

SOCIOECONOMIC INEQUALITY AND HEALTH STATUS AMONG THE BRAZILIAN ELDERLY, 1998 AND 2008

Luciana Correia Alves¹, Natália Martins Arruda²

Abstract

The aim was to present and compare estimates of life expectancy with and without a specific chronic disease among older adult population in Brazil, by sex, and socioeconomic factors for the years 1998 and 2008. Life expectancy with and without hypertension, diabetes, bronchitis/asthma, heart disease was calculated using the Sullivan method and prevalence estimates from data collection at two points from the Brazilian National Household Survey (PNAD). Results indicate that for all chronic diseases there was an increase in mean survival with the disease between the two periods analyzed and all socioeconomic levels. Hypertension was the chronic disease that has caused the greatest influences. Education has showed to be the most important socioeconomic determinant. Higher education increased the average healthy time and shorter survival average years of life with the disease. The socioeconomic inequality affects more negatively the health of the women than men. Despite the social changes in Brazil in recent decades with a reduction in inequality and poverty, it is evident the effect of socioeconomic inequality in the country in the health status of the elderly.

Key words: life expectancy; health of the elderly; health inequalities; socioeconomic factors; Brazil

1 Department of Demography, Population Studies Center Elza Berquó (NEPO), University of Campinas (UNICAMP), Brazil (luciana@nepo.unicamp.br)

2 Institute of Economics, University of Campinas (UNICAMP), Brazil (naty_martins10@hotmail.com)

Introduction

Since the last decades of the past century, Brazil has witnessed a rapid and accentuated decline in its fertility rates, a phenomenon without precedent in the country's history, and which stands out even in comparison with other countries, both in the developed world and in emerging countries. As has happened in the majority of these countries, this decline, in conjunction with the fall in mortality rates, has resulted in the process of producing an ageing population and in the increase of the population's longevity.

Mortality in Brazil has declined significantly from 1940 until the 1970's. This reduction in Brazilian mortality levels was much more rapid than that experienced by developed countries and its evolution over time has caused expressive gains in the life expectancy of the population (Carvalho and Garcia, 2003). Life expectancy has increased by 30 years between 1940 and 2000, from 37.6 to 64.8 years among men and from 39.4 to 72.6 years among women. The results of the Brazilian Demographic Census in 2010 indicate that life expectancy reached 73.48 years (IBGE, 2010). The process of demographic and epidemiologic transition has led to a greater incidence and prevalence of chronic-degenerative diseases, which are the major causes of mortality and an important health problem of the population worldwide, especially among the elderly (WHO, 2008).

Socioeconomic status plays a key role in determining the health of individuals. The effect of socioeconomic status on health is the result of an interaction of psychological and sociological mechanisms such as behavior, social support, environmental factors, and access to goods and health services (House et al, 1994). Some studies have showed that low socioeconomic status is associated with poor health and high mortality risk (Arber, 1991; Marmot et al., 1997). According to Porell and Miltiades (2002), the impact of adverse socioeconomic conditions on the health of individuals is higher in regions with high inequality in income distribution. High income inequality measured in the national, state or community is associated with poorer health (Kaplan et al., 1996).

Brazil is among those with the highest levels of social inequality in the world (Lima-Costa et al., 2006). However, the past two decades have been marked by important social changes, characterized mainly by reducing inequality and poverty. This reduction occurs for the country as a whole, but differently between the regions. The Gini coefficient, which measures income inequality, fell by almost 12%, ranging from 0.61 to 0.54 between 1990 and 2009. The most pronounced changes were observed in the poverty rates. The poverty rate declined from 41.92 to 11.60 between 1990 and 2009. Despite these reductions, significant regional differences are still present (IPEA, 2011; Andrade et al., 2013), maintaining the difference in inequalities among Brazilian regions (South and Southeast versus North and Northeast), or between socioeconomic status (poor versus rich).

Healthy life expectancy is a measure that combines morbidity and mortality information into a single index. It presents a similar concept to life expectancy, but refers to the average number of years of life that a person of a certain age can expect to live healthy, given prevailing morbidity and mortality rates in that particular age.

