Cardiovascular Mortality by Gender and Age Range in the City of Sao Paulo, Brazil: 1996 to 1998, and 2003 to 2005

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Summary

Background: Knowledge on the trends of cardiovascular mortality is important to make hypotheses on its occurrence as well as to support prevention and control measures.

Objectives: To compare mortality for the group of cardiovascular diseases and their main subgroups (ischemic heart diseases and cerebrovascular diseases) in the city of Sao Paulo by age and gender between the periods of 1996 to1998 and 2003 to 2005.

Methods: Data on deaths from the *Programa de Aprimoramento das Informações de Mortalidade para o Município* (Program of Improvement of Information on Mortality for the City), and population estimates from the SEADE Foundation of the State of Sao Paulo were used. The magnitude of mortality and its changes between the three-year periods were measured using the description of coefficients and relative percentage variation. The Poisson regression model was also used to estimate the change in mortality between the periods.

Results: A significant reduction was observed in cardiovascular mortality. The coefficients increased with age in both genders, and were higher in the male population in comparison to the female population, and in the age range of 70 years and older. Mortality coefficients for ischemic heart diseases were higher than those for cerebrovascular diseases among men and women aged 50 years or older. The reduction in the group of cardiovascular diseases was greater among women aged 20 to 29 years (-30%), and among men aged 30 to 39 years (-26%).

Conclusion: The intensity of cardiovascular mortality decreased between 1996 and 1998, and 2003 and 2005, however with differences between the groups. This reduction may reflect, in part, a greater access to diagnostic and therapeutic methods. (Arq Bras Cardiol 2009; 93(5) : 461-467)

Key Words: Cardiovascular Diseases / mortality / epidemiology; Sex; Age of Onset; São Paulo; Brazil.

Introduction

Population health, as measured by mortality indicators, has considerably improved in the past 50 years. In Latin America, three in four adults die of non-communicable diseases, and this indicates a relatively advanced epidemiological transition[1]. In Brazil, cardiovascular diseases (CVD) are the major cause of mortality[2]. In the city of Sao Paulo, CVD were the leading cause of death in 1960; among them, the major causes – ischemic heart disease (IHD) and cerebrovascular disease (CBVD), have decreased since the 1970's, but still show a higher death risk than in other industrialized countries[3-4].

Trends in cardiovascular mortality were analyzed in 13 Brazilian States between 1980 and 1998[5], with increases being observed in Northeastern and Central-Western States, and reductions in Southern and Southeastern States. A multicenter study conducted in Rio Grande do Sul, Sao Paulo and Rio de Janeiro between 1980 and 1999[6] showed variations between the States and capitals. Coefficients for CBVD were higher in the city of Rio de Janeiro, although it had the greatest trend of decline.

A decrease in mortality for CVD has been described in several areas of the world[7-9]. A comparative study between Eastern and Western European countries showed that in Eastern Europe this decline started from the 1970's and continued gradually, whereas in Western Europe, although decreases were only recorded as from 1995, they were steeper and more abrupt[10].

Analyses of death risk for IHD in the Framingham Heart Study (1950 to 1999) cohort showed a reduction in mortality of subjects with and without previous heart disease[11].

Although a decrease in CVD mortality is observed especially in developed areas[12], its magnitude and decline may vary according to periods, regions, gender, and age. Knowledge on the trends of these conditions may lead to hypotheses on their occurrence, support prevention and control measures. The objective of this study was to compare mortality for the group of cardiovascular diseases and their main subgroups – ischemic heart disease and cerebrovascular diseases – in the city of Sao Paulo by age and gender, in two periods: from 1996 to 1998, and from 2003 to 2005.

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Methods

We used secondary data on deaths from the pool of cardiovascular diseases in people residing and dying in the city of Sao Paulo and their most frequent specific causes of mortality – ischemic heart disease and cerebrovascular diseases, in the population aged 20 years and older. The age ranges selected were: 20 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 years and older.

Deaths were grouped into two three-year periods: 1996 to 1998, and 2003 to 2005. In addition to studies of historical series, studies analyzing the trends of conditions have been reported in the literature, comparing two or more different moments[13-14].

