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Segateli L. Oliveira MA, Fornasier GF, Coca MLL, Ferracini ER, Sobrinho CE, Mancini APN, Delchiaro CM
Epidemiological Profile Of Mortality From Falls Among Elderly People In Southeast Brazil: Time Analysis From 2012 To 2023

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Perfil Epidemiológico da Mortalidade por Quedas Entre Idosos no Sudeste Brasileiro: Análise Temporal de 2012 a 2023

Perfil Epidemiológico de La Mortalidad por Caídas En Personas Ancianas En El Sureste de Brasil: Análisis Tiempo de 2012 a 2023

RESUMO

Objetivo: Analisar o perfil epidemiológico da mortalidade por quedas entre idosos na região sudeste do Brasil, no período de 2012 a 2023. **Método**: Estudo descritivo, retrospectivo, a partir de dados sobre óbitos por quedas entre idosos do Sistema de Informações sobre Mortalidade, da base de dados do DATASUS. Foram analisadas variáveis demográficas, socioeconômicas, tipo de queda e local de ocorrência do óbito. Realizou-se o cálculo do coeficiente de mortalidade e da variação percentual anual (VPA) do período analisado. **Resultados:** Foram registrados 62.910 óbitos, com predomínio no sexo masculino (50,7%), faixa etária de 80 anos ou mais (54,5%), raça/cor da pele branca (71%), viúvos (38,8), escolaridade de 4 a 7 anos (23,5%). **Conclusão:** Houve aumento do número absoluto de óbitos, em idosos com ≥ 80 anos ou mais. Isso reforça o impacto do envelhecimento populacional sobre os índices de morbimortalidade, destacando a gravidade das quedas como um problema de saúde pública.
DESCRITORES: Acidentes por quedas; Idoso; Epidemiologia; Mortalidade.

ABSTRACT

Objective: To analyze the epidemiological profile of mortality from falls among the elderly in the southeast region of Brazil, from 2012 to 2023. **Method:** Descriptive, retrospective study, based on data on deaths from falls among the elderly from the Mortality Information System, from DATASUS database. Demographic, socioeconomic variables, type of fall and place of death were analyzed. The mortality coefficient and annual percentage variation (APV) for the analyzed period were calculated. **Results:** 62,910 deaths were recorded, with a predominance of males (50.7%), age group of 80 years or more (54.5%), white race/skin color (71%), widowers (38.8) , 4 to 7 years of education (23.5%). **Conclusion:** There was an increase in the absolute number of deaths in elderly people aged ≥ 80 years or more. This reinforces the impact of population aging on morbidity and mortality rates, highlighting the severity of falls as a public health problem**.**
DESCRIPTORS: Accidental falls; Elderly; Epidemiology; Mortality.

RESUMEN

Objetivo: Analizar el perfil epidemiológico de la mortalidad por caídas entre ancianos en la región Sudeste de Brasil, de 2012 a 2023. **Método:** Estudio descriptivo, retrospectivo, basado en datos sobre muertes por caídas entre ancianos del Sistema de Información de Mortalidad, de Base de datos DATASUS. Se analizaron variables demográficas, socioeconómicas, tipo de caída y lugar de muerte. Se calculó el coeficiente de mortalidad y la variación porcentual anual (APV) para el período analizado. **Resultados:** Se registraron 62.910 defunciones, con predominio del sexo masculino (50,7%), grupo etario de 80 años o más (54,5%), raza/color de piel blanca (71%), viudos (38,8), 4 a 7 años de educación. (23,5%). **Conclusión:** Hubo un aumento en el número absoluto de muertes en personas mayores de ≥ 80 años o más. Esto refuerza el impacto del envejecimiento de la población en las tasas de morbilidad y mortalidad, destacando la gravedad de las caídas como un problema de salud pública.
DESCRIPTORES: Accidentes por caídas; Anciano; Epidemiología; Mortalidad.