Thus, healthy life expectancy measures are important to guide public policy because they help governments to plan specific health policies, contributing to the increase in years lived in good health. They can also provide information on the demand for health services, allowing authorities to consider the need for care in the present and future for the population (Portrait et al., 2001). In addition, Bone et al. (1998) point out that healthy life expectancy can observe the health of population trends and can be used to monitor the impact of health and social policies, and allow comparison between different populations and subgroups.

Although there is a fair number of studies investigating the healthy life expectancy in Brazil (IBGE, 2004; Baptista, 2003; Romero et al., 2005; Camargos et al., 2005; Camargos et al., 2009; Campolina et al., 2013; Camargos and Gonzaga, 2015), there are no studies analyzing the healthy life expectancy for a specific chronic disease according to the socioeconomic status and their evolution over time among the elderly.

The purpose of this study is to investigate whether socioeconomic status plays a key role in determining the life expectancy with and without a specific chronic disease of the elderly. In addition, our work hypothesis is that changes in the magnitude of life expectancy would be different according to income versus for education. Therefore, the objective of this study was to present and compare estimates of life expectancy with and without a specific chronic disease among older adult population in Brazil, for the years 1998 and 2008, by sex, and socioeconomic status.

Material and Methods

The study was developed based on data provided by *Pesquisa Nacional por Amostra de Domicílios* (PNAD – Brazilian National Household Survey) from *Instituto Brasileiro de Geografia e Estatística* (IBGE - Brazilian Institute of Demographic Geography and Statistics), by *Sistema de Informação sobre Mortalidade* (MIS - Mortality Information System), by Latin American Human Mortality Database, and by *Tábuas de Mortalidade* (Life Tables), 2014. http://www.ibge.gov.br/home/estatistica/populacao/projecao_da_populacao/2013/default_tab.shtm, accessed in 8/24/2014). PNAD is a cross-sectional household interview survey with national coverage, held annually, in order to obtain information on the household of individuals, migration, education, labor and fertility characteristics. In 1998, PNAD included in its questionnaire, a health supplement whose information should be collected every five years, and 2008 was the most recent available information. We based our calculations on prevalence data from the PNAD cross-section survey of 1998 and 2008. The population and corrected mortality data for underreporting of deaths for 2000 and 2010 were used to generate the estimates of age-specific mortality rates. To calculate we used the population in the middle of the 1998 and 2008 and deaths in the respective years. The estimated population for the middle of 1998 and 2008 was obtained based on the Brazilian Demographic Census of 2000 and 2010.

The prevalence of chronic disease was estimated based on self-reported presence of hypertension, diabetes, bronchitis/asthma, heart disease. The demographic and socioeconomic variables were: age (60-64, 65-69, 70-74, 75-79, 80-84, 85 years or more), sex, household income (80th or more percentile as high income, and 20th percentile or less as low income), and level of education (0 to 4 years of study as low education, and 11 or more years of study as high education).

We estimated the life expectancy with and without chronic diseases for the Brazilian elderly population in 1998 and 2008, based on the construction of life tables, which combined mortality information and prevalence of chronic diseases, as proposed by method Sullivan (1971). The Sullivan method is the most widely used to estimate healthy life expectancy (HLE) (Imai and Soneji, 2007). The most important quantities for calculation of life (and therefore health) expectancy are the person-years lived in each age group by a future cohort assuming that the same age-specific mortality rates apply. To calculate these we need to know the total time spent in each age group by each member of the cohort. These data are not available, as we do not usually have the life story of each individual. Instead, we can do estimation using the population in each age group and the number of deaths in the age group (Jagger et al., 2007).

The age-specific prevalence of healthy (without chronic disease) and unhealthy states (with chronic disease) and age-specific mortality rates in the population was estimates. The expected years in healthy state and unhealthy states are calculated by applying the age- and sex- specific cross-sectional prevalence rates of with chronic disease and without chronic disease, respectively, to the person-years lived in different age categories derived from period life tables (Andrade et al, 2014).