The source of death information was the Program of Improvement of Information on Mortality for the City. The basic causes of mortality in the years studied are those coded according to the World Health Organization's International Classification of Diseases 10th revision – IDC 10. The group of cardiovascular diseases corresponds to *cause (chap ICD 10) – IX – diseases of the circulatory system*. For ischemic heart diseases, the codes are: 120-125, and for cerebrovascular diseases, 160-169[15].

Mortality coefficients per 100,000 men and 100,000 women were calculated for all conditions in the age ranges and in each period. The numerator corresponded to the mean death in the three-year period, and the denominator, to the population in the middle of each three-year period. The analysis included data on deaths of three consecutive years in order to reduce the fluctuations in the number of deaths recorded each year. Reference population estimates were obtained from the SEADE Foundation of the State of Sao Paulo, with base on the 2000 census.

The magnitude of mortality for the group of CVD, IHD, and CBVD by gender and age range was observed using the description of mortality coefficients. For the comparison of the differences in the coefficients between the two periods, the relative percentage coefficient variation was calculated between the second and the first periods in the groups selected. In order to verify the trend in mortality in each group, between the periods, the Poisson regression was used with the analysis stratified by gender and age. The model included number of deaths, population, and period, the latter being treated as a dummy variable. The first period (1996-1998) was treated as a reference category. Results of Poisson regression (β) and respective 95% confidence intervals are presented to analyze this trend of change in mortality between the final and initial periods. P values < 0.05 were considered statistically significant. Data were analyzed in the Stata 9.1 program.

Results

Table 1 shows the mortality coefficients per 100,000 for CVD, IHD, and CBVD in men and women by age range in each period, and the relative percentage coefficient variation between the first and second periods.

The mortality coefficients were higher for all causes in the three-year period of 1996-1998 in relation to the three-year period of 2003-2005, except for cerebrovascular diseases in men aged 20 to 29 years.

Mortality was higher in the male population in relation to the female population for all conditions, age ranges and periods. The coefficients increased progressively with age.

The age-adjusted male mortality coefficient for the group of CVD in the population aged 20 years and older (Figure 1) was approximately 367/100,000 men between 1996 and 1998, dropping to 304/100,000 between 2003 and 2005, thus representing a reduction by 17%. Among women (Figure 2), the coefficients decreased from 309 to 250/100,000, respectively, corresponding to a drop by 19%.

In the male population, CBVD were only ahead of ischemic diseases as mortality causes, in the age range of 20 to 29 years and in the second three-year period, with an excess mortality of 14%. In the female population, this phenomenon was observed for both periods in the age ranges from 20 to 49 years, with an excess mortality of CBVD over IHD between 2003 and 2005 of 103% among women aged 20 to 29 years, and 38% among those aged 40 to 49 years.

In the total population, the male/female mortality ratio for the group of cardiovascular diseases was higher than 1.00 in both periods. There were differences in gender ratio according to the age ranges, with values closer to 1.00 among the eldest: 1.24 (1996 to 1998) and 1.29 (2003 to 2005). The highest difference in CVD mortality between men and women was observed in the age range of 50 to 59 years, in which the coefficient ratio was approximately 2 for both periods. In relation to specific causes of mortality, the male/female ratio for IHD was higher than 2 in the age range of 20 to 60 years for both periods, and higher than 1 in the age range of 70 years and older. For cerebrovascular diseases, this ratio was of approximately, or slightly higher than, 1 in all age ranges.

The highest coefficients were recorded in the population aged 70 years and older. In the age ranges of 60 to 69 and 70 years and older, the CVD coefficient practically tripled in both periods and increased by approximately 5 times in the male and female populations, respectively.

CVD are important mortality causes in all age ranges, especially among individuals aged 70 years and older. Among the total deaths for CVD recorded in the city between 1996 and 1998 (62,833) and between 2003 and 2005 (62,223), the proportion of deaths in the age range of 20 to 29 years was 0.9% (n=545) and 0.7% (n=412), respectively. In the age range of 70 years and older, this proportion reached 53.5% (n=33,622) and 57% (n=35,332) in the same periods.

