 1975-1999, Male, All Ages												
0-1	26,565	26,549.5	9,715	982.33	989	0.3659	0.0370	328.9		0.6341	0.9630	65.8
1-1-2	16,819	16815.0	2,958	507.81	582	0.1759	0.0302	145.7		0.5226	0.9339	56.0
2-2-5	13,853	36620.0	4,210	1,112.45	378	0.1150	0.0304	84.6		0.3636	0.8514	42.7
5-10	9,615	40551.0	3,215	1,166.61	276	0.0793	0.0288	50.5		0.2417	0.7360	32.8
10-20	6,358	50205.0	2,459	1,334.08	184	0.0490	0.0266	22.4		0.1478	0.5629	26.3
Leukemia, 2000-2022, Male, All Ages												
0-1	36,503	35,543.5	7,890	1,009.44	782	0.2220	0.0284	193.6		0.7780	0.9716	80.1
1-1-2	26,694	25908.0	2,632	637.34	413	0.1016	0.0246	77.0		0.6990	0.9477	73.8
2-5	22,490	57946.5	3,450	1,452.73	237	0.0595	0.0251	34.5		0.5824	0.8781	66.3
5-10	15,431	58274.5	2,818	1,554.30	181	0.0484	0.0267	21.7		0.4547	0.7666	59.3
10-20	7,920	38494.5	1,702	1,098.93	155	0.0442	0.0285	15.7		0.2923	0.5717	51.1
Leukemia, 1975-1999, Female, All Ages												
0-1	19,463	19,451.0	7,337	624.38	1,175	0.3772	0.0321	345.1		0.6228	0.9679	64.3
1-1-2	12,102	12096.0	2,069	310.87	666	0.1710	0.0257	145.3		0.5163	0.9430	54.7
2-5	10,021	26830.5	2,775	704.55	394	0.1034	0.0263	77.2		0.3730	0.8706	42.8
5-10	7,215	30994.0	2,196	794.37	276	0.0709	0.0256	45.2		0.2592	0.7648	33.9
10-20	4,983	39447.0	1,851	946.24	196	0.0469	0.0240	22.9		0.1623	0.6006	27.0
Leukemia, 2000-2022, Female, All Ages												
0-1	25,721	25,114.0	5,990	655.48	914	0.2385	0.0261	212.4		0.7615	0.9739	78.2
1-1-2	18,517	17954.5	1,713	386.02	444	0.0954	0.0215	73.9		0.6889	0.9530	72.3
2-2-5	15,679	40492.5	2,216	902.17	246	0.0547	0.0223	32.4		0.5832	0.8906	65.5
5-10	10,924	41933.0	1,714	986.05	174	0.0409	0.0235	17.4		0.4738	0.7904	59.9
10-20	5,872	29077.0	1,103	714.12	154	0.0379	0.0246	13.4		0.3253	0.6159	52.8
Basis of expected survival: Contemporaneous life tables 1970-2021, Ages 0-99, All Races.												

