Temporal trend of mortality in old people in cities in the state of Acre

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Abstract

Objective: To analyze the temporal trend of mortality in the old people population in selected municipalities in the five regional development areas in the state of Acre, Brazil. *Method:* Descriptive, ecological study of time series, which used data from the Mortality Information System (SIM), in which the universe of deaths occurred in old people, recorded in the cities of Acre from 1996 to 2015 was selected. Crude and age-adjusted mortality rates were calculated using the direct method and the world population as a reference. For the analysis of trends, the annual percentage change in mortality was estimated with a 95% confidence level using the Joinpoint Regression Program software. *Results:* The general mortality trend was decreasing in Rio Branco and with fluctuations in the other municipalities investigated. The main causes of death were diseases of the circulatory, respiratory and neoplasms. In Rio Branco, mortality rates standardized by age in diseases of the circulatory system decreased by 2.26% (p<0.001) per year and neoplasms showed an increasing and constant trend with an annual variation of 1.02% (p=0.010). *Conclusion:* The study showed evidence of epidemiological, geographical and social polarization in the behavior of mortality trends. Rio Branco, the state capital, presented similar patterns to those of the developed Brazilian regions. On the other hand, the other municipalities showed considerable fluctuations in trends that may be related to the high proportion of ill-defined causes. These findings can assist in the planning of strategic actions and hypothesis suggestions for further studies.

Keywords: Cause of Death. Time Serie Studies. Health of the Elderly. Mortality. Information Systems.

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INTRODUCTION

Population aging is a worldwide phenomenon and in Brazil it occurs in an intense and accelerated way[1]. This can be evidenced from the aging index (number of people aged ≥60 years for every 100 people >15 years old), which was approximately 39 in Brazil in 2010, more than the triple registered in the year 1950 with 10.2[2]. The current demographic transition has peculiar characteristics with great social inequalities, which, consequently, reflect on a direct impact on the change of the epidemiological profile of the country, in which old people have a triple burden of diseases, with a predominance of chronic conditions, high morbidity and mortality due to acute conditions from external causes and worsening of chronic conditions[1].

In the health-disease process, one of the possible final events may be death[3]. Mortality is an important health indicator that contains relevant information, which may reflect health conditions and the performance of health systems[4]. The processes of collecting, managing, storing and registering deaths in Brazil are carried out in the Mortality Information System (SIM). Through these data, health indicators are produced, which support the decisions of managers, based on the situational health panorama, through consolidated data[5].

In the current epidemiological context, the transition of mortality in the country occurs in a prolonged and polarized way, with different mortality patterns between the regions of Brazil[6]. Even with improvements in the health system, there are still great differences between rich and poor regions, the proportion of causes of death and the age groups that compose them are differentiated between Brazilian regions, as well as the quality of vital statistics, which present scenarios more precarious in the North and Northeast[7]. However, despite this limitation, one should not simply discard these statistics, considering that a large part of the explanatory power of these deaths can be rescued[7].

In 2017, the North region presented a proportion of 8.67% of ill-defined causes of deaths in old people[8]. Regarding the specific rates by defined causes, infectious and parasitic diseases had a rate of 107.11 deaths/100,000 inhabitants, neoplasms 496.12 deaths/100,000 inhabitants, diseases of the circulatory system 1,091 deaths/100,000 inhabitants and diseases of the respiratory system 429.41 deaths/100,000 inhabitants[8].

In this sense, Acre presents patterns of epidemiological polarization with distinct mortality among its five regional development areas. Population aging is present in the state and can be expressed by the additional 21 years of life for individuals who reached 60 years in 2012, close to the average number in Brazil, which was an additional 22 years[8]. This reinforces the growth of the old people population in the state and the importance of knowing the mortality pattern of this population, in view of the need to plan health actions that favor a decrease in the number of deaths from preventable causes and greater life expectancy.

Thus, an analysis of mortality in old people stratified by municipalities in the state of Acre is necessary, in order to obtain knowledge of the behavior of mortality according to the socioeconomic variations of each development region. Therefore, the present study aimed to analyze the temporal trend of mortality in the old people population in selected municipalities in the five regions in the state of Acre, Brazil.

METHOD

It is a descriptive, ecological and time series study. The state of Acre has 22 municipalities in five regional development regions. For this study, the most socioeconomically developed municipality in each of the five regions was selected, which had the largest population, being these: Rio Branco (Baixo Acre), Cruzeiro do Sul (Juruá), Sena Madureira (Purus), Tarauacá (Tarauacá/Envira) and Brasileia (Alto Acre). These municipalities together represent approximately 70% of the state's population.