Change in the pattern of cardiovascular mortality between 1996 and 1998, and between 2003 and 2005

The comparison of age-standardized mortality coefficients between the first and the second periods in the population aged 20 years and older showed a reduction in male coefficients by 29% for ischemic heart diseases, and by 23% for cerebrovascular diseases (Figure 1). In the female population, this reduction was of 18% and 20%, respectively (Figure 2).

Table 1 - Mortality coefficients by the group of cardiovascular diseases and their specific causes: ischemic heart diseases and cerebrovascular diseases (per 1,000,000)[a], according to age range and gender, city of Sao Paulo: 1996 to 1998, and 2003 to 2005

Age range/Cause of Death	Men			β (95% CI) [d]	Women			β (95% CI) [d]
	1996 to 1998[b]	2003 to 2005[b]	change in mortality[c] %		1996 to 1998[b]	2003 to 2005[b]	change in mortality[c] %	
20 to 29 years								
All cardiovascular diseases	11.33	9.12	-20	-0.22 (-0.50; 0.07)	7.60	5.33	-30	-0.35 (-0.71; -0.00) [e]
Ischemic heart diseases	2.56	2.08	-19	-0.03 (-0.11; 0.05)	1.24	0.81	-35	-0.06 (-0.19; 0.06)
Cerebrovascular diseases	2.34	2.37	+1	-0.04 (-0.14; 0.04)	2.29	1.65	-28	0.00 (-0.08; 0.08)
30 to 39 years								
All cardiovascular diseases	49.52	36.82	-26	-0.29 (-0.44; -0.15) [e]	28.74	20.69	-28	-0.33 (-0.52; -0.14) [e]
Ischemic heart diseases	18.32	13.19	-28	-0.05 (-0.08; -0.01) [e]	6.50	4.46	-31	-0.05 (-0.11; 0.00) [e]
Cerebrovascular diseases	12.59	8.07	-36	-0.05 (-0.09; -0.00) [e]	11.86	8.45	-29	-0.06 (-0.11; -0.02) [e]
40 to 49 years								
All cardiovascular diseases	181.35	136.90	-25	-0.28 (-0.37; -0.19) [e]	96.04	74.03	-23	-0.26 (-0.37; -0.15) [e]
Ischemic heart diseases	81.10	54.32	-33	-0.06 (-0.07; -0.04) [e]	28.00	21.30	-24	-0.04 (-0.07; -0.01) [e]
Cerebrovascular diseases	48.82	34.66	-29	-0.04 (-0.06; -0.01) [e]	39.18	29.43	-25	-0.05 (-0.07; -0.02) [e]
50 to 59 years							v	
All cardiovascular diseases	485.05	392.21	-19	-0.21 (-0.28; -0.15) [e]	238.25	183.95	-23	-0.26 (-0.34; -0.17) [e]
Ischemic heart diseases	222.44	182.31	-18	-0.03 (-0.04; -0.02) [e]	86.78	68.50	-21	-0.03 (-0.05; -0.01) [e]
Cerebrovascular diseases	120.79	84.64	-30	-0.04 (-0.07; -0.02) [e]	71.85	52.61	-27	-0.05 (-0.07; -0.03) [e]
60 to 69 years								
All cardiovascular diseases	1173.51	940.00	-20	-0.22 (-0.28; -0.16) [e]	622.41	481.68	-23	-0.25 (-0.32; -0.19) [e]
Ischemic heart diseases	541.80	437.90	-19	-0.03 (-0.04; -0.02) [e]	244.32	189.08	-23	-0.04 (-0.05; -0.02) [e]
Cerebrovascular diseases	295.87	216.26	-27	-0.03 (-0.05; -0.01) [e]	156.20	122.18	-22	-0.04 (-0.06; -0.03) [e]
70 years and older								
All cardiovascular diseases	3332.15	2893.40	-13	-0.14 (-0.18; -0.10) [e]	2695.19	2249.84	-17	-0.18 (-0.21; -0.14) [e]
Ischemic heart diseases	1368.20	834.30	-39	-0.02 (-0.02; -0.01) [e]	947.09	806.27	-15	-0.02 (-0.03; -0.01) [e]
Cerebrovascular diseases	881.53	726.59	-18	-0.02 (-0.03; -0.01) [e]	708.77	591.95	-16	-0.02 (-0.03; -0.01) [e]