So

$$HLE_x = \frac{\sum [1 - n\pi_x i] nLx}{l_x}$$

and

$$LED_x = \frac{\sum [n\pi_x i] nL_x}{l_x}$$

where HLE_x is the average number of years that an individual will live without chronic disease, starting from exact age x whereas life expectancy with chronic disease (LED_x) is the average number of years that an individual will live with any disease, starting from exact age x . $n\pi_x i$ is a proportion of age group x to $x+n$ with a chronic disease i , which is the prevalence of disease obtained based on the PNAD. nL_x is a person years lived in age interval and l_x is the numbers surviving to age x . Both are obtained from the life table generated based on estimates provided by Mortality Reporting System. $1 - n\pi_x i$ is a proportion of age group x to $x+n$ without chronic disease i . $[1 - n\pi_x] * nL_x$ is a person years lived in age interval without chronic disease. $[n\pi_x] * nL_x$ is a person years lived with chronic disease in age interval x to $x+n$. $\Sigma [1 - n\pi_x] * nL_x$ is a total years lived without chronic disease from age x . It was obtained by the sum of the all $[1 - n\pi_x] * nL_x$ from the age x until the final age group (85 or more). $\Sigma [n\pi_x] * nL_x$ is a years lived with chronic disease from age x .

The total life expectancy (TLE) at each age e_x is found by dividing the total number of years lived from that age by the numbers surviving to age x . Life expectancy with and without chronic disease was estimated according to sex, education and income. All statistical analyses were performed with the aid of the software R version 3.2.2 and Microsoft Excel 2010.

RESULTS

Table 1 shows the prevalence of chronic diseases among the Brazilians elderly in 1998 and 2008. This data reveal that the prevalence of diabetes and hypertension has increased among the elderly and in both sex during the period. In turn, there is a reduction of cardiac and respiratory diseases in both sexes. Hypertension is the most prevalent chronic disease within two years, and in both sexes, followed by heart disease. However, among elderly aged 60, in 2008, in both sexes, the prevalence of diabetes occupies the second position. It was observed that all chronic diseases has increased significantly between the ages of 60 to 80 years, except for diabetes, that has showed a

slight reduction. For men, aged 80, the rate of heart disease rose from 1998 to 2008. As regards to women, the prevalence of all chronic diseases is higher compared to men, in all age groups, but much higher at 80 years old, except in the case of bronchitis in 1998, when women aged 80 showed a lower prevalence than men (8.5% vs. 12.3%, respectively).

Table 1 - Prevalence of hypertension, diabetes, bronchitis/asthma, heart disease among older adults in Brazil by sex and age, 1998 and 2008.

Sex and Age	Hypertension		Diabetes		Bronchitis/asthma		Heart Disease	
	1998	2008	1998	2008	1998	2008	1998	2008
Total	44.0	53.3	10.4	16.1	7.8	5.9	19.1	17.4
60	40.7	48.4	9.3	14.7	6.1	5.1	15.3	13.0
80	46.2	58.4	11.4	17.7	10.0	7.3	23.9	25.1
Men	36.7	46.4	8.1	14.2	7.8	5.5	16.8	16.7
60	34.3	41.7	7.7	13.6	5.5	4.4	13.4	12.4
80	38.3	51.7	7.1	14.9	12.3	6.2	20.6	24.6
Women	49.8	58.7	12.2	17.6	7.7	6.2	20.9	18.0
60	46.1	53.9	10.7	15.6	6.6	5.6	16.8	13.5
80	51.5	62.7	14.3	19.4	8.5	8.0	26.1	25.3

Source: PNAD, 1998 and 2008.

Tables 2 and 3 present the estimates of total life expectancy (TLE), healthy life expectancy (HLE) and life expectancy with chronic disease (LED) by age in 1998 and 2008 for the total population of elderly and sex, income and education, respectively. Life expectancy has increased between 1998 and 2008 in both sexes. In 1998, at the aged 60, women could expect to live, on average, 3.4 years longer than men. In turn, in 2008, women 60 years lived on average 3.5 years longer than men the same age. This increased average survival of women compared to men was also observed at the ages of 80 years.

With regards to income, when decomposing the TLE in healthy and with every chronic disease, we found that hypertension was the chronic disease that has caused the greatest influences. Considering both sexes, a higher income increases the HLE and reduces the LED. However, there are not any significant differences between the high and low-income group. Income did not show major effects between the total and men in both years and ages. In 1998, only women 60 years old and with

high income had a higher average time of healthy survival or hypertension-free in relation to low-income. A similar scenario could be seen for 2008, adding the fact that older elderly women also had a longer healthy survival comparatively low income. In 2008, HLE was lower compared to 1998 in both sexes, age groups (except women 80 years) and in both income groups. Among those with low-income, men had a higher HLE than women, at both ages and in both years. However, in high income, there was no inequality between men and women and also between the ages of 60 and after 80 years old. Only in 2008, women showed a higher average time of healthy survival than men of the same age. As for the LDE, women showed a more favorable overall condition than men in all age groups since they experienced greater median survival time with hypertension and values were worse in the lowest income group and in both periods.

