Mortality from Pediatric Leukemias in Brazil: Temporal Analysis from 2011 to 2021

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Mortalidade por Leucemias Pediátricas no Brasil: Análise Temporal de 2011 a 2021

Mortalidad por Leucemias Pediátricas en el Brasil: Análisis Temporal de 2011 a 2021

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ABSTRACT

Introduction: Leukemias are neoplasms that affect hematopoietic cells and represent a significant cause of morbidity and mortality in childhood. **Objective:** To describe the epidemiological profile and analyze the temporal trend of mortality from leukemia in individuals aged 0 to 19 years in Brazil, between 2011 and 2021. **Method:** Ecological, descriptive, and retrospective time-series study with a quantitative approach. Deaths from leukemia among children and adolescents aged 0 to 19 years that occurred in Brazil between 2011 and 2021 were analyzed. Data was obtained from national and international public health databases. Mortality rates were adjusted by age group. Statistical analysis included frequency distribution and application of the Joinpoint Regression Model, with calculation of annual percent changes, considering a 5% significance level and a 95% confidence interval. **Results:** During the period analyzed, leukemias accounted for approximately 28% of childhood cancers, totaling 9,604 deaths, with a peak in 2012. The frequency of deaths was higher among male adolescents aged 15 to 19 years, mainly due to lymphoid leukemias, with emphasis on the Southeast region. An average annual decrease of -1.54% in mortality rates was observed. **Conclusion:** The results show a declining trend in pediatric leukemia mortality, possibly reflecting the positive impact of national public health policies. The study highlights the need for integrated strategies to promote early diagnosis and ensure equitable access to specialized treatment.

Key words: Leukemia/epidemiology; Leukemia/mortality; Leukemia, Lymphoid; Minors; Young Adult.

RESUMO

Introdução: As leucemias são neoplasias que acometem as células hematopoiéticas e configuram importante causa de morbimortalidade na infância. **Objetivo:** Descrever o perfil epidemiológico e analisar a tendência temporal da mortalidade por leucemias em indivíduos de 0 a 19 anos no Brasil, entre 2011 e 2021. **Método:** Estudo ecológico, descritivo e retrospectivo, com abordagem quantitativa, do tipo série temporal. Foram analisados óbitos por leucemias em crianças e adolescentes de 0 a 19 anos, ocorridos no Brasil entre 2011 e 2021. Os dados foram obtidos de bases nacionais e internacionais de saúde pública. As taxas de mortalidade foram ajustadas por faixa etária. A análise estatística incluiu distribuição de frequências e aplicação do modelo de regressão por pontos de inflexão, com cálculo das variações percentuais anuais, considerando nível de significância de 5% e intervalo de confiança de 95%. **Resultados:** No período analisado, as leucemias representaram cerca de 28% dos cânceres infantis, totalizando 9.604 óbitos, com maior concentração em 2012. A frequência de óbitos foi maior entre adolescentes do sexo masculino, com idade entre 15 e 19 anos, acometidos por leucemias linfoides, principalmente na Região Sudeste. Observou-se redução média anual de -1,54% nas taxas de mortalidade. **Conclusão:** Os resultados evidenciam uma tendência de queda da mortalidade por leucemias pediátricas, o que pode refletir o impacto positivo das políticas públicas voltadas ao câncer infantojuvenil. Reforça-se a necessidade de estratégias integradas que promovam diagnóstico precoce e acesso equitativo ao tratamento especializado.

Palavras-chave: Leucemia/epidemiologia; Leucemia/mortalidade; Leucemia Linfoide; Menores de Idade; Adulto Jovem.