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INTRODUCTION

Population aging is a global phenomenon that is occurring rapidly in Brazil. [1] According to data from the 2022 Census, the number of elderly people in the country reached more than 22 million, totaling 10.9% of the population, which represents a growth of 57.4% compared to 2010. [2] This demographic transition presents significant challenges to the health system, especially in the prevention and management of common adverse events in this age group, such as falls. [3]

Falls among the elderly are multifactorial, involving biological, behavioral, environmental and social aspects. Intrinsic factors include changes in balance, muscle weakness, polymedication and the existence of chronic diseases. Extrinsic factors include unsafe environments, lack of residential and urban adaptations, and insufficient public policies aimed at preventing accidents among the elderly. The combination of these factors directly impacts the severity of injuries resulting from falls, including femur fractures, head injuries and complications that can progress to death. [4]

In the global context, falls are among the main causes of morbidity and mortality among the elderly, imposing a substantial burden not only on the individuals directly affected, but also on their families and society as a whole. [5] Recent research indicates an increasing trend in mortality rates due to falls among the elderly in Brazil. Between 2000 and 2019, 135,209 elderly people lost their lives due to falls, with an annual increase rate of 5.45%. [6,7]

In Brazil, the Southeast region has demographic and economic characteristics that make it a strategic setting for the analysis of mortality due to falls in the elderly. This region, which has the largest population in the country, presents a diversity of factors that can influence mortality rates, such as access to health services, socioeconomic inequalities and differences in urban infrastructure. In addition, regional disparities can impact both the incidence of falls and the response capacity of the health system. Therefore, it is crucial to understand the epidemiological profile of mortality due to falls in the elderly in this region, to support the development of more effective public policies adapted to its specific characteristics. [8]

Given the above and the scarcity of studies analyzing mortality from falls in this region, especially in more recent periods, the objective of this study was to analyze the epidemiological profile of mortality from falls among the elderly in the southeast region of Brazil, from 2012 to 2023.

METHODS

This is a descriptive, retrospective, time-series study of deaths due to falls among elderly people in southeastern Brazil, from 2012 to 2023.

The study site, the Southeast Region of the country, occupies an area of 924,565,469 km², has four states, and is inhabited by more than 17 million elderly people (≥ 60 years old), and is the region with the highest proportion of elderly people in the country, at 12.2%.

The study population consisted of people aged 60 or over living in the Southeast Region of Brazil with a death record in the Mortality Information System (SIM). The death records of elderly people were analyzed according to Chapter XX of the International Statistical Classification of Diseases and Related Health Problems – Tenth Revision (ICD-10), corresponding to the category 'Falls' and codes W00 to W19.

The variables investigated were: sex (male; female), age group (in years: 60 to 69; 70 to 79; 80 or older), race/skin color (white; black; brown; yellow; indigenous; no information), education (in years of study: none; 1 to 3; 4 to 7; 8 to 11; 12 or more; unknown), marital

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status (single; married; widowed; separated; other; unknown), state (Minas Gerais; Espírito Santo; Rio de Janeiro; São Paulo), place of death (hospital; home; other health facility; public road; others) and ICD-10 category (W00 to W19).

Mortality rates were obtained by dividing the number of deaths due to falls in elderly individuals aged 60 or over by the estimated number of inhabitants in this age group, according to data and population estimates from the 2022 Census of the Brazilian Institute of Geography and Statistics (IBGE). The results were multiplied by 100,000 inhabitants. The overall mortality rate in the elderly population was calculated, segmented by sex, age group and states in the Southeast region.

In the descriptive analysis of the profile of deaths due to falls, the absolute (n) and relative (%) frequencies of the variables were considered. Mortality rates, place of occurrence of deaths and cause of death were also described. The percentage change (PV) in mortality rates between 2012 and 2023 was calculated using the following formula: mortality rate in 2023 minus the mortality rate in 2012, divided by the mortality rate in 2012, multiplied by 100. The data were analyzed using Microsoft Office Excel 2019.

As this is public domain and anonymized data, there was no need for this study to be submitted for evaluation by a Research Ethics Committee, in accordance with resolution no. 510, of April 7th, 2016, of the National Health Council.

RESULTS

Between 2012 and 2023, 62,910 deaths due to falls among elderly people were recorded in the southeast region. Among these, 50.7% were male and 49.3% were female, with a predominance of those in the age group of 80 years or older (54.5%), white race/skin color (71%), widowed (38.8%), and with 4 to 7 years of education (23.5%). The state of São Paulo recorded the highest number of deaths resulting from this condition (32,081), while the state of Espírito Santo (4,868) recorded the lowest number of deaths (Table 1).