Considering the education, hypertension remains the disease with the highest magnitude compared to others. There are no significant differences in HLE and LED when comparing the low education with low income, in both sexes, both age groups and periods. However, they experienced significant differences and in favor of schooling when looking at high-income with high education. Higher education increases the average length of healthy survival and decreases the average years of living with high blood pressure, being more favorable to women than men, in both years, except for those with the age of 80 who showed a result in the opposite direction and different from that found in the high-income group. As happened with income, in the low education group, men had higher HLE than women, both age 60 as the age of 80 and in both periods.

After hypertension, heart disease is the major chronic disease that influenced the amount of HLE. The average time lived free of disease improved between the two periods, for both sexes, considering both income and schooling, except for men 80 years with high socioeconomic status. In heart disease, there were significant differences when it directly analyzed the high-income groups with high education and low income group with low education level. There was a slight advantage in favor of higher education compared to the group of greater income among women. More education led to a greater increase of HLE and decrease in LED compared to high income in both periods among

women. Women had higher average times of healthy survival than men, in both groups, ages and years. At higher socioeconomic levels, the values were higher. Although women have higher HLE, they also experience greater median survival with heart disease compared to men. However, higher education improved the scenario, does reducing the average time spent with the disease.

Diabetes did not exert important influences. With regards to income, HLE has not significantly changed between the two periods, both in the total population and for both sexes. It appears that there were no significant differences between high and low income groups. Women had healthier life expectancy when compared to men. Median survival with the disease has increased in both periods and in both sexes and the increase was greater among low-income women. A similar scenario was observed when analyzing the level of education. It is important to notice the major differences regarding to what was found for income were observed among women with higher education, which showed longer survival without the disease (18.4 in 1998 and 18.7 in 2008), compared to those with higher incomes (17.5 and 17.8, respectively).

The bronchitis / asthma was a chronic disease that caused the least effect. There are no significant differences when we directly analyzed the high-income groups with high education and low income with low schooling. And there were also no significant differences when comparing the low-income groups with the high-income ones, in both sexes, age groups and periods. Education had greater influence in expected standards of living with the disease in the low education group. The less educated, the more years of high life lived with the disease. Women had longer survival with and without the disease compared to men in all ages, period, and socioeconomic status. The LED was increased in this period and between both sexes.

Table 2 – Total life expectancy, healthy life expectancy and life expectancy with chronic disease among older adults in Brazil by income: 1998 and 2008.

LOW INCOME																			
Sex and Age	TLE		Hypertension				Diabetes				Bronchitis/asthma				Heart Disease				
			1998		2008		1998		2008		1998		2008		1998		2008		
	1998	2008	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	
Total																			
60	19.1	21.2	10.0	9.1	9.0	12.2	16.7	2.4	16.9	4.3	16.7	2.4	18.8	2.4	14.9	4.2	16.6	4.6	
80	7.6	8.9	3.4	4.2	2.9	6.0	5.7	1.9	5.8	3.1	5.6	2.0	6.3	2.6	4.7	2.9	5.4	3.5	
Men																			
60	17.4	19.4	10.6	6.8	9.8	9.6	16.0	1.4	16.3	3.1	15.3	2.1	17.5	1.9	14.3	3.1	15.6	3.8	
80	6.8	8.0	3.9	2.9	3.4	4.6	5.6	1.2	5.8	2.2	5.3	1.5	6.0	2.0	4.9	1.9	5.1	2.9	
Women																			
60	20.8	22.9	9.7	11.1	8.5	14.4	17.6	3.2	17.5	5.4	18.1	2.7	20.0	2.9	15.5	5.3	17.4	5.5	
80	8.2	9.5	3.2	5.0	2.7	6.8	5.8	2.4	5.8	3.7	5.9	2.3	6.4	3.1	4.7	3.5	5.6	3.9	
HIGH INCOME																			
Total																			
60	19.1	21.2	10.7	8.4	9.7	11.5	16.3	2.8	16.7	4.5	17.5	1.6	19.0	2.1	14.9	4.2	16.3	4.9	
80	7.6	8.9	3.5	4.1	3.2	5.7	5.4	2.2	5.7	3.2	5.9	1.7	6.4	2.5	4.7	2.9	4.9	4.0	
Men																			
60	17.4	19.4	10.8	6.6	10.0	9.4	15.1	2.3	15.6	3.8	16.0	1.4	17.8	1.6	14.0	3.4	15.1	4.3	
80	6.8	8.0	4.1	2.7	3.5	4.6	5.3	1.5	5.5	2.5	5.4	1.4	6.1	1.9	4.7	2.1	4.6	3.4	
Women																			
60	20.8	22.9	10.7	10.1	10.5	12.4	17.5	3.3	17.8	5.1	18.8	2.0	20.1	2.8	15.8	5.0	17.4	5.5	
80	8.2	9.5	3.2	5.0	4.5	5.0	5.5	2.7	5.8	3.6	6.2	2.0	6.6	2.9	4.7	3.5	5.1	4.4	