According to Resolution No. 466/2012, of the National Health Council (CNS), and Law No. 12,527/2011, this study used information from the public and unrestricted access database, whose data do not have the possibility of nominal and

individual identification. Thus, it was not necessary to be evaluated by the Research Ethics Committee.

In the present study, an individual aged ≥60 years was considered an old person. Mortality data were obtained from the Informatics Department of the Unified Health System (DATASUS)[9] of the Ministry of Health of Brazil, through SIM, in which the universe of deaths in old people registered in the above-mentioned municipalities was selected, in the period from 1996 to 2015. Census and inter-census population estimates, according to the age groups of 60-69 years, 70-79 years and ≥80 years, were obtained from DATASUS based on the Brazilian Institute of Geography and Statistics (IBGE).

To analyze mortality, crude mortality rates were calculated, specific for age groups and age-standardized for old people aged ≥60 years. The rates were presented for all causes and for specific ones, grouped by chapters of the 10th review of the International Classification of Disease (ICD-10), in the selected municipalities. For that, the method of proportional reallocation of ill-defined causes was carried out, which consisted of the proportional redistribution of deaths resulting from these causes in the others that resulted in deaths.

For the calculation of crude and adjusted rates, the numerator considered the number of deaths in a given period, in a given population and the denominator contemplated the sum of person time, estimated from the census or inter-census population for July 1 of the middle of the analyzed period and the municipality selected, multiplied by the number of years to which the rate referred.

Mortality rates were presented per 100,000 people/year and their standardization, relative to the population aged ≥60 years, was performed using the direct method, using the world population as the standard, proposed in 1960 and modified in 1966[10]. This reference was adopted for making the results of this study comparable with previous studies[11,12], since this is the most frequent methodology in investigations with this theme.

In order to analyze the quality of the data, calculations of the proportions of ill-defined causes of deaths were performed. The analysis of deaths in old people by age and sex was performed only for Rio Branco due to the large number of records in the state capital, which allows a better assessment of these characteristics instead of grouping them with other municipalities, whose process could sub or overestimate some analyzes, due to the different mortality patterns between them.

To analyze the trend in mortality rates from 1996 to 2015, the Joinpoint Program version 4.5 (Statistical Research and Applications Branch, National Cancer Institute, United States) was used. This regression identifies points of statistically significant changes and the annual percentage change (Annual Percent Change - APC) of mortality rates by the statistical modeling technique, which aims to explain the relationship between two variables by means of regression lines, and the points that join these lines are called inflection or junction points. The analysis makes it possible to adjust data in a series based on the minimum number of joinpoints and tests whether the inclusion of one or more points is significant. The APC in different periods are determined by the amount of inflection points in the model[13]. To minimize the effect of possible autocorrelations, the fit an autocorrelated errors model based on the data option was used.

The final model selected was the one that best described the behavior of the series with APC, using the log-linear model for its calculation, based on the trend of each segment, in order to estimate the statistical significance (p<0.05) at the 95% confidence level using the Monte Carlo permutation method[13]. In describing the trend, the terms "increasing" on slopes and "decreasing" on slopes were used, with a 95% confidence level and for the APC that did not show a p-value <0.05, no trend was observed.

In the municipalities of Cruzeiro do Sul, Brasileia, Sena Madureira and Tarauacá, due to the oscillation resulting from the small number of deaths, the centralized moving average of the standardized mortality rate in old people for three years was calculated in order to perform the smoothing of the time series and minimize white noise.

RESULTS

Between 1996 and 2015, there were 26,347 deaths among old people across the state of Acre, of which 20,840 (79.1%) were from residents in the cities evaluated. The municipalities of Cruzeiro do Sul, Tarauacá, Brasileia and Sena Madureira, although in 2014 they presented proportional mortality from ill-defined causes of 0.5%, 6.8%, 7.8% and 6.1%, respectively, there were moments in historical series with large random oscillations that in addition to the small volume of data, in some moments these proportions were above 50%, especially in years before 2004.