[a] mean coefficient of the three-year period (Source of crude death data: PROAIM)
[b] Reference population from 1996 to 1998, and 2003 to 2005: estimates of the population residing in the city in 1997 and 2004, respectively (Source: SEADE Foundation of the State of Sao Paulo)
*[c] relative difference of coefficients between 1996 to 1998 and 2003 to 2005 = ((coef.$_{2003-2005}$ - coef.$_{1996-1998}$)/coef. $_{1998-1998}$))*100.*
[d] changes in mortality coefficients were also evaluated using Poisson's regression (stratified for gender and age range), and were presented by estimates of β with respective 95% confidence intervals, which reflect how the coefficients increased or decreased during the study period (1996 to 1998 is the reference period).
[e] P < 0.05

Table 1 shows a reduction in mortality coefficients for CVD, IHD, and CBVD between the two periods, except for CBVD in men aged 20 to 29 years, among whom a 1% increase was observed. In the male population, the change in mortality between the periods was not statistically significant for this age range; however, it was significant for all the other groups and conditions ($p < 0.05$). In the female population, the drop in overall mortality was not significant only for IHD and CBVD among younger women. This phenomenon may be explained by the small number of deaths recorded in the population aged 20 to 29 years.

In both genders, the decrease in CVD mortality was less significant among individuals aged 70 years or older: -13% in men and -17% in women. The greatest reductions in this mortality

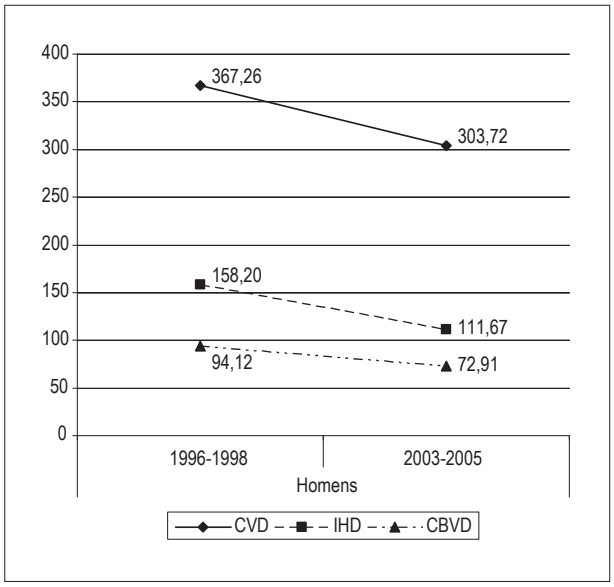

Figure 1 – Evolution of age-adjusted male mortality coefficients in the population aged 20 years and over residing in the city of Sao Paulo, according to the total of cardiovascular diseases (CVD), ischemic heart diseases (IHD) and cerebrovascular diseases (CBVD) between the period of 1996 to 1998, and 2003 to 2005

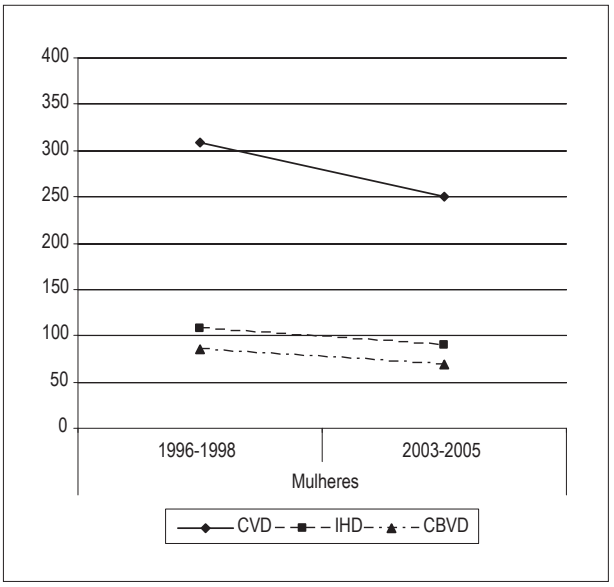

Figure 2 – Evolution of age-adjusted female mortality coefficients in the population aged 20 years and over residing in the city of Sao Paulo, according to the total of cardiovascular diseases (CVD), ischemic heart diseases (IHD), and cerebrovascular diseases (CBVD), between the period of 1996 to 1998 and 2003 to 2005

were observed in the youngest age ranges: -30% for women aged 20 to 29 years, and -26% for men aged 30 to 39 years.