Table 1 – Sociodemographic characteristics of mortality due to falls in elderly people in the southeast region, Brazil, 2012-2023 (no = 62,910)

VARIABLES	Age Group (years) n (%)		
	60-69	70-79	≥80
GENDER			
Male	8638 (27,1)	9136 (28,7)	14098 (44,2)
Female	2832 (9,1)	7039 (22,7)	21167 (68,2)
RACE/COLOR OF SKIN			
White	7011 (15,7)	11295 (25,3)	26336 (59,0)
Black	818 (27,6)	832 (28,1)	1313 (44,3)
Brown	96 (10,8)	232 (26,2)	557 (62,9)
Yellow	3387 (26,0)	3498 (26,9)	6133 (47,1)
Indigenous	3 (15,0)	5 (25,0)	12 (60,0)
No info	181 (13,1)	319 (23,1)	882 (63,8)
MARITAL STATUS			
Single	2524 (30,2)	2294 (27,4)	3543 (42,4)
Married	5159 (24,6)	6967 (33,2)	8852 (42,2)
Widow	1189 (5,0)	4221 (17,6)	18563 (77,4)
Legally separated	1542 (35,6)	1446 (33,4)	1340 (31,0)
Other	219 (39,0)	161 (28,7)	181 (32,3)
Ignored	734 (15,6)	1017 (21,6)	2958 (62,8)
EDUCATION (YEARS)			
None	636 (8,0)	1671 (20,9)	5691 (71,2)
From 1 to 3	2149 (16,4)	3296 (25,1)	7694 (58,6)
From 4 to 7	3215 (21,6)	4097 (27,6)	7545 (50,8)
From 8 to 11	2284 (28,8)	2186 (27,6)	3451 (43,6)
12 or more	556 (19,3)	894 (31,0)	1431 (49,7)
Ignored	2631 (16,3)	4104 (25,5)	9379 (58,2)
STATE			
Minas Gerais	2525 (16,5)	3853 (25,2)	8921 (58,3)
Espírito Santo	846 (17,3)	1169 (23,9)	2871 (58,8)
Rio de Janeiro	2204 (20,6)	2862 (26,7)	5638 (52,7)
São Paulo	5825 (18,2)	8364 (26,1)	17832 (55,7)
Southeast	11400 (18,1)	16248 (25,8)	35262 (56,1)

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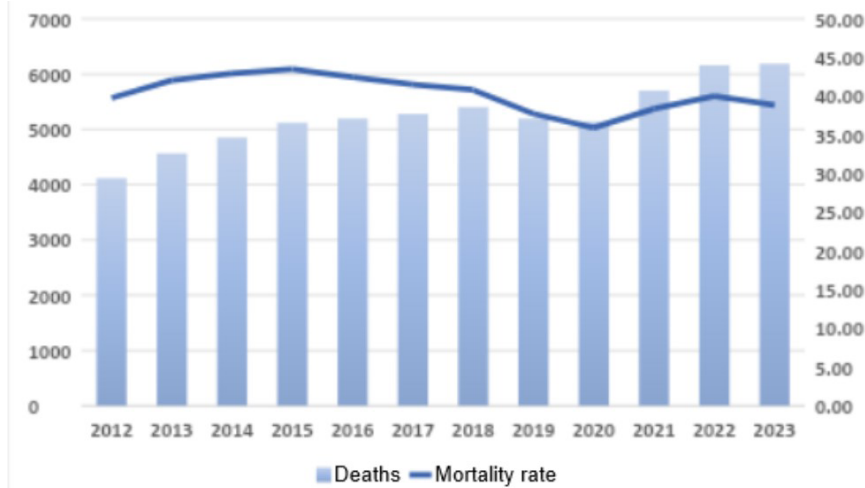
Figura 1 – Relação entre o número de óbitos e taxa de mortalidade por quedas em idosos na região sudeste, Brasil, 2012-2023 (n = 62.910).

Figure 1 shows the variation in deaths and mortality rates in the Southeast region in the historical series. Regarding the number of deaths, there was an increase in the period from 2012 to 2018, with a recession in 2019 and 2020, increasing again in subsequent years, with 2023 being the year with the highest number of deaths (6,192). The highest mortality rate in the time series was recorded in 2015, with 43.52 per 100,000 inhabitants in the Southeast region.

The analysis of deaths due to falls among the elderly, according to year and place of occurrence, showed that the main place of occurrence of deaths was the hospital (86.9%), followed by home (7.3%) in all years of the series (Table 2).

Table 2 – Deaths from falls among elderly people (no = 62,910) per year, according to place of occurrence, Southeast, Brazil, 2012-2023.