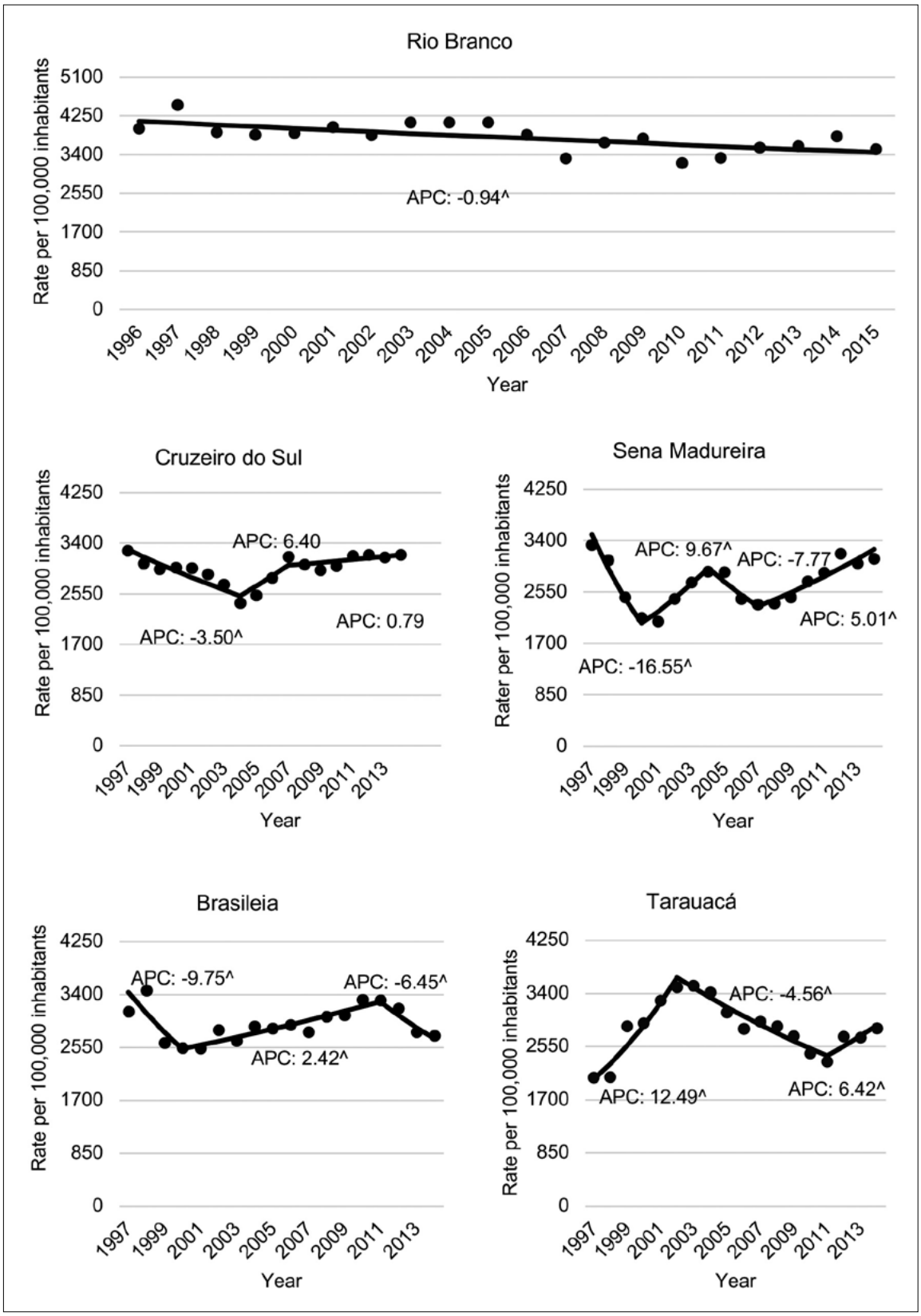
In the selected municipalities, the highest percentage of deaths was in octogenarians (39.1%), followed by those aged 70 to 79 years (33.4%) and 60 to 69 years (27.5%), being 57.8% in men, 69.7% were literate, 80.5% were non-white and 65.6% of deaths occurred in hospitals. The main causes of death were diseases of the circulatory system (29.8%), respiratory (15.0%) and neoplasms (12.9%).

In Figure 1, it can be seen that most municipalities showed changes in trends in general mortality. Rio Branco was the only one that presented a linear downward trend during the entire period studied, with an APC of -0.94%. In Cruzeiro do Sul this trend was only significant in the period from 1997 to 2004 with an APC of -3.5%. During the years 1997 to 2000, the cities of Sena Madureira and Brasileia, which have territorial limits between them, showed a similar pattern of mortality with a decline and APC of -16.55% and -9.75%, respectively; the rest of the period showed fluctuations in trends.

