Male mortality in three Brazilian State Capitals, 1979-2007*

*Mortalidade masculina em três capitais brasileiras, 1979 a 2007**

Carolina Terra de Moraes Luizaga

Sabina Léa Davidson Gotlieb

Department of Epidemiology, School of Public Health, University of São Paulo (USP)

*This research project is part of the Master's degree thesis presented to the Graduate Program in Public Health of the School of Public Health of the University of São Paulo (USP) entitled "Male mortality in time and space".

Funding: Graduate scholarship granted by the CNPq (National Council for Technological and Scientific Development) under process 134538/2008-0.

Corresponding author: Carolina Terra de Moraes Luizaga. Departamento de Epidemiologia, Faculdade de Saúde Pública da USP. Av. Dr. Arnaldo, 715, São Paulo, SP, BRAZIL, 01246-904. E-mail: carolinaterra@usp.br

Abstract

Introduction: In Brazil, there is a higher male mortality in almost all ages and causes. The objective is to estimate and describe the trend in male mortality, between 1979/2007, in three State Capitals (São Paulo, Rio de Janeiro and Porto Alegre). **Methods:** The study populations refer to the residents in the three cities, in 1979/1981, 1990/1992, 1999/2001 and 2005/2007, and their deaths. The data source was Health Information System of the Brazilian Ministry of Health. Overall (crude/standardized) and specific mortality coefficients were calculated. **Results:** Up to 24 years, men predominate in the population; after, it has been observed higher female participation and gender ratios ever lower. This fact is associated with high male mortality and the intense involvement of young men with external causes. Throughout the series, these causes were responsible for large risk estimates of male death. In 2005/2007, this group was the leading cause of death in men until the age 40-44 years. In the following age groups, deaths by circulatory system diseases are the main cause. **Conclusion:** These capitals show features of a developing city, with reduced fertility, increased longevity and consequent trend to an aging population. Estimates of the men high risk of dying make clear their vulnerability. The intensity with these events occur demand actions that will reduce the mortality rates of preventable diseases and the men's risky behaviors. It is necessary that men adopt healthier lifestyles habits, thus increasing life expectancy and reducing the gender differences in mortalities.

Keywords: Men's health. Gender and health. Mortality. Death rate. Information systems. Health statistics.

Resumo

Introdução: No Brasil, verifica-se maior mortalidade masculina em praticamente todas as idades e na quase totalidade das causas. **Objetivo:** Estimar e descrever a tendência da mortalidade masculina, entre 1979 e 2007, em São Paulo (SP), Rio de Janeiro (RJ) e Porto Alegre (RS). **Material e método:** As populações de estudo referem-se aos residentes nas três capitais, nos triênios 1979/81, 1990/92, 1999/2001 e 2005/07 e respectivos óbitos. As fontes de dados incluíram Instituto Brasileiro de Geografia e Estatística e Sistemas de Informações em Saúde do Brasil. Calcularam-se os coeficientes de mortalidade gerais e específicos (brutos e padronizados). **Resultados:** Verificaram-se declínio da proporção de crianças e de jovens e crescimento da proporção de idosos. Até 24 anos, os homens predominaram na população; a partir daí observaram-se maiores participações femininas e razões de sexos cada vez mais baixas, evidenciando, entre idosos, maior presença de mulheres, fato associado à elevada mortalidade masculina. Houve perda intensa de jovens por causas externas. Em 2005/07, este grupo correspondeu à principal causa de morte masculina até a faixa de 40-44 anos. Nos grupos etários seguintes, as doenças circulatórias foram a principal causa. **Considerações finais:** As localidades evidenciam características de cidades em desenvolvimento, com redução da fecundidade, aumento da sobrevivência e envelhecimento populacional. As estimativas do elevado risco de morrer dos homens tornam clara sua vulnerabilidade, demandando ações que possibilitem redução da mortalidade por causas evitáveis, eliminando comportamentos de risco e incentivando hábitos saudáveis. Só assim haverá aumento da esperança de vida e redução das diferenças entre as mortalidades feminina e masculina.

Palavras-chave: Saúde do homem. Gênero e saúde. Mortalidade. Coeficiente de mortalidade. Sistemas de informação. Estatísticas de saúde.

Introduction

Differences between men and women have been the focus of studies and discussions, especially in the area of health. It is well known that men have a lower life expectancy and that women go more frequently to health services and report poorer health status. However, women are less likely to die in all age groups[1]. The higher female life expectancy is partly associated with genetic factors, although such advantage does not necessarily mean better health. Morbidity indicators obtained from service demand statistics and surveys suggest that women fall ill more often and have higher prevalences of non-fatal chronic diseases[2,3].