RESUMEN

Introducción: Las leucemias son neoplasias que afectan a las células hematopoyéticas y representan una causa significativa de morbilidad y mortalidad en la infancia. **Objetivo:** Describir el perfil epidemiológico y analizar la tendencia temporal de la mortalidad por leucemias en individuos de 0 a 19 años en el Brasil, entre 2011 y 2021. **Método:** Estudio ecológico, descriptivo y retrospectivo, de series de tiempo, con enfoque cuantitativo. Se analizaron las muertes por leucemia en niños y adolescentes de 0 a 19 años ocurridas en el Brasil entre 2011 y 2021. Los datos se obtuvieron de bases de datos nacionales e internacionales de salud pública. Las tasas de mortalidad fueron ajustadas por grupo etario. El análisis estadístico incluyó la distribución de frecuencias y la aplicación del modelo de regresión por puntos de inflexión, con el cálculo de los cambios porcentuales anuales, considerando un nivel de significación del 5% y un intervalo de confianza del 95%. **Resultados:** Durante el período analizado, las leucemias representaron aproximadamente el 28% de los cánceres infantiles, con un total de 9604 muertes, alcanzando su punto máximo en 2012. La frecuencia de muertes fue mayor entre los adolescentes de sexo masculino, de 15 a 19 años, principalmente por leucemias linfoides, con destaque para la región Sudeste. Se observó una disminución media anual del -1,54% en las tasas de mortalidad. **Conclusión:** Los resultados evidencian una tendencia decreciente de la mortalidad por leucemias pediátricas, lo que puede reflejar el impacto positivo de las políticas públicas nacionales orientadas al combate del cáncer infantil y juvenil. El estudio resalta la necesidad de estrategias integradas que promuevan el diagnóstico temprano y el acceso equitativo al tratamiento especializado.

Palabras clave: Leucemia/epidemiología; Leucemia/mortalidad; Leucemia Linfoide; Menores; Adulto Joven.

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INTRODUCTION

Childhood cancer, which includes the 0-19 years age group, is currently the main cause of death from diseases in children and adolescents. Among the neoplasms, we highlight leukemias, which predominantly target blood cells and supporting tissues, presenting different histological types frequently associated with demographic and socioeconomic factors of the analyzed population[1].

Leukemias comprise a heterogeneous group of neoplasms that originate from somatic mutations and monoclonal replication of malignant hematopoietic progenitor cells of myeloid or lymphoid lineage, which infiltrate the bone marrow, peripheral blood, and other tissues. The replacement of normal cells with neoplastic cells can cause the disease to evolve as acute (fast) or chronic (slow)[2].

Several risk factors are associated with pediatric leukemias, like family history of cancer, genetic syndromes (Down syndrome, Li-Fraumeni syndrome), hereditary immunodeficiencies (like ataxia telangiectasia, Wiskott-Aldrich syndrome, Bloom syndrome, Shwachman-Diamond syndrome), in addition to exposure to high levels of radiation, chemotherapy agents, and specific chemical substances[3].

In Brazil, according to estimates from the National Cancer Institute (INCA), 11,540 new cases of leukemia are expected each year for the 2023-2025 triennium[2]. For the pediatric population, the median incidence rate was 154.3 per million, representing around 28% of all cancers diagnosed in childhood[4]. Among those cases, acute lymphoblastic leukemia predominates with 75% to 80% of occurrences, followed by acute myeloid leukemia with 15% to 20%[1].

Regarding mortality, data from the Department of Informatics of the National Health System (DATASUS/SUS) Mortality Information System (SIM)[5] indicate that, in 2023, 751 children and adolescents died from leukemias in Brazil. The deaths are distributed across Regions: Southeast (246), Northeast (232), South (115), North (111), and Central-West (47).

On a global scale, in 2018, leukemias corresponded to 32.5% of cancer cases, totaling 65,111 diagnoses in children and adolescents aged 0 to 14 years. Moreover, leukemias were responsible for 39% of deaths from neoplasms in this age group, with 29,241 recorded deaths[6]. Despite studies that proved stability[7] or reduction in mortality[8], pediatric leukemias still constitute a relevant national and international public health challenge.

In view of clinical suspicion, it is recommended to take a hemogram test within 48 hours. The presence of nonspecific signs and symptoms, like paleness, fatigue, fever, persistent infections, generalized lymphadenopathy, hepatosplenomegaly, bone pain, and hemorrhagic manifestations (petechiae, hematomas), along with laboratory findings such as anemia, leukopenia, neutropenia, or thrombocytopenia, requires immediate referral to specialized evaluation[2,9].

The Brazilian legislation, through the Statute of Persons with Cancer[10], ensures priority care and the right to early diagnosis and appropriate treatment. These actions are essential to improve prognosis, increase survival rates, and reduce oncological complications[11].

Despite legal warranties provided in the Statute, important inequalities in access to diagnosis and treatment of pediatric leukemias persist. In low and medium-income countries, mortality rates remain higher, mainly due to structural limitations and higher incidence of therapeutic complications[12]. In Brazil, regional heterogeneity and socioeconomic inequalities directly influence outcomes, highlighting the need for public policies that broaden equity in oncopediatric care[13].