Table 1 shows that the mortality rate in old people due to age-related circulatory system diseases was decreasing in Rio Branco from 1996 to 2015, while neoplasms showed a substantial increase. It is worth mentioning that, except in Rio Branco, the other municipalities showed large fluctuations in rates, as observed in Brasileia, which presented zero rates for infectious and parasitic diseases in 1996, 2012 and 2015 and for neoplasms in 1996. In Tarauacá, oscillations were of zero rate in 1996 to 1,110.12/100,000 inhabitants in 2000 and again zero rate in 2004 for neoplasms. Respiratory system diseases also had a zero rate in 2000.

Table 2 shows the trends according to the main chapters of the ICD-10 for the selected municipalities, from 1996 to 2015. It was found that in Cruzeiro do Sul, the trend of mortality from diseases of the circulatory system was also decreasing, however, this occurred in different periods (from 1997 to 2004 and from 2007 to 2014). The trend of mortality from diseases of the respiratory system in old people did not change significantly in Rio Branco. In Cruzeiro do Sul and Brasileia the trends have been increasing since 2004. The mortality rate due to infectious and parasitic diseases showed a significant reduction in Rio Branco from 1996 to 2011. Mortality rates due to neoplasms in Rio Branco and Cruzeiro do Sul have been growing and constant throughout the studied period. Sena Madureira and Tarauacá showed fluctuations in trends in mortality rates due to neoplasms, while Brasileia did not show any significant change.

In Rio Branco, a significant decline in mortality from all causes was observed in the age groups of 60-69 years and 70-79 years, while the older people showed a growing and significant trend since 2010 (Table 3). Diseases of the circulatory system showed a steadily decreasing trend only in the 70-79 age group. With regard to neoplasms, the age groups of 60-69 years and ≥80 years showed an increase in mortality over the study period. Mortality due to diseases of the respiratory system was increasing and significant only for octogenarians, ranging from 4.01% from 1996 to 2005 to 10.47% from 2009 to 2015.



*APC: Annual Percentage Change; ^ with p value <0.05.

Figure 1. Annual percentage change in general mortality rates among old people in selected municipalities in the five regional development regions of Acre, Brazil, 1996 to 2015.

Table 1. General mortality rates and by the main chapters of the ICD-10, in old people in the selected municipalities of the five regional development regions of Acre, Brazil, 1996 to 2015.

Causes by municipalities	1996	2000	2004	2008	2012	2015
Rio Branco						
All causes	3963.66	3869.21	4133.18	3661.01	3636.20	3515.61
Circulatory System	1578.55	1425.81	1103.91	1383.93	1078.90	1128.61
Respiratory System	601.37	787.81	950.56	530.84	675.38	733.65
Neoplasms	526.42	572.12	699.71	679.38	709.50	652.54
Infectious and Parasitic	399.59	201.78	282.35	164.20	169.84	155.29
Cruzeiro do Sul						
All causes	3685.76	3131.21	2262.25	3161.00	3325.42	3462.16
Circulatory System	2439.74	1180.60	682.37	1204.89	1273.91	984.73
Respiratory System	221.29	427.65	555.27	630.94	664.32	848.74
Neoplasms	539.37	516.11	411.91	570.51	662.87	633.69
Infectious and Parasitic	52.81	282.45	102.78	168.16	92.34	85.55
Sena Madureira						
All causes	3103.43	1295.31	3538.43	2394.17	2904.36	3144.96
Circulatory System	2052.31	637.76	2341.34	1001.16	1112.06	1394.55
Respiratory System	584.24	165.90	322.90	467.21	495.43	517.77
Neoplasms	233.43	223.52	149.74	398.84	507.50	501.72
Infectious and Parasitic	90.65	76.75	170.49	169.55	31.06	97.13
Brasileia						
All causes	1711.58	1599.67	2754.02	3053.78	3128.25	2954.09
Circulatory System	391.39	120.21	966.79	1504.67	945.75	1497.66
Respiratory System	391.39	653.64	274.67	217.02	826.32	516.86
Neoplasms	0.00	120.21	413.82	548.64	518.22	380.72
Infectious and Parasitic	0.00	378.78	271.09	132.94	0.00	0.00
Tarauacá						
All causes	2165.07	3348.98	3983.11	2512.73	2385.26	2802.42
Circulatory System	1101.07	2018.45	2178.83	1779.58	649.34	1073.49
Respiratory System	329.38	0.00	340.16	90.88	281.33	434.00
Neoplasms	0.00	1110.12	0.00	363.53	614.01	399.05
Infectious and Parasitic	367.30	0.00	100.15	112.27	54.62	248.02