YEAR	HOSPITAL	RESIDENCE	ANOTHER HEALTH INST.	PUBLIC WAY	OTHER
	N (%)	N (%)	N (%)	N (%)	N (%)
2012	3734 (90,7%)	241 (5,8%)	70 (1,7%)	16 (0,4%)	57 (1,4%)
2013	4111 (90,0%)	268 (5,9%)	99 (2,2%)	22 (0,5%)	66 (1,4%)
2014	4336 (89,3%)	286 (5,9%)	135 (2,8%)	24 (0,5%)	72 (1,5%)
2015	4607 (90,1%)	298 (5,8%)	109 (2,1%)	16 (0,3%)	85 (1,7%)
2016	4597 (88,5%)	320 (6,2%)	168 (3,2%)	17 (0,3%)	90 (1,7%)
2017	4708 (89,1%)	300 (5,7%)	168 (3,2%)	16 (0,3%)	89 (1,7%)
2018	4784 (88,5%)	343 (6,3%)	168 (3,1%)	25 (0,5%)	86 (1,6%)
2019	4572 (88,0%)	336 (6,5%)	180 (3,5%)	21 (0,4%)	85 (1,6%)
2020	4413 (85,9%)	428 (8,3%)	161 (3,1%)	29 (0,6%)	107 (2,1%)
2021	4900 (86,0%)	471 (8,3%)	210 (3,7%)	33 (0,6%)	83 (1,5%)
2022	5315 (86,9%)	499 (8,1%)	200 (3,2%)	29 (0,5%)	115 (1,9%)
2023	5382 (86,9%)	451 (7,3%)	194 (3,1%)	24 (0,4%)	141 (2,3%)
TOTAL	55459 (88,9%)	4241 (6,7%)	1558 (2,5%)	234 (0,4%)	953 (1,5%)

Regarding the cause of deaths, a higher prevalence of the categories 'W18 – Other falls at the same level' was observed, indicating the age group ≥80 years with 51.8%; 70 to 79 years with 46.8% and 60 to 69 years with 37.6%

Table 3 – Deaths from falls among elderly people (no = 62,910) according to cause of death and age group, Southeast, Brazil, 2012-2023.

Death cause	Age group (years) n (%)		
	60-69	70-79	≥80
W00 Fall from level involving ice and snow	-	1 (0,0)	1 (0,0)
W01 Fall from level by tripping, slipping or false steps	898 (7,8)	1772 (10,9)	4609 (13,1)

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W02 Fall involving roller or ice skates, skis, roller or ice boards	1 (0,0)	2 (0,0)	1 (0,0)
W03 Other falls from level by collision or pushing by another person	7 (0,1	1 (0,0)	7 (0,0)
W04 Fall while being carried or supported by others	3 (0,0)	2 (0,0)	13 (0,0)
W05 Fall involving a wheelchair	21 (0,2)	42 (0,3)	66 (0,2)
W06 Fall from a bed	160 (1,4)	362 (2,2)	1027 (2,9)
W07 Fall from a chair	47 (0,4)	85 (0,5)	248 (0,7)
W08 Fall from other furniture	15 (0,1)	21 (0,1)	112 (0,3)
W09 Fall involving playground equipment	1 (0,0)	3 (0,0)	4 (0,0)
W10 Fall on or from stairs or steps	957 (8,3)	812 (5,0)	735 (2,1)
W11 Fall on or from ladders	107 (0,9)	80 (0,5)	49 (0,1)
W12 Fall on or from scaffolding	172 (1,5)	67 (0,4)	11 (0,0)
W13 Fall from or out of buildings or other structures	870 (7,6)	555 (3,4)	196 (0,6)
W14 Fall from tree	136 (1,2)	88 (0,5)	35 (0,1)
W15 Fall from cliff	7 (0,1)	10 (0,1)	9 (0,0)
W16 Diving-jumping into water causing other trauma in underwater drowning	10 (0,1)	3 (0,0)	3 (0,0)
W17 Other falls from one level to another	1057 (9,2)	842 (5,2)	897 (2,5)
W18 Other falls on the same level	4319 (37,6)	7583 (46,8)	18243 (51,8)

Table 4 shows the annual mortality rates due to falls during the study period. There was a reduction in the mortality rate in the male population from 48.21 per 100,000 inhabitants in 2012 to 46.04 per 100,000 inhabitants in 2023, and in the female population from 34.97 per 100,000 inhabitants in 2012 to 33.21 per 100,000 inhabitants in 2023, corresponding to a reduction of 4.51% for males and 4.75% for females.