In this context, temporal trend studies become relevant instruments to identify patterns, assess interventions, and support strategies for childhood cancer control and care, since they are useful tools for longitudinal analysis of events, enabling pattern identification, assessment of public policies, and guidance on cancer control strategies[14]. Regarding pediatric leukemias, the analysis of mortality rates contributes to understanding disease social determinants, supporting planning decisions and assessment of healthcare services.

Thus, this research is justified by the importance of generating updated scientific evidence on mortality from pediatric leukemias, given its high prevalence in Brazil. The study is also in line with the National Policy of Children's Health Integral Care[15], within the context of SUS, by aiming to identify trends and foster the formulation of agile public policies, preventive actions, and strategies that favor survival increase.

Thus, the objective of this study is to describe the epidemiological profile and analyze the temporal trend of mortality from leukemia in individuals aged 0 to 19 years in Brazil, between 2011 and 2021.

METHOD

Ecological time-series study with descriptive, retrospective design and quantitative approach. The research was conducted based on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[16] guidelines, according to recommendations for observational studies in epidemiology. Time-series studies enable the longitudinal analysis of events across

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time, allowing us to understand patterns and variations in indicators of interest for public healthcare[14].

The study setting encompasses the Brazilian territory. Brazil is a country of continental dimensions, located in South America, with a territorial area of approximately 8,510,345 km², composed of 26 States and the Federal District, totaling 5,570 municipalities. According to estimates from the Brazilian Institute of Geography and Statistics (IBGE), the Brazilian population in 2022 was around 203.1 million inhabitants. The country presents a Human Development Index (HDI) of 0.754, classified as high human development, despite marked by regional inequalities[15].

The studied population corresponded to deaths from leukemia recorded among children and adolescents aged 0 to 19 years, which occurred in Brazil from 2011 to 2021. The deaths considered were those whose basic causes were codified according to the 10th Review of the International Classification of Diseases and Related Health Problems (ICD-10)[17], including the following codes: C91 (lymphoid leukemias), C92 (myeloid leukemias), C93 (monocytic leukemias), C94 (other leukemias of specified cell type), and C95 (leukemia of unspecified cell type). The study excluded any pathologies absent from the online mortality atlas of the National Cancer Institute (INCA) or the ICD-10 fixed leukemias grouping.

Information on sociodemographic variables in the epidemiological profile of deaths was obtained from the Mortality Information System[5], available on the Ministry of Health's DATASUS platform. The Brazilian mortality rates were extracted from INCA's online mortality atlas[18], stratified by specific age groups (0–4, 5–9, 10–14, and 15–19 years), and adjusted to the 2010 population, since the 2022 IBGE demographic census[19] was still unavailable on the platform at the time of collection. Age standardization is justified by the possible differences in population age structures, age being a relevant risk factor for leukemias.

The data analysis was conducted in two steps. First, we used the Excel® 365 software (Microsoft Corporation, USA) for descriptive analysis of variables, using absolute and relative frequencies. Next, we applied the regression model by inflection points (Joinpoint Regression Model) to analyze the temporal trend, using the Joinpoint Regression Program[20] software (National Cancer Institute, USA), version 5.0.2. The calendar-year was considered the independent variable of the model.

This type of regression identifies statistically significant changes in the trend inclination, dividing the time-series into segments united by inflection points (Joinpoint)[20]. For each segment, the annual percent change (APC) is calculated, and the model tests whether the addition of new points significantly improves the adjustment through the Monte Carlo permutation test. The global trend measurement was obtained from calculating the average annual percent change (AAPC), weighted by the duration of each segment.

For the results interpretation, a 95% confidence interval (CI) and a 5% significance level ($p \leq 0.05$) were adopted. The trends were classified as stationary (when non-significant), increasing (positive and significant APC), or decreasing (negative and significant APC). To bypass null values in dependent variables, the value 0.000001 was adopted as a continuity adjustment, following the software's technical recommendation[20], being inferior to the Laplace correction and having no relevant impact on the results.

Since this study uses free, publicly available secondary data, it does not require consideration from a Research Ethics Committee, according to Resolution no. 510/16 of April 7, 2016, of the National Health Council[21].