Table 2. Annual percentage change in mortality rates, by the main chapters of the ICD-10, in old people in selected municipalities in the five regional development regions of Acre, Brazil, 1996 to 2015

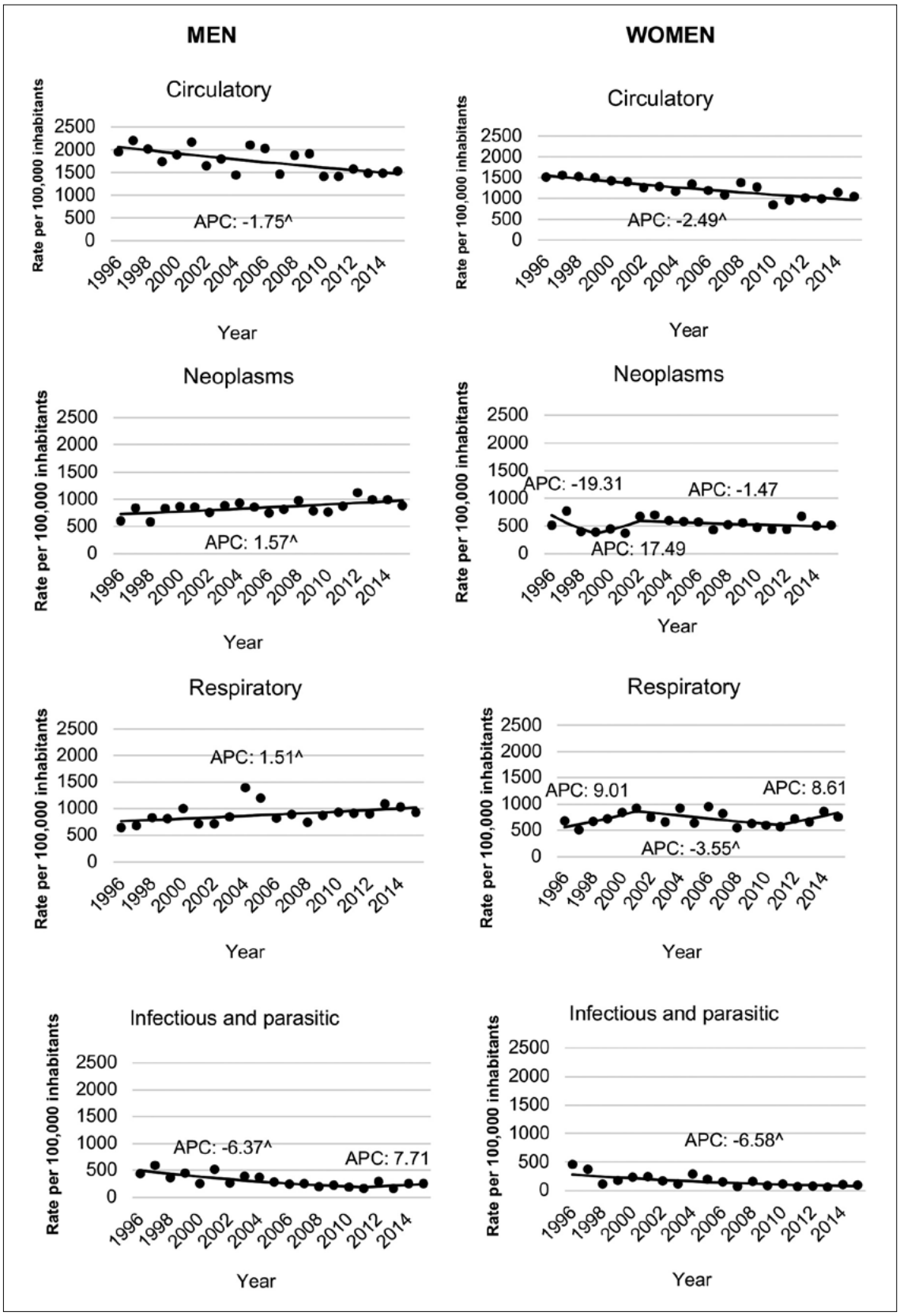
Municipalities	Circulatory system			Respiratory system			Neoplasms			Infectious and parasitic		
	APC*	Period	*p*	APC*	Period	*p*	APC*	Period	*p*	APC*	Period	*p*
Rio Branco	-2.26	1996-2015	<0.001	0.60	1996-2015	0.230	1.02	1996-2015	0.010	-6.97	1996-2011	<0.001
	-	-	-	-	-	-	-	-	-	6.15	2011-2015	0.450
Cruzeiro do Sul	-6.23	1997-2004	<0.001	0.34	1997-2004	0.660	3.88	1997-2014	<0.001	13.52	1997-2001	0.010
	9.44	2004-2007	0.320	3.63	2004-2014	<0.001	-	-	-	-11.42	2001-2004	0.430
	-3.20	2007-2014	0.010	-	-	-	-	-	-	13.68	2004-2007	0.400
	-	-	-	-	-	-	-	-	-	13.71	2007-2014	<0.001
Sena Madureira	-16.03	1997-2001	<0.001	-20.91	1997-1999	0.210	-8.96	1997-2008	<0.001	-13.43	1997-2001	0.040
	24.95	2001-2004	0.090	5.74	1999-2014	<0.001	12.67	2008-2014	<0.001	3.63	2001-2009	0.170
	-18.06	2004-2007	0.120	-	-	-	-	-	-	15.51	2009-2014	<0.001
	4.51	2007-2014	0.040	-	-	-	-	-	-	-	-	-
Brasileia	-12.58	1997-2001	0.070	-18.54	1997-2001	0.150	21.96	1997-1999	0.220	-23.50	1997-2003	<0.001
	1.19	2001-2004	0.270	-25.65	2001-2004	0.370	47.19	1999-2000	0.070	7.18	2003-2009	0.360
	-	-	-	8.23	2004-2014	0.020	-0.45	2000-2014	0.460	-45.64	2009 2012	0.170
	-	-	-	-	-	-	-	-	-	50.01	2012-2014	0.360
Tarauacá	14.23	1997-2003	<0.001	-31.65	1997-1999	0.200	69.03	1997-1999	0.190	-37.69	1997-1999	0.190
	-8.60	2003-2011	<0.001	64.87	1999-2002	0.110	22.92	1999-2005	0.010	10.83	1999-2006	0.010
	2.90	2011-2014	0.700	-23.66	2002-2007	0.010	44.20	2005-2008	0.260	-5.18	2006-2012	0.260
	-	-	-	15.88	2007-2014	<0.001	0.18	2008-2011	0.500	25.82	2012-2014	0.500