In the male population, the greatest reduction in the risk of death for IHD was observed in the age ranges of 30 to 39 years (-28%), 40 to 49 years (- 33%), and 70 years and older (-39%). For CBVD, the reduction of mortality coefficients was observed as of 30 years; however, unlike observed for IHD, the reduction was smaller in the age range of 70 years and older: - 18%.

In the female population, a reduction in IHD mortality was recorded between the first and second periods in all age ranges, with a lower reduction in women aged 70 years and older (-15%), unlike that observed in men. For CBVD, reduction occurred in all age ranges, but was lower than in the male population, except for women aged 20 to 29 years: -30% versus -20% among men. Like for the male gender, a lower reduction in CBVD mortality was observed in the age range of 70 years and older: -16%.

Discussion

The present study showed a reduction in mortality for the group of cardiovascular diseases and their main specific causes (ischemic heart diseases and cerebrovascular diseases) between the second half of the 1990's and the first half of the 2000's.

Considering the improvement in the quality of information, we should take into account the errors of classification of basic causes of mortality. As regards the ill-defined causes, statistics on mortality in the city of Sao Paulo showed a 1.5% rate in 1989, thus lower than the national mean of 18.4%[16].

The results showed that the decrease in the group of CVD and IHD occurred especially for the female gender in most of the age ranges, and were consistent with studies that assessed the trends in cardiovascular disease mortality in the city. Those previous analyses showed a progressive increase for IHD up to 1976, with a progressive reduction, especially among women[17-19].

The drop in cardiovascular mortality in the city may be partly explained by the technological advancements and easier access to health services, especially after the *Sistema Único de Saúde* (SUS - Unified Health System) was created. Data from the health care network, consolidated by the Department of Information and Technology of the Ministry of Health – DATASUS – from 1995, provide information on the profile of hospital morbidity and mortality for several specific causes, according to the cities in which the patients lived, as well as on diagnostic and therapeutic procedures paid by SUS at the hospital and outpatient care levels[20,21].

Highly complex procedures such as coronary artery bypass grafting (CABG) and coronary angioplasties may have a positive impact by reducing mortality. In 1996, a total of 1,673 CABG and 1,411 coronary angioplasties were recorded in city residents, and in 2003 these figures increased to 2,236 CABG and 3,504 angioplasties, thus representing an increment by 34% and 148% for each procedure, respectively[20,21].

In relation to gender distribution, the data available between 2000 and 2004 showed that 3,509 coronary angioplasties were performed in the male population in the two-year period of 2000-2001, increasing to 4,817 in the two-year period of 2003-2004, thus corresponding to a 37% increase between the two periods. The number of CABG in 2002 was 195, reaching 1,422 in 2003-2004, that is, an increase by 630%[20,21].

In the female population, the number of coronary angioplasties in 2000-2001 was 1,776 and 1,870 in 2003-

2004, representing an increase by 5.3%. In 2002, 95 CABG were performed, reaching 776 in the two-year period of 2003-2004, therefore an increase by 717%[20,21].

In 1998, a total of 38,130 hospital admissions were paid by SUS for the group of diseases of the circulatory system, going to 62,993 in 2007. Acute and chronic ischemic heart diseases corresponded to 8,938 and 15,363 hospitalizations in the same years, respectively. Strokes accounted for 1970 hospitalizations in 1998, reaching 6,020 in 2007[20,21].

The analysis of the periods of 1996-1998 and 2003-2005 revealed a total of 6,713 hospitalizations for acute myocardial infarction in 1996 to 1998, reaching 16,636 in 2003 to 2005, that is, an increase by 148%. Hospitalizations for unstable angina went from 7,089 in the first period to 11,379 in the second, thus an increase by 60%, whereas hospitalizations for stroke increased from 13,076 to 19,331 (an increase by 48%)[20,21].