In the age group from 70 to 79 years, the mortality rates went from 35.62 per 100,000 inhabitants in 2012 to 33.09 per 100,000 inhabitants in 2023, representing a reduction of 7.10% over the period. Regarding the percentage increase in mortality rates between the end and the beginning of the historical series, the age group from 60 to 69 years old showed a 3.22% increase in mortality rates (Table 2).

When analyzing mortality rates due to falls in the states of the southeastern region of Brazil, the state of Minas Gerais stood out with an increase of 43.11%, going from 31.39 per 100,000 inhabitants in 2012 to 44.92 per 100,000 inhabitants in 2023. All other states in the southeastern region showed a reduction in mortality rates in the period analyzed, with the state of Rio de Janeiro standing out, which went from 32.72 per 100,000 inhabitants in 2012 to 25.39 per 100,000 inhabitants in 2023, representing a reduction of 22.4%.

DISCUSSION

This study analyzed the epidemiological profile of mortality due to falls among the elderly in the Southeast region of Brazil, from 2012 to 2023. The results showed a significant increase in the number of deaths due to falls, mainly in the age group aged 80 years or older. This finding reflects the impact of population aging on morbidity and mortality among the elderly, in addition to reinforcing that this age group is particularly susceptible to the adverse consequences of falls due to physical frailty, chronic diseases and greater functional dependence. [9]

The prevalence of deaths due to falls in males may be related to behavioral factors, such as greater exposure to risky activities, less search for health services and differences in the patterns of use of support devices. [10] In contrast, women had higher mortality in the older age group, probably due to the higher prevalence of osteoporosis, bone fragility and hormonal factors that make falls more fatal. [11]

The regional distribution of deaths revealed a reduction in mortality rates in states such as Rio de Janeiro, Espírito Santo and São Paulo, but with a significant increase in Minas Gerais (+43.11%). This finding corroborates

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the study by Gonçalves et al. (2022), which also pointed out regional variations in Brazil, associating an increase in some areas with socioeconomic inequalities and differences in access to health services. [6] Similarly, another study found that structural and demographic factors impact fall mortality rates, suggesting that interventions targeted to specific regions may be more effective. [7]

According to reports from the World Health Organization (WHO), high-income countries have managed to reduce mortality rates from falls through integrated public policies, while developing countries face greater challenges due to lack of resources and regional inequalities. [5]

The predominance of deaths in elderly people aged 80 or over (54.5%) confirms the greater vulnerability of this age group, which is widely corroborated by the literature. Dutra et al. (2024) highlight that this population has a higher incidence of physical frailty, comorbidities and balance deficits, making them more susceptible to serious falls. 4 Furthermore, the prevalence of deaths among widowers reflects the lack of family support, a factor that, according to Nespolo et al., is directly related to greater functional dependence and a lower probability of adopting preventive measures. [1]

In a study carried out in 2022, in Latin American countries, it was shown that elderly people in situations of socioeconomic vulnerability have a greater risk of fatal falls, highlighting the importance of specific public policies for these populations. [12]

VARIABLES	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	VPA (%)
Table 4 – Mortality rate due to falls in the elderly, according to sex, age group and states, Southeast, Brazil, 2012-2023.													
GENDER													
MALE	48,21	48,74	49,04	49,96	49,91	47,98	47,07	43,65	43,14	44,69	47,28	46,04	-4,51
FEMALE	34,97	36,95	38,28	38,58	36,71	36,49	36,00	33,15	30,33	33,53	34,42	33,31	-4,75
AGE GROUP													
60 TO 69	13,24	13,63	12,99	14,04	13,59	13,20	13,42	12,34	12,63	13,26	12,94	13,67	+3,22
70 TO 79	35,62	37,91	37,94	39,06	36,86	36,97	34,92	30,63	31,05	32,99	35,06	33,09	-7,10
≥80	149,40	158,71	166,86	164,00	162,34	156,35	154,27	145,34	131,00	140,59	147,74	140,43	-6,00
STATES													
MINAS GERAIS	31,39	31,42	36,74	35,37	35,64	43,65	44,00	44,78	40,31	41,40	48,60	44,92	+43,11
ESPÍRITO SANTO	80,06	81,89	89,39	79,84	88,27	90,94	78,29	66,50	62,75	75,92	64,57	67,48	-15,71
RIO DE JANEIRO	32,72	38,06	42,40	41,80	39,06	33,34	33,00	22,95	25,29	29,83	29,48	25,39	-22,40
SÃO PAULO	43,11	45,79	42,55	45,27	43,46	39,88	39,53	38,15	36,04	37,39	38,24	39,09	-9,33
SOUTHEAST	39,78	42,07	42,97	43,52	42,44	41,48	40,81	37,72	35,93	38,39	40,02	38,86	-2,31