*APC: Annual percentage change

Table 3. Annual percentage change in mortality rates from all causes and the main chapters of ICD-10, in old people by age group, in the municipality of Rio Branco, Acre, Brazil, 1996 to 2015.

Causes by age	Annual percentage change	*p*	Period
All causes (years)			
60 to 69	-1.51	<0.001	1996-2015
70 to 79	-1.37	<0.001	1996-2015
≥80	1.07	0.100	1996-2005
≥80	-4.66	0.100	2005-2010
≥80	7.99	<0.001	2010-2015
Circulatory system (years)			
60 to 69	-4.37	<0.001	1996-2004
60 to 69	4.47	0.500	2004-2008
60 to 69	-16.6	0.200	2008-2011
60 to 69	4.39	0.200	2011-2015
70 to 79	-2.56	<0.001	1996 -2015
≥80	-0.69	0.300	1996 -2015
Neoplasms (years)			
60 to 69	1.72	<0.001	1996-2015
70 to 79	-0.10	0.100	1996-2015
≥80	1.55	<0.001	1996-2015
Respiratory system (years)			
60 to 69	0.89	0.200	1996-2015
70 to 79	0.27	0.700	1996-2015
≥80	4.01	<0.001	1996-2005
≥80	-11.04	0.200	2005-2009
≥80	10.47	<0.001	2009-2015

When analyzing the behavior of mortality trends due to specific causes in the municipality of Rio Branco, it was observed that diseases of the circulatory system in both sexes showed a decreasing trend, however, in women this decline was more accentuated (Figure 2). Neoplasms in men, on the other hand, had an upward behavior throughout the analyzed period. On the other hand, women showed fluctuations in mortality rates without significant trends. Respiratory system diseases in men showed an increasing and constant trend in the period from 1996 to 2015. Women, in turn, showed a declining trend in the period from 2001 to 2011. Infectious and parasitic diseases among women had a reduction during the whole period analyzed, similar to men, that was until the year 2011.



*APC: Annual Percentage Change; ^ with p value <0.05.