Source: PNAD, IBGE, and MRS, 1998, 2008.

TLE: Total life expectancy; HLE: Healthy life expectancy; LED: Life expectancy with chronic disease.

Table 3 – Total life expectancy, healthy life expectancy and life expectancy with chronic disease among older adults in Brazil by education: 1998 and 2008.

LOW EDUCATION																			
Sex and Age	TLE		Hypertension				Diabetes				Bronchitis/asthma				Heart Disease				
			1998		2008		1998		2008		1998		2008		1998		2008		
	1998	2008	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	HLE	LED	
Total																			
60	19.1	21.2	10.0	9.1	9.0	12.2	16.6	2.5	16.8	4.4	16.9	2.2	18.8	2.4	14.9	4.2	16.4	4.8	
80	7.6	8.9	3.4	4.2	2.9	6.0	5.7	1.9	5.7	3.2	5.6	2.0	6.3	2.6	4.8	2.8	5.1	3.8	
Men																			
60	17.4	19.4	10.6	6.8	10.0	9.4	15.9	1.5	16.3	3.1	15.5	1.9	17.5	1.9	14.2	3.2	15.5	3.9	
80	6.8	8.0	3.7	3.1	3.2	4.8	5.5	1.3	5.6	2.4	5.1	1.7	5.9	2.1	4.8	2.0	5.0	3.0	
Women																			
60	20.8	22.9	9.4	11.4	8.2	14.7	17.4	3.4	17.2	5.7	18.2	2.6	19.9	3.0	15.5	5.3	17.2	5.7	
80	8.2	9.5	3.2	5.0	2.7	6.8	5.8	2.4	5.8	3.7	5.9	2.3	6.5	3.0	4.8	3.4	5.2	4.3	
HIGH EDUCATION																			
Total																			
60	19.1	21.2	11.8	7.3	10.8	10.4	16.9	2.2	17.2	4.0	17.7	1.4	19.2	2.0	15.2	3.9	16.6	4.6	
80	7.6	8.9	4.1	3.5	3.8	5.1	5.6	2.0	5.8	3.1	6.1	1.5	6.4	2.5	5.0	2.6	5.0	3.9	
Men																			
60	17.4	19.4	11.2	6.2	10.4	9.0	15.4	2.0	15.5	3.9	16.2	1.2	17.9	1.5	13.8	3.6	15.0	4.4	
80	6.8	8.0	4.3	2.5	3.7	4.3	5.2	1.6	5.4	2.6	5.7	1.1	6.1	1.9	4.8	2.0	4.4	3.6	
Women																			
60	20.8	22.9	12.3	8.5	11.2	11.7	18.4	2.4	18.7	4.2	19.0	1.8	20.4	2.5	16.4	4.4	18.0	4.9	
80	8.2	9.5	4.0	4.2	3.7	5.8	5.9	2.3	6.1	3.4	6.4	1.8	6.6	2.9	5.2	3.0	5.6	3.9	

Source: PNAD, IBGE, and MRS, 1998, 2008.