Reduction in IHD mortality was more significant among men aged 70 years and older in comparison to other age ranges and to women of the same age range. A study on early mortality in Brazil in the 1980's[17] showed that approximately 50% of the male deaths for IHD occurred before 65 years of age, reflecting the phenomenon that most of the Brazilian population belonged to this age range, which consequently concentrated a greater proportion of deaths. Based on the findings of the present study, we should point out the importance of investigating the factors related to the differences in the reduction of IHD mortality observed by gender among long-lived individuals, although several studies have shown that IHD mortality rates have been higher in the male gender in all age ranges[17-19].

Elderly individuals aged 70 years and over had much higher mortality coefficients in both genders, and also lower reduction in mortality for the causes analyzed (except for IHD among men). These results should be carefully interpreted, since a very broad age range was used, without including, for instance, the very elderly (85 years and older). Thus, there may have been differences by age and gender that were not detected in the group of 70 years and over.

We should underscore that the oldest individuals present aging-related morphologic changes, which play an important role in the occurrence of CVD[22]. Systemic hypertension, which is the most prevalent non-communicable condition in this population, is also an important risk factor for cardiovascular diseases[22].

The population-based cohort study on health, well-being and aging – SABE[23], conducted in the city of Sao Paulo, showed that hypertension was the most frequent disease among people aged 60 years and older in the year of 2000 (56.3% in women, and 49.1% in men). Additionally, approximately 15% of the women and 26.5% of the men were not using antihypertensive medication.

The analysis of mortality in elderly people has peculiarities in relation to other age groups, since the major risk factor is still the age itself. The heterogeneity of the elderly population is also an important component of this process[24,25]. Among the factors that influence this heterogeneity, other than anatomical and functional changes, polypharmacy can be mentioned which contributes to increased toxicity and interaction between certain drug compounds, as well as variables related to the lifestyle and social support[24]. Contextual variables depend on a complex interaction between individuals and the environment, and vary according to the different social and cultural patterns[25].

The population-based EPIDOSO project being carried out in the city of Sao Paulo since 1991[25] showed that the risk factors for all-cause mortality in a cohort of elderly people were age (advanced), gender (male), history of sedentary lifestyle, occurrence of stroke, and others.

In the present study, a higher risk of dying of IHD than of CBVD was observed in the male gender from 30 years on, and in the female gender from 50 years on in both periods analyzed. These data are different from those obtained in a study conducted in the city of Maringá (State of Paraná, Brazil) in individuals aged 60 years and older[26], in which the coefficients for CBVD were higher than those for IHD in both genders between 1979 and 1981, and between 1996 and 1998. In Brazil, among CVD, cerebrovascular diseases are the major cause of death[27].

In 2002, considering all causes of death, cerebrovascular diseases accounted for 87,344 deaths in Brazil. Of these, 42,883 (49%) were recorded in the female gender, and the highest percentages were observed in the less socioeconomically developed regions such as the North, Northeast and Central-West[28]. The social determination of cerebrovascular disease mortality has been addressed in the scientific literature. A study in the population aged between 30 and 79 years in the city of Sao Paulo from 1999 to 2001, using race/color as a socioeconomic variable, showed a trend of progressive increase in the gradient of cerebrovascular disease coefficients for the mixed race/color followed by blacks in comparison to whites in both genders[29].

Since the frequency of cardiovascular diseases is associated with known risk factors, intervention on these risk factors may interfere with the morbidity and mortality for CVD. Modifiable risk factors are those resulting from customs and habits that are harmful to the human body and that may be modified, minimized, or eliminated by means of primary prevention measures (smoking, physical inactivity, hypertension, diabetes, hypercholesterolemia, obesity)[27].

Avezum et al[30] analyzed the risk factors associated with acute myocardial infarction (AMI) in a case-control study in 12 hospitals in the metropolitan area of Sao Paulo. History of systemic hypertension, family history of coronary insufficiency, smoking, obesity, history of diabetes, and serum LDL-cholesterol levels ≥ 100mg/dL were proven independent factors associated with the risk of AMI.