RESULTS

In the analyzed period, 2011-2021, Brazil recorded 9,604 deaths from leukemia in children and adolescents (Table 1). The highest number of deaths occurred in 2012. There was a predominance of the male sex, which corresponded to 57.4% of deaths (n=5,512). The age group with the highest proportion of deaths was the 15-19 years, totaling 27.3% of cases (n=2,621), with a highlight for both male (28.8%; n=1,587) and female (25.3%; n=1,034) individuals.

Regarding education, most records with complete information corresponded to the 4-7 years of study (20.5%; n=1,969), although the high proportion of unknown data in this field must be noted (45.6%; n=4,380), which limits more precise interpretations. Regarding the race/skin color variable, deaths among self-declared white individuals prevailed (46.3%; n=4,451), followed by brown-skinned (42.2%; n=4,055).

Regarding the classification following ICD-10 (Table 1), category C91, lymphoid leukemia, was the main cause of death, responsible for 57% of cases (n=5,483), with a predominance for both sexes. Next, category C92, myeloid leukemia, was responsible for 30.7% of deaths (n=2,947), again equally distributed among girls and boys.

Regarding the Brazilian mortality rates (Table 2), by age group, for both sexes, the higher number of records were for children aged 0 to 4 years (1.73) in 2012, while the lower was for children aged 5 to 9 (1.17) in 2020.

From the analysis of mortality rates stratified by great Brazilian Regions, during the studied period, considering the pediatric age group and both sexes, the North stands out (2.09) with the major record within the territory for

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Table 1. Epidemiological profile of deaths from pediatric leukemia in Brazil, 2011-2021 (n=9,604), by sex, and distributed in absolute (n) and relative (%) frequency

Socio-demographic variables		BRAZIL					
		Male		Female		Total	
		n	%	n	%	n	%
Age group (years)	<1	176	3.2	200	4.9	376	3.9
	1 to 4	1,042	18.9	928	22.7	1,971	20.5
	5 to 9	1,357	24.6	913	22.3	2,270	23.6
	10 to 14	1,350	24.5	1,016	24.8	2,366	24.6
	15 to 19	1,587	28.8	1,034	25.3	2,621	27.3
Education (years of study)	None	351	6.4	245	6.0	596	6.2
	1 to 3	771	14.0	517	12.6	1288	13.4
	4 to 7	1176	21.3	793	19.4	1969	20.5
	8 to 11	754	13.7	540	13.2	1294	13.5
	≥ 12	39	0.7	38	0.9	77	0.8
	Ignored	2421	43.9	1958	47.9	4380	45.6
Race/Color	White	2505	45.4	1946	47.6	4451	46.3
	Black	283	5.1	209	5.1	492	5.1
	Yellow	10	0.2	10	0.2	20	0.2
	Brown	2378	43.1	1677	41.0	4055	42.2
	Indigenous	48	0.9	39	1.0	89	0.9
	Ignored	288	5.2	210	5.1	498	5.2
Deaths from leukemia type (ICD-10 category)	C91	3280	59.5	2203	53.8	5483	57.1
	C92	1568	28.4	1379	33.7	2947	30.7
	C93	17	0.3	16	0.4	33	0.3
	C94	20	0.4	16	0.4	36	0.4
	C95	627	11.4	477	11.7	1104	11.5
Total		5512	57.4	4091	42.6	9604	100.0

Source: SIM/DATASUS, 2025[5].
Captions: C91 – lymphoid leukemias; C92 – myeloid leukemias; C93 – monocytic leukemias; C94 – other leukemias of specified cell type; C95 – leukemia of unspecified cell type.

the year 2016. The minor is attributed to the Southeast (1.06) in the year 2020 (Table 3).

Figure 1 presents the variation of age-adjusted mortality rates by pediatric leukemias in Brazil and its great Regions, throughout the 2011-2021 period. Data stratification by sex and age group allows to identify differences in the temporal behavior of mortality, underscoring regional patterns and age groups more vulnerable to the disease. This analysis contributes to understanding regional inequalities and guiding more specific and targeted strategies for prevention and care.

The time series analysis by Joinpoint regression for Brazil (Table 4), in the 0-19 years age group, in both sexes, showed a decreasing trend in mortality (APC=-1.54%; $CI_{95\%}$ -2.86:-0.22, p<0.05), whose rate went from 1.48 to 1.31/100 thousand. The trend for the Southeast (APC = -2.46%), South (APC = -2.46%), and Northeast (APC=-3.27%) Regions also showed a reduction between 2016 and 2021. Furthermore, considering the male sex, the Southeast (APC=-2.77%) and South (APC=-3.48%) Regions showed a decreasing trend, while all rates for the female sex remained stationary. The Central-West and North Regions maintained stable rates.