TLE: Total life expectancy; HLE: Healthy life expectancy; LED: Life expectancy with chronic disease.

DISCUSSION

This study estimated the life expectancy with and without a specific chronic disease among older adult population in Brazil, for the years 1998 and 2008, by sex, income, and education. Hypertension was the most influential chronic disease, followed by heart disease. For all chronic diseases, there was an increase in average survival with disease between the two periods analyzed and all socioeconomic levels. This is an expected result to the extent that the Brazilian elderly are living longer. The current trend is to have an increasing number of individuals living longer and have a greater number of chronic conditions (Chaimowicz, 1998).

Regarding hypertension, the average number of years lived in good health decreased between the reporting period and in a similar way to income and education. Women lived on average longer with hypertension than men, and this difference is more pronounced in the lowest income group. In other words, a lower income is still rather more favorable to men's health. In 1998, only women 60 years old and with high income had a higher average time of healthy survival or hypertension-free in relation to low-income. In 2008, both younger older women and very older elderly also had a longer healthy survival comparatively low income. And women of 80 years old in 2008 lived longer without hypertension. This finding reinforces the question of survival, which selects, with advancing age, the healthier elderly, considering that those with worse health and greater risks mortality cohort leave earlier. In addition, this study confirms the growing body of evidence that points to the fact that oldest old as a group is quite different. Within this new perspective, it is essential to investigate more carefully these individuals in order to get these possible explanations. Education played a much more pronounced effect on blood pressure than income. Higher education increase the average time healthy and shorter survival average years of life with hypertension, the most favorable scenario for women compared to men, in both years, except for the age of 80 years.

As for heart disease, the average time lived free of disease improved between the two periods, for both sexes, considering both income and education, except for men 80 years with the highest socioeconomic status. More education level led to a greater increase of HLE and decrease in LED compared to the group of high income in both periods among women. Women have higher average times of healthy survival than men, in both groups, ages and years. The values are larger at higher socioeconomic levels. Nevertheless, they experience greater median survival with heart disease compared to men. Women generally have greater insight into disease, are more likely to self-care and seek more medical care than men, which would tend to increase the likelihood of having the disease diagnosed. In contrast, studies highlight that men have higher specific mortality rates, which causes them to leave the cohort earlier. Higher education improves this scenario by reducing the average time spent living with heart disease. There is a slight advantage in favor of higher education in relation to the group of higher income among women. That is, the effect of education is most effective in women.

With regards to diabetes, HLE has not changed significantly between the periods for both sexes and there were no significant differences between the high and low income groups. Socioeconomic inequalities were not very expressive, except for the highly educated group of women for which we found the greater differences towards a longer survival without the disease and lower average time spent living with the disease compared to that found for the high income. Respiratory disease showed no significant differences when comparing income and education. In this case, the schooling also produces the major influences. The lower level of education increased the average years of life lived with the disease. Women had longer survival with and without the disease compared to men in all ages, period, and socioeconomic status.

The results of this study corroborate with previous research (Arber, 1991; House et al, 1994; Kaplan et al, 1996; Marmot et al, 1997), which is that socioeconomic status plays a key role in determining the health of individuals. Higher socioeconomic status increased health. Indicators of socioeconomic status are often measured by education and income. Income and education have a

different effect. Education, for example, encourages access to information and the practice of healthy behaviors (Kubzansky et al., 1998). Education provides several advantages for health because it influences psychosocial and behavioral factors. Older people with a higher level of education are less likely to expose themselves to risk factors for diseases. On the other hand, it is fair to say that the less privileged population must also have a higher prevalence of risk factors already established and considered as modifiable factors (dyslipidemia, hypertension, diabetes mellitus, smoking, obesity, physical inactivity and stress). Higher education favors access to information and lifestyle modification, the adoption of healthy habits, the demand for health services, and involvement in activities that prioritize health promotion, especially, the correct follow-up of related guidelines to health. There is also evidence that low-income elderly acts negatively on healthy behavior, in the home environment, access to services and health care, even if these are properly provided (Alves and Rodrigues, 2005). According to Lima-Costa et al. (2003), the poorest elderly seek less health care, have poor adherence to treatment and have little access to drugs, which directly reflects on the health of the individuals. Income facilitated access to medical services (Zimmer and Amornsirisomboon, 2001). Higher income provides greater opportunity to access to goods and services, including quality education and health care with effective diagnostic and therapeutic resources, including skilled and sophisticated diagnostic equipment (Kaplan and Keil, 1993).