Figure 2. Annual percentage change in mortality rates by the main chapters of the ICD-10 for all causes, in old people by sex, in the municipality of Rio Branco, AC, Brazil, 1996 to 2015.

DISCUSSION

This investigation analyzed the temporal trend of mortality in the old people population in selected municipalities in the five regional development areas in the state of Acre, Brazil. As a main result, it can be seen that the general mortality trend was decreasing in Rio Branco, while in the other municipalities there were oscillations. The main causes of mortality were diseases of the circulatory and respiratory systems and neoplasms.

The study identified a higher proportion of deaths in long-lived old people, with a result similar to others performed in different regions of Brazil[14-18]. Similar to other studies, deaths were more frequent in men[14,16,19]. One of the hypotheses is that women, generally attend health services[20,21], perform more prevention practices such as reducing the consumption of salt and fatty diet, less alcohol and smoking[20] and culturally experience a greater practice of self-care when compared to men, and since their pre-adolescence they are encouraged to perform gynecological and preventive exams[22]. In addition, occupational injuries and traffic accidents are also more frequent in men[23]. It is worth mentioning the low demand of men for primary care, making them more vulnerable to some diseases and when they finally access services, there is no time for effective treatment of the disease, which can cause greater male morbidity and mortality[24].

In Rio Branco, the mortality rate from all causes showed a decreasing and constant trend over the study period (APC=-0.94%) and (APC=-1.37%) for the age group from 70 to 79 years old. A study carried out in this municipality, which analyzed the trend of mortality from all causes in the period from 1980 to 2012 when assessing by age group, the trends are also similar in terms of their declining behavior in individuals aged 70 to 79 years with a decrease in -1.3%[12], similar to that found in this investigation. Other studies also showed similar results, such as the one carried out in Recife, PE, Brazil, which assessed mortality in old people from 1996 to 2007 and showed a decreasing trend of -0.86% per year[16]. This decreasing and significant trend may be a reflection of better health conditions in the old people population[25], with more favorable quality of care and the effectiveness of care provided in primary care, as observed in a study carried out in Florianópolis, SC, Brazil, in the period from 2008 to 2015[11]. In contrast, the municipalities of Sena Madureira, Brasileia and Tarauacá showed a non-constant trend and, when assessing the evolution of the periods analyzed, most of the time they showed a significant increase in mortality rates in old people. This may be the result of regional inequalities inherent to social unevenness, especially with regard to greater difficulty in accessing health services by the less favored population[6].

The results showed the presence of geographic polarization in Acre, characterized by the difference in mortality rates between the municipalities of different regions of development, since Rio Branco is a more developed city, with greater socioeconomic power in the state and greater availability of health services for old people, reflected a mortality pattern typical of developed regions, while municipalities such as Tarauacá, Sena Madureira and Brasileia showed remarkable fluctuations in mortality rates

The mortality trend due to diseases of the circulatory system was decreasing and constant in Rio Branco throughout the studied period, with an annual reduction of -2.26%. In Recife-PE, Brazil in the period from 1996 to 2007, the reduction in mortality due to diseases of the circulatory system presented a greater magnitude with a decreasing trend of -5.13% per year[16]. In Rio Grande do Sul, Brazil, the mortality rate for this cause per 1,000 inhabitants also decreased from 19.34 in 1996 to 17.15 in 2004[14].

Mortality rates due to neoplasia in Rio Branco and Cruzeiro do Sul showed an increasing and linear trend throughout the study period. In a nationwide study by Lima-Costa et al.[26], there was also a significant increase in the mortality rate from neoplasms, which went from 549.5/100,000 inhabitants in 1980 to 652.3/100,000 inhabitants in the 2000s. Neoplasms play an important role in changing the profile of Brazilian public health and several factors contribute to the increase in mortality from neoplasms in Brazil, such as: increased life expectancy, changes in lifestyle with greater exposure to environmental factors and to carcinogenic agents, improvements in cancer

diagnosis services and advances in the quality of death records[27]. On the other hand, mortality from neoplasms in the municipalities of Sena Madureira, Brasileia and Tarauacá showed an irregular trend. Such behavior may be due to the fluctuation of data and the quality of records, due to the high proportion of ill-defined causes.