DISCUSSION

Leukemias are a set of oncohematological disorders that are highly frequent in childhood, characterized by

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Table 2. Mortality rates from pediatric leukemias in Brazil, 2011-2021, according to age group, for both sexes

Age group	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
0-4	1.46	1.73	1.46	1.37	1.38	1.56	1.32	1.46	1.45	1.27	1.52
5-9	1.45	1.55	1.43	1.4	1.3	1.59	1.38	1.37	1.38	1.17	1.23
10-14	1.43	1.53	1.27	1.36	1.57	1.37	1.29	1.32	1.36	1.21	1.28
15-19	1.56	1.51	1.45	1.43	1.44	1.54	1.41	1.38	1.39	1.23	1.23

Source: INCA, 2025[2].

Table 3. Adjusted mortality rates from pediatric leukemias in Brazil, 2011-2021, according to age group, for both sexes

Territory	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Brazil	1.48	1.57	1.4	1.39	1.43	1.51	1.35	1.38	1.39	1.22	1.32
Central-West	1.5	1.77	1.31	1.53	1.61	1.67	1.26	1.39	1.23	1.24	1.44
Northeast	1.44	1.46	1.21	1.39	1.37	1.6	1.51	1.45	1.47	1.34	1.32
North	1.68	1.68	1.9	1.77	1.98	2.09	1.58	1.81	1.71	1.56	1.78
Southeast	1.35	1.53	1.39	1.2	1.36	1.31	1.14	1.25	1.21	1.06	1.16
South	1.75	1.76	1.48	1.56	1.23	1.33	1.46	1.22	1.59	1.12	1.25

Source: INCA, 2025[2].

multi-causal origin and constituting one of the main causes of mortality from neoplasms in children and adolescents. Thus, understanding its epidemiological behavior, especially regarding mortality and associated sociodemographic characteristics, requires an integrated analysis of population information distributed across time.

In this research, the epidemiological profile of deaths from leukemia in Brazil was predominantly represented by male individuals, in the 15-19 years age group, of unknown education status, of white race/skin color. Previous studies indicate higher mortality in male children and adolescents[4,22], which is possibly correlated to the greater incidence of the disease in this group, according to recent estimates[23].

Lymphoid leukemia was the main cause of death in this sample, with 57.1% of cases in Brazil. Lymphoid leukemias also represent most diagnoses worldwide[4]. Myeloid leukemia, in turn, was the second most frequent cause of mortality, corresponding to 30.7% in the country and 36.4% in the State. A study conducted in the Brazilian State capitals showed a decreasing trend in mortality from lymphoid, myeloid, and other leukemias from 1980-2015, in children and adolescents from Brazilian capitals[8].

In this context, the present study observed a general reduction trend for leukemia mortality rates in the pediatric age group in Brazil from 2011-2021, despite significant regional differences. The aggregated analysis for the 0-19 years population indicated a decline in the Southeast, South, and Northeast Regions (2016-2021 period), with the Southeast responsible for 34% of deaths from pediatric leukemias in the country. The other Regions presented stable trends.

Regarding race/skin color, nationally, 46.3% of deaths were of white individuals. Data from the Oncology Observatory, in Brazil, indicate that, from 2008 to 2017, 47% of deaths from pediatric leukemias occurred in white individuals in the country[24].

On a global scale, Brazil presented a rate of 1.5 deaths per 100 thousand inhabitants, showing mortality rates lower than those of neighboring Latin-American countries, like Ecuador (3.1) and Peru (3.0), which have the highest rates according to the global ranking[6,25]. This pattern can be associated with the relationship between HDI and leukemia indicators, as demonstrated by this worldwide study, which identified a positive correlation between high mortality rates and very high and moderate HDI[26].

Likewise, a global study on cancer in people aged 0-14 years identified that the HDI increase is associated with the increase of incidence and mortality from leukemias, reflecting changes in etiological factors[6]. A predictive study conducted by Torres-Roman projected a mortality increase in some Latin American countries, while Brazil foresees a reduction in rates for females and an increase for males, possibly due to population and risk changes[27].