Chart C. Leukemia Statistics 1975-2022

	M&F		Male		Female	
	No.	%	No.	%	No.	%
Age (Total Leukemia)						
0-14	10,136	7.1	5,594	6.7	3451	7.5
15-34	8312	5.8	4,862	5.9	3451	5.7
35-54	18,923	14.0	11,815	14.3	8108	13.5
55-64	24,002	16.8	14,723	17.8	9279	15.4
65-74	34,308	24.0	20,983	25.4	13,325	22.1
75 up	46,031	32.3	24,575	29.8	21,456	35.7
Total (count and %)	142,713	100.0%	82,552	99.9%	60,161	99.9%
Sex: 1975-2022	M&F		Male		Female	
No. & Percent	142,713	100.0%	82,552	58.8%	60,161	42.2%
Mean age-years	58.4		58.8		57.7	
Race: 1975-2022	White		Black		Other*-unk	
No. & Percent	123,393	86.5%	8217	5.6%	11,103	7.8%
Mean age-years.	59.4		53.0		51.0	
Cohort entrants	M&F	%	Male	%	Female	%
Freq 1975-2022 – total #	142,713	100.0	82,552	57.8	60,161	42.2
Freq 1975-1999	55,179	38.7	31,437	57.0	23,742	43.0
Freq 2000-2022	87,534	61.3	51,115	58.4	36,419	41.6
Surv** 1975-2022 – total #	108,252	75.9	63,068	58.3	45,184	41.7
Surv 1975-1999 - %	46,028	42.5	10-yr Surv	33%		
Surv 2000-2022 - %	62,224	57.5	10-yr Surv	60%		
SEER*Stat 8.4.5 Categories	M&F	%	Male	%	Female	%
<i>LEUKEMIA – SEX</i>	<i>142,713</i>		<i>82,552</i>	<i>57.8</i>	<i>60,161</i>	<i>42.2</i>
Lymphocytic leukemia	72,494	50.8	43,525	60.0	28,969	40.0
Myeloid/Monocytic leuk.	61,701	43.2	34,468	55.9	27,232	44.1
Other leukemia	8518	6.0	4559	53.5	3959	46.5
<i>Total Leukemia Cases</i>	<i>142,713</i>		<i>82,552</i>	<i>57.8</i>	<i>60,161</i>	<i>42.2</i>
<i>LEUKEMIA – RACE</i>	<i>All races</i>	<i>White</i>	<i>%</i>	<i>Black</i>	<i>%</i>	<i>Other*</i>
All leukemia	<i>142,713</i>	<i>123,393</i>	<i>86.5</i>	<i>8,217</i>	<i>5.8</i>	<i>10,156 7.1%</i>
Lymphocytic leukemia	72,494	64,727	89.3	3,576	4.9	3,556 4.9%
Myeloid/Monocytic leuk.	61,701	51,386	83.3	4,082	6.8	5,969 9.7%
Other leukemia	8518	7280	85.5	559	6.6	631 7.4%
<i>Total Leukemia Cases</i>	<i>142,713</i>	<i>123,393</i>	<i>86.5</i>	<i>8217</i>	<i>5.8</i>	<i>10,156 7.1%</i>
Leukemia Types	M&F	%	Male	%	Female	%
Acute Lymphoid	15,302	10.7	8629	56.4	6673	43.6
Mean age-years	24.6		24.1		25.1	
Chronic Lymphoid	52,332	36.7	31,389	60.0	20,943	40.0
Mean age-years	66.2		66.1		66.0	
Other Lymphoid	4860	3.4	3507	72.2	1353	27.8
Mean age-years	59.8		59.7		60.1	
Acute Myeloid	38,761	27.2	21,145	54.6	17,616	45.4
Mean age-years	59.8		60.6		58.7	

Chart C. Continued

Leukemia Types	M&F	%	Male	%	Female	%
Acute Monocytic	2209	1.5	1208	54.7	1001	45.3
Mean age-years	56.6		57.5		55.3	
Chronic Myeloid	18,697	13.1	10,969	58.7	7728	41.3
Mean age-years	59.5		59.4		59.5	
Other Myeloid/Monocytic	2034	1.4	1146	56.3	888	43.7
Mean age-years	62.7		63.2		62.1	
Other Acute Leukemia	3953	2.8	2152	54.4	1801	45.6
Mean age-years	60.5		60.9		60.4	
Alukemic-Subleukemic-NOS	4565	3.2	2407	52.7	2158	47.3
Mean age-years	62.0		63.9		60.0	
Hairy Cell Leukemia	3369	2.4	2655	78.8	714	21.2
Mean age-years	58.6		58.5		59.2	
Total Leukemia	142,713	100.0%	Mean x	58.4 yrs.		
Sex – Mean age-years		Male	58.8	Female	57.7	

* Other-American Indian/Alaska Native, Asian/Pacific Islander.

** Number and percent of M&F Entrants Available for Survival Analysis.

Chart D. Summary Table 10: Impact of Cohort Entrant Time Period on EDR & SR

Leukemia Subtype, Age & Sex	1975-99	2000-22	1975-99	2000-22
	EDR/1000	EDR/1000	SR%	SR%
Leukemia (total-all subtypes), all ages	48	20	33	60
Lymphoid (acute-chronic-other), all ages	42	20	55	77
Myeloid/Monocytic (acute-chronic-other), all ages	74	20	12	39
Male leukemia, all ages	51	22	33	59
Female leukemia, all ages	45	17	34	60
ALL, M&F, Ages 0-14	6	4	85	90
ALL, M&F, Ages 65 up	18	23	6	19
CLL, M&F, Ages 65 up	64	29	47	73
AML, M&F, Ages 65 up	112	38	2	8
CML, M&F, Ages 65 up	199	64	6.1	33