This studied shows that education was the socioeconomic factor that exercised the greatest influence on healthy life expectancy and with disease compared to income.

According to data from the National Household Survey, in 1998, 26.2% of the population had less than a year of education, and among individuals 60 years of age, the proportion was 31.6%. In 2008, it changed to 20.0%, thus representing a reduction of 23.7% in the period. Regarding sex, in 1998, elderly men were proportionally more educated than women (27.9% versus 34.7%, respectively) as until the 1960s, men had more access to education than women. On the other hand, in 2008 there was a reversal in the sense that 21.7% of elderly women aged 60 had less than one year of schooling compared to 23.2% of elderly men. The data show that, despite the progress, there is

still a high number of elderly with no education in the country, which makes education an important factor in determining health conditions.

Education has produced a greater effect on hypertension than income. This can be explained by the fact that high blood pressure is directly related to lifestyle and also the reason that lack of adherence to treatment is one of the greatest problems in controlling blood pressure, both directly influenced by the educational level. Excessive use of salt and high-sodium condiments associated with the consumption of fatty meats, fried foods, sugars and little physical activity depend much more on education than income.

This study points to the existence of socioeconomic differences in cardiovascular morbidity. As with hypertension, schooling introduces major effects. Heart disease is concentrated in the lower socioeconomic levels. Education is an important factor for the adoption of certain behaviors and lifestyle, interfering with the development of this disease. In addition, lower education entails less access to the benefits of prevention and treatment. According to Simões (2002), the missing number of years of life associated with cardiovascular disease in Brazil has declined and that although cardiovascular diseases occupy first place as cause of death in the age group of 60 years or more, they are in decline due to the relative improvement of socioeconomic conditions and new medical technologies, especially in the more developed areas of the country.

The socioeconomic status and gender influenced health of Brazilians through different relationships and intensity (Chor, 2013). There is a differential contribution by sex for several chronic diseases. Gender inequality exhibits a significant influence on health and well-being because it affects most of the determinants of health, including education, occupation, income, social networks, physical and social environment and health services (Plouffe, 2003). The socioeconomic inequality affects the health women more negatively than men. This study reinforces that there is a slight advantage in favor of high education to women's health than income. Brazilian women entered the XXI century with higher educational levels than those of men with a continuous difference over time that has increased in favor of women. The country displays a process of increasing the educational

level and the reversal of the gender gap. It was observed that at older ages in all cohorts, men have higher levels of education than women. However, in younger cohorts, women have started to exceed men since the mid-twentieth century (Alves and Corrêa, 2009).

The advantage of this study was the use of morbidity data with representation at the national level in two periods in time (1998 and 2008), which allowed the monitoring of their evolution over time and guaranteed comparability. Few studies in Brazil collect information on the prevalence of chronic diseases considering a representative sample of the population. An important limitation of this study was the use of self-reported morbidity information about the presence of chronic diseases. That morbidity information helps identify individuals who have had the diagnosis made at least once in life, but omits those unaware of the condition and may lead to underestimation of the prevalence of disease.

CONCLUSION

Healthy life expectancy is an important indicator for public health planning in most countries of the world. In Brazil, some research have studied the healthy life expectancy in the elderly population. However, this study is one of the few that has tried to analyze the healthy life expectancy and the evolution of selected diseases according to the socioeconomic status among the elderly.

Regarding our analyses, the findings of this study confirms our initial hypothesis, which states: socioeconomic status plays a key role in determining the health of individuals. On the other hand, an improvement in socioeconomic level, as measured by income and education may result in an increase in the number of years lived in good health. Education has showed to be the most important socioeconomic determinant.

Despite the social changes in Brazil in recent decades with a reduction in inequality and poverty, the effect of socioeconomic inequality in the health status of the elderly in the country it is also evident. Therefore, this study adds further discussions involving the aging and longevity of the elderly in Brazil. The lack and the need for further studies in smaller levels of geographic aggregation,

such as regions, may guide several other analyses with the purpose of explore the socioeconomic inequality and health status among the Brazilian elderly.

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