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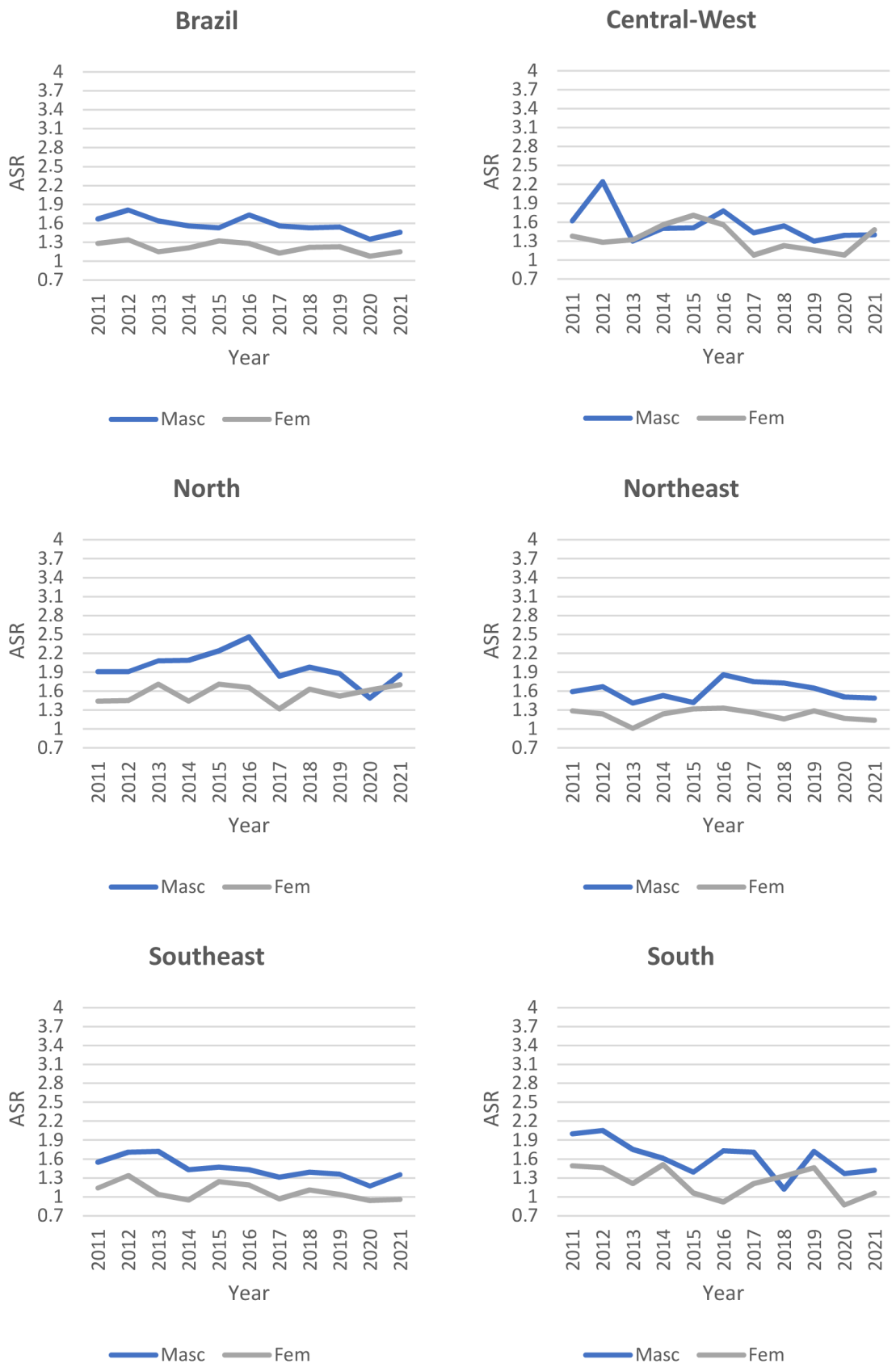

Figure 1. Variation of the age-adjusted mortality rates for pediatric leukemias in Brazil and its great Regions, according to sex and age group, 2011-2021
Source: Elaborated by the authors, adapted from INCA, 2025[2].
Caption: ASR = Age Standardized Incidence Rate.