In relation to hypertension, the number of hospitalizations for essential hypertension (code I10 of the International Classification of Diseases – 10th revision) among people residing in the city of Sao Paulo in 1998 was 3,156 in public hospitals and hospitals providing care for SUS patients, and increased progressively, reaching 7,102 in 2007[20,21]. As regards the primary health care network in the city, data on SUS outpatient production showed a total of 123,803 nursing procedures provided to women in the year 2001,

with a progressive increase to 2,478,661 in 2007. In the same period, this category of procedure increased from 64,526 to 1,364,440 in the male gender[20,21].

As regards health promotion measures, the "*Promoção do estilo de vida ativo: O Agita São Paulo*" project for the promotion of an active lifestyle was created in 1996, is being carried out in the State of Sao Paulo, and its target population is comprised of students, workers and the population aged 60 years and over. The program uses intervention approaches for the individuals living in the state, and encourages the engagement in moderate physical activity 30 minutes per day[31,32]. Intervention studies comparing specific groups in order to evaluate the impact of the program were conducted between 1999 and 2002 in the metropolitan area of Sao Paulo, showing positive results with changes in the level of physical activity throughout time[32,33].

Health promotion measures and changes in relation to risk factors could only partly explain a reduction in morbidity for cardiovascular diseases, with a subsequent impact on mortality. A household survey on risk behaviors and self-reported morbidity of non-communicable diseases and conditions conducted in 2002 and 2003 in Brazilian capitals showed that, in relation to other cities analyzed, the city of Sao Paulo had the highest percentage of excess weight among people aged 50 years and older (BMI > 25), and a value close to the worst overweight indicator in the population aged 25 to 49 years[34]. Sao Paulo also had the highest percentage of individuals reporting the diagnosis of diabetes, of men with hypertension, and of hypertensive individuals aged 40 years and over in both genders[34]. Hypertension and diabetes, which are known risk factors for CVD, are also morbidities, so the structure of the age range of the population interfering in the frequency of these conditions should be considered because of the proportional increase of the elderly population. However, the results of this survey showed that the city had the highest national prevalence of diabetic individuals between 25 and 39 years of age[34].

In relation to cigarette smoking, the city stood out among the capitals of the country in the 1989 survey, but no longer in 2003-2003. However, the percentages of smokers of both genders are still high when compared to the highest value in Brazil, with a larger proportion among the male population[34].

Also in the previously mentioned survey, we can observe that the city of Sao Paulo had the best result in the country for daily alcohol consumption, considered classified as a of risk factor when positive for the past the 30 days preceding the interview. In relation to the frequency of individuals considered non-sedentary, the city had rates close to the best value found in the country, especially in the male population and among individuals of both genders aged 15 to 24 years[34].

The World Health Organization states that, in addition to the prevention of modifiable risk factors, to the access to health services, and to the use of diagnostic and therapeutic methods, the secondary prevention of cardiovascular events such as fatal and non-fatal acute myocardial infarction (AMI) as well as fatal and non-fatal cerebrovascular accidents (CVA) play an important role in the reduction of the cardiovascular disease burden. Individuals with CVD, particularly those who survived an AMI or CVA, are much more likely to die in a recurrent event[35]. The decrease in cardiovascular disease mortality between 1971 and 1992 observed in a population sample of the United States showed that this decline was due to declines in both the incidence and case fatality rates, thus suggesting that both primary and secondary prevention and treatment contributed to the decline of CVD mortality in the country[36].

Although ischemic heart disease and cerebrovascular diseases represent the major cause of death in the city of Sao Paulo, a significant reduction in their frequency has been observed, thus corroborating trend studies conducted in previous periods. Easier access to health care and use of diagnostic and therapeutic technologies may explain in part the progression in the reduction of cardiovascular disease mortality recorded in the city of Sao Paulo.

Likewise, it is important to investigate not only the risk factors at an individual level, but mainly the determinants at the social and cultural level, since there may be different mortality trends according to the different socioeconomic groups. This type of investigation aims at a better understanding and elaboration of population-wide strategies of health policy and intervention. Thus, new approaches considering the inequities in health at the contextual and individual levels are necessary to explain differences in cardiovascular disease incidence, prevalence and mortality, as well as to facilitate the reorientation of healthy policies in this area.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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