Falls from the same level (ICD W18) were the most prevalent cause of mortality, especially in elderly individuals aged 80 years or older. This finding reinforces the results found by Monteiro et al., who pointed to changes in balance and mobility as the main risk factors for serious falls in this age group. 7 Furthermore, the prevalence of deaths in hospital settings (86.9%) highlights the severity of injuries resulting from falls, often related to femur fractures and head injuries. [13]

Research shows that home adaptations and physical interventions aimed at muscle strengthening and balance can significantly reduce the occurrence of falls at the same level, reinforcing the need for integrated prevention. [14,15]

The increase in mortality rates in Minas Gerais contrasts with the reduction observed in Rio de Janeiro (-22.4%), which can be explained by regional differences in infrastructure and investment in health. [16] Research

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carried out in 2019 indicates that states with greater urbanization and better human development indices tend to present better results in health indicators for the elderly. [8]

In comparison, WHO highlights that countries that have implemented preventive policies based on community approaches, such as Canada and Australia, have seen substantial reductions in mortality rates from falls. This reinforces the need for regional strategies adapted to local specificities. [5]

The COVID-19 pandemic may have influenced the data observed between 2019 and 2020, with temporary reductions in deaths followed by increases in subsequent years. Changes in social behavior and the dynamics of health care during the pandemic may have contributed to this fluctuation. [17] This period highlights the importance of strengthening health systems to ensure adequate care for vulnerable populations, even in adverse scenarios. [18]

Polymedication, widely documented as a risk factor for falls in the elderly, also deserves attention. [19] Medications that affect balance, such as anxiolytics and antidepressants, must be closely monitored to minimize the risk of serious falls and their fatal outcomes. [20]

The differences between the states in the Southeast region reinforce the importance of tailored regional interventions. States such as Minas Gerais could benefit from a more detailed analysis of their public policies and resource allocation, while the good results observed in Rio de Janeiro and São Paulo could serve as a model for other regions.

The study results corroborate national and international research that points to falls as one of the main causes of mortality in the elderly. [21] However, Brazil still has relatively high rates when compared to other countries, especially due to social inequalities and limitations in the public health system. [22]

> " Preventive programs, such as physical rehabilitation initiatives, educational campaigns and improvements in urban accessibility, are promising strategies to reduce the impact of falls. "

In addition, it is essential to train health professionals to identify risk factors early and manage cases appropriately. [23]

Although the present study provided a comprehensive analysis of fall mortality among older adults in the Southeast Region, it has limitations, such as the reliance on secondary data and the possibility of underreporting. Future studies should include qualitative analyses to explore the contextual factors that influence falls and evaluate the effectiveness of preventive interventions in different regional settings.

CONCLUSION

The study presented a detailed overview of the epidemiological profile of mortality due to falls among the elderly in the Southeast region of Brazil, from 2012 to 2023, highlighting worrying trends and significant inequalities. The increase in the absolute number of deaths, mainly in individuals aged 80 or over, reinforces the impact of population aging on morbidity and mortality rates, highlighting the severity of falls as a public health problem. In addition, the prevalence of deaths in hospital settings and the predominant association with causes such as falls at the same level point to the need for preventive measures targeted at the domestic and public environments, aiming to reduce the risk of falls and improve post-fall care.

The findings also highlighted the importance of considering regional disparities and sociodemographic characteristics, such as sex, age group, race/skin color and education, when formulating public policies. The reduction in mortality rates in some states suggests that specific regional interventions, such as improvements in access to health care and urban adaptations, are effective and can serve as models. Therefore, it is essential to strengthen intersectoral preventive actions, monitor risk factors such as polypharmacy, and implement strategies that promote safer environments for the elderly. This study contributes to the planning of interventions and public policies aimed at promoting healthier aging and reducing the impacts of falls on the health and quality of life of elderly Brazilians.

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