Since 1980, researchers have attempted to understand the different risks of disease and death in men and women, aiming to promote health, although questions of right and equity have arisen[4]. Morbi-mortality patterns are debated, with an interest in the biological, social and cultural determinants associated with gender[2]. Longevity and health problems are analyzed not only due to the biological difference between sexes, but also due to the distinct behavior and lifestyle of each sex.

For a long time, male events were analyzed according to the essentialist perspective, as if biology predetermined their behavior. This approach became outdated as the complex relation between sex and gender began to be investigated[4]. According to Korin[5], there is a hegemonic model of manhood that determines unequal relations between sexes and defines men as active, competitive, strong, and capable of arduous and productive physical work. Additionally, this author states that, from an early age, they learn to avoid so-called female qualities, such as passivity, fragility, dependence and sensitivity. In this model, the desire and capacity to care disappear in the male socialization process, forcing men to have power, autonomy, rationality, and strength and to repress their emotions. By fulfilling their prescribed role, they behave in an inexpressive and competitive way,

which often leads them to have compensatory, dysfunctional, aggressive and risky types of behavior.

Health problems are considered to be associated with specific female and male behavior, namely risk or protective cultural, occupational and social factors. There are undoubtedly biological aspects associated with differences between sexes, such as the complications from coronary atherosclerosis. After menopause, there is an increase in the number of female deaths caused by this disease, thus leading to a reduction in the male/female difference with age[2].

Since 1992, there has been a growing interest in men's health in England and Wales[6]. Researchers state that health involves more than biological or physiological characteristics; however, there is yet no clear and consistent definition of what men's health is. The Australian Men's Health Network defines men's health as "Conditions or diseases that are exclusive of and more prevalent and severe in men, including different risk factors or requiring distinct interventions". The European Men's Health Forum describes it as "Questions originated from physiological, psychological, social or environmental factors, which have an impact on boys and men and require specific interventions to achieve an improvement in individual and population health and well-being". Such definitions reflect the scope of this field and emphasize the need to include several disciplines for it to be understood[7]. Men's health began to be debated according to the following indicators: high excess mortality, lower life expectancy, and lower use of health services. Additionally, men are more likely to ignore signs and symptoms, delay seeking medical care and adopt risk behavior, such as smoking, alcohol drinking, violent behavior and risky driving.

The description of male deaths can provide the means to raise hypotheses that explain the difference in mortality rates. The present study aimed to describe male mortality between 1979 and 2007 among individuals living in the cities of São Paulo (SP), Rio de Janeiro (RJ) and Porto Alegre (RS), according to age group, place of residence and primary cause of death.

Methods

An ecological study was conducted[8,9], analyzing a series of data in time and space. The populations were comprised of men living in three capital cities, São Paulo, Rio de Janeiro and Porto Alegre, during the three-year periods of 1979/81, 1990/92, 1999/2001 and 2005/07, including the respective deaths. The variables selected were age group, place of residence, time (three--year periods around census years and the last one available, 2005/07) and primary cause of death (International Classification of Diseases-ICD, 9th and 10th revisions[10, 11]).

The sources of data used were the *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics)[12], *Sistema de Informações sobre Nascidos Vivos* (SINASC – Life Birth Information System), and *Sistema de Informações sobre Mortalidade* (SIM – Mortality Information System), whose data are available on the electronic page of the *Departamento de Informática do Sistema Único de Saúde* (DATASUS – Unified Health System Data Processing Department)[13]. Additionally, socioeconomic data from the Health Indicators and Basic Data in Brazil (2008)[14], developed by the Inter-Agency Network of Health Information, were collected.

Initially, the socio-demographic context of the study areas was set up to identify possible differences. Next, the mean mortality coefficients, both general and specific, were calculated to find out the estimates of male death risk. Direct standardization of coefficients was used for adequate comparisons in time and space, as crude coefficients suffer interference from population age composition, although they represent the actual speed and rate of deaths. The standard population was obtained from the harmonic mean of age groups present in the 2000 Demographic Census.

In the trend analysis, three-year periods

around census years were adopted to avoid yearly distortions due to possible errors, such as underestimation of the number of deaths and/or inaccurate population estimates for the years distant from census years, which do not always correspond to the reality of the area. In this way, indicators represent the mean mortality of a three-year period. The three capital cities were selected because they have good coverage and adequate quality of vital statistics, making available valid and reliable data[16,17]. These data were collected from unidentified databases for public use and access. For this reason, there was no need to submit this research project to the Research Ethics Committee of the University of São Paulo School of Public Health (FSP-USP). Nonetheless, authors declared there were no conflicts of interest.