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Table 4. Variation and trend analysis of mortality from leukemias in the 0-19 years age group, in Brazil and its five Regions, 2011-2021

Sex	Location	Adjusted rate		Joinpoint Regression					
		2011	2021	Joinpoint[1]	Period	APC[2]	Lower[3]	Upper[4]	Trend
Both	Brazil	1.48	1.31		2011-2021	-1.54*	-2.86	-0.22	Decreasing
	Central-West	1.5	1.44		2011-2021	-2.03	-5.82	-1.95	Stationary
	North	1.68	1.78		2011-2021	-0.46	-3.25	2.42	Stationary
	Northeast	1.44	1.32	2013, 2016	2011-2013	-8.29	-15.7	3.39	Stationary
					2013-2016	7.67	-1.15	13.79	Stationary
					2016-2021	-3.27*	-10.62	-0.56	Decreasing
	Southeast	1.35	1.16		2011-2021	-2.46*	-3.73	-1.16	Decreasing
	South	1.75	1.25		2011-2021	-3.22*	-6.28	-0.04	Decreasing
Male	Brazil	1.67	1.46		2011-2021	-1.85*	-3.48	-0.2	Decreasing
	Central-West	1.62	1.4		2011-2021	-2.37	-5.2	0.57	Stationary
	North	1.91	1.86		2011-2021	-156	-4.13	1.06	Stationary
	Northeast	1.59	1.49		2011-2021	0.18	-2.71	3.15	Stationary
	Southeast	1.55	1.35		2011-2021	-2.77*	-5.16	-0.27	Decreasing
	South	2	1.42		2011-2021	-3.48*	-6.16	-0.61	Decreasing
Female	Brazil	1.28	1.15		2011-2021	-1.21	-2.91	0.56	Stationary
	Central-West	1.38	1.48		2011-2021	-1.49	-5.99	3.17	Stationary
	North	1.44	1.7		2011-2021	0.83	-1.38	3.14	Stationary
	Northeast	1.29	1.14		2011-2021	-0.27	-2.38	1.96	Stationary
	Southeast	1.14	0.96		2011-2021	-1.99	-5.27	1.43	Stationary
	South	1.49	1.06		2011-2021	-2.98	-7.62	1.99	Stationary

Source: Elaborated by the authors, adapted from INCA, 2025[2].
Captions: CI = Confidence interval; [1]Inflection point; [2]Annual Percent Change; [3]minimum 95%CI; [4]maximum 95%CI; *p<0.05.

In the Brazilian context, regional and socioeconomic inequalities negatively impact access to healthcare services, despite the presence of SUS, which is public and free, and offers a care network at different technological levels. Factors related to poverty and structural and regional inequality compromise prevention, diagnosis, and treatment actions, affecting the survival of patients[28].

The limitations of this study include: outdated population data for rates standardization, since, at the time of data collection, the last available census was from 2010; outdated worldwide 2020 data, which could affect countries' ranking; and the utilization of secondary data, subject to under-recording and high percentage of unknown information, especially regarding the education and race/skin color variables, impairing the interpretation of these factors in the mortality from leukemias.

Finally, given the scarcity of recent epidemiological studies on the mortality from pediatric leukemias in Brazil using time series, we recommend that further research focus on specific types of leukemias, considering that this study approached the disease from a broader perspective.

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CONCLUSION

The results of this study revealed that the epidemiological profile of mortality from leukemias in children and adolescents in Brazil is characterized by a predominance of the male sex, the15-19 years age group, a high proportion of unknown education status, predominance of white individuals, and higher concentration of deaths in the Southeast Region.

Lymphoid leukemia (ICD-10: C91) was the main cause of death for both sexes. Regarding the temporal trend, there was a decline in mortality rates in Brazil. Specifically for the male sex, lymphoid leukemia presented a downward trend, while remaining stable for the female sex. On an international level, Brazil presented rates lower than those recorded in countries with higher mortality from pediatric leukemias.

These findings contribute to improving public policies and strategies to cope with childhood cancer, especially regarding epidemiological monitoring, planning of preventive actions, and resource allocation. Furthermore, they provide relevant support to managers and researchers to formulate interventions aimed at reducing mortality from leukemias in children and adolescents across the country.

CONTRIBUTIONS

All the authors have substantially contributed to the study design, data acquisition, analysis, interpretation, wording, and critical review. They approved the final version for publication.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

All the contents associated with the article are included in the manuscript.

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