The mortality rates due to diseases of the respiratory system in Cruzeiro do Sul and Brasileia showed an increasing trend in the period from 2004 to 2014, similar to the behavior observed in the state of Mato Grosso, Brazil, in the period from 1986 to 2006[15]. It is noteworthy that the pollutants produced by fires can influence the health of old people and be transported over large areas from the areas of origin[28]. According to the National Institute for Space Research in Brazil, in 2005, Acre had the largest number of active fires ever recorded[29]. The points detected by satellites showed high numbers of fires in Brasileia, a city bordering Bolivia and the municipality of Cruzeiro do Sul presented increasing fires in the western limit of the border with the state of Amazonas[30]. These facts may corroborate the upward behavior of mortality from respiratory diseases in these municipalities from 2004 onwards.

Mortality from infectious and parasitic diseases declined in the capital Rio Branco, as well as in another capital Recife-PE, Brazil, which showed a reduction of -34.4% when compared to the rates of 1996 and 2007[16]. However, despite the decline it is noteworthy that in these capitals there is epidemiological polarization, as they simultaneously present high mortality rates due to chronic-degenerative diseases and infectious and parasitic diseases, whose mortality is still high when compared to developed countries[6].

The comparative analysis of mortality by sex and by age group was carried out only in the state capital, Rio Branco, due to a better record of the declaration of deaths that occurred. Individuals aged ≥80 years have health aspects that are different from other old people, due to a series of factors such as higher frequency of chronic diseases and comorbidities, greater social vulnerability and reduced functional capacity[31]. Mortality in octogenarians showed an increasing trend due to neoplasms throughout the analyzed period and due to diseases of the respiratory system in the periods 1996-2005 and 2009-2015. Older people have a lower immune response, decreased diaphragmatic muscle tone and less effective cough reflex, in addition to remaining largely confined to bed, which may favor increased mortality from this cause, notably in this age group[32].

Although mortality from circulatory and infectious and parasitic diseases are declining in both sexes, this has occurred more intensely in women. Bearing in mind that men have a lower life expectancy and higher mortality, resulting in higher male mortality in all age groups, including old people. Similarly, an ecological study in Araraquara-SP, Brazil, which assessed mortality from 2006 to 2011 also identified a greater reduction in mortality from diseases of the circulatory system in women when compared to men, in the period from 2006 to 2008, with a statistically significant difference between the rates[33]. Corroborating this hypothesis, the presence of biological determinants, such as the higher concentration of coronary atherosclerotic complications inherent to males, results in a higher mortality from diseases of the circulatory system, in addition to the cultural and social determinants of less access to health services[23].

Mortality due to neoplasms and diseases of the respiratory system was increasing in men, while in women, no significant trends were detected. The high male mortality from neoplasms was also present in a descriptive study carried out in Florianópolis-SC, Brazil, in 2007, which, when comparing mortality in old people between genders, observed a higher rate in men, mainly due to lung cancer[34].

Regarding the limitations of the study, we can mention the high proportion of deaths from ill-defined causes, demanding caution in the interpretation of results. The redistribution of ill-defined causes between defined causes (except external causes) was applied in order to minimize this limitation. However, the high proportion of ill-defined causes is a reality of the inadequate filling in of death certificates, which reflects in a problem in the data quality of the Mortality Information System. The high proportions of ill-defined causes, especially in old people, were higher in 2013 in the North (11.1%), specifically in the states of Acre (9.5%),

Amazonas (17.9%), Amapá (12.6%), in addition to states in other regions such as Bahia with (15.7%)[35].

Despite these limitations, one of the strengths of this study is the analysis of trends in general and specific mortality rates in old people in municipalities in each state's regional development, which represent about 70% of the old people in Acre, which may make it possible to monitor and evaluate health services, as well as assist in planning for public health actions. In addition to the analysis by chapter of the ICD-10, for Rio Branco the rates were analyzed specific by sex and age group. This assessment allows us to suggest more hypotheses according to the behavior of mortality in these two variables. Another highlight is the methodology used, as there was an approach to mortality rates adjusted by the world population (which allows comparison with other studies that used this methodology) and with correction of ill-defined causes.

CONCLUSION

The results of this study demonstrated the presence of epidemiological, geographical and social polarization with the trend of decreasing general mortality in Rio Branco, while the other municipalities showed oscillations. The main causes of mortality in old people were diseases of the circulatory, respiratory and neoplasms, thus presenting results similar to those in developed Brazilian regions.

Such results may contribute to the discussion of the current epidemiological picture through the evaluation of the mortality indicator, highlighting the basic causes of deaths in old people, according to the main municipalities of each regional development in the state, identifying the main variations in health conditions that can assist in the planning of strategic actions, resource allocation and suggestion of hypotheses for further studies in other locations.

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