Results

The capital cities of São Paulo, Rio de Janeiro and Porto Alegre stand out in the national context. They are large urban centers with adequate coverage of the Brazilian Ministry of Health Official Information Systems and low proportions of deaths from ill-defined causes. They have large populations; high urbanization rates, demographic density and life expectancy; and low fecundity, aging and feminization rates. The growth rate has decreased as a result of reduced fecundity; in 2000, this rate reached a value close to that of population replacement in Rio de Janeiro and Porto Alegre.

These three cities are undergoing the advanced stage of demographic transition, as their mortality and fecundity indices changed from high to low. This process has transformed the age composition, causing it to be older (a proportion of elderly individuals higher than the national average). The reduction in fecundity and mortality rates has led to an increase in life expectancy. Men die in a greater proportion and at an earlier time, resulting in a higher prevalence of women in advanced ages.

In addition to changes in population structure, there were high male mortality coefficients. In 1979/81, in São Paulo and Porto Alegre, the crude mean coefficients were similar (eight deaths per 1,000 men). In Rio de Janeiro, this value was higher (9.4 per 1,000 men). After standardization, the risk of death in Rio de Janeiro was 6.7% higher than that of São Paulo and 5% higher than that of Porto Alegre[13].

In 1979/81, the main primary causes of death in men were cardiovascular diseases (CVD) and neoplasms. In the last three-year period, despite the reduction in standardized coefficients (nearly 50%), CVD remained as one of the main causes. In São Paulo and Porto Alegre, neoplasms still ranked second, while external causes stood out in Rio de Janeiro (Table 1).

Respiratory system diseases also had an impact on male mortality and a great reduction was identified throughout the time series in Porto Alegre. In 1979/81, digestive system diseases led to a rate not higher than 71.2 deaths per 100,000 men and this coefficient did not reach 60 deaths per 100,000 men in the end of the time series. In São Paulo, in the initial three-year period, the highest standardized coefficient was identified for infections and parasitic diseases (56.3 deaths per 100,000 men), while the lowest one was in Porto Alegre (39.5 deaths per 100,000 men). In the final three-year period, mortality from infectious diseases doubled in Porto Alegre, reaching 78.7 deaths per 100,000 men, whereas it decreased 38.4% in São Paulo (Table 1).

Another characteristic of epidemiological transition is the reduction in child mortality. Between 1979 and 2007, the greatest decrease was found in São Paulo (from 60.5 to 14 deaths per 1,000 live births). In Rio de Janeiro, this reduction totaled 69% (from 48 to 15 deaths per 1,000 live births) and, in Porto Alegre, such reduction was lower (66%), dropping from 36 to 12 deaths per 1,000 live births[13]. One limitation worth mentioning is that, in 1979/81 and 1990/92, the number of live births recorded in notary public offices was used to calculate the coefficients, as the SINASC system had not been implemented yet. It is possible that

Table 1 - Average standardized mortality rates (per 100,000 males) according to underlying cause of death (chapters of ICD[1]), triennium and relative variation (%), in Sao Paulo, Rio de Janeiro and Porto Alegre, Brazil, 1979 to 2007.
Tabela 1 - *Coeficientes médios de mortalidade padronizados (por cem mil homens) segundo grupos de causas (capítulos da CID[1]), triênios e variação no tempo (%). São Paulo, Rio de Janeiro e Porto Alegre, 1979 a 2007.*

Cause	1979/1981			2005/2007			Variation (%)		
	SP[2]	RJ[3]	POA[4]	SP[2]	RJ[3]	POA[4]	SP[2]	RJ[3]	POA[4]
Infectious and parasitic	56.3	50.9	39.5	38.4	51.8	78.7	-31.8	+1.8	+99.2
Malignant neoplasms	166.7	184.4	212.4	167.6	151.4	212.7	+0.5	-17.9	+0.1
Circulatory system	506.9	548.5	497.9	288.9	260.2	264.0	-43.0	-52.6	-47.0
Respiratory system	135.6	118.6	174.8	112.2	102.4	87.0	-17.3	-13.7	-50.2
Digestive system	65.7	64.6	71.2	59.2	45.1	48.8	-9.9	-30.2	-31.5
External causes	122.2	163.0	117.8	109.3	159.9	123.1	-10.6	-1.9	+4.5
Total number of deaths	32.894	22.797	4.260	36.055	26.651	5.550	+9.6	+16.9	+30.3
General coefficient	1194.4	1150.4	1068.9	1159.5	1023.3	948.0	-2.9	-11.0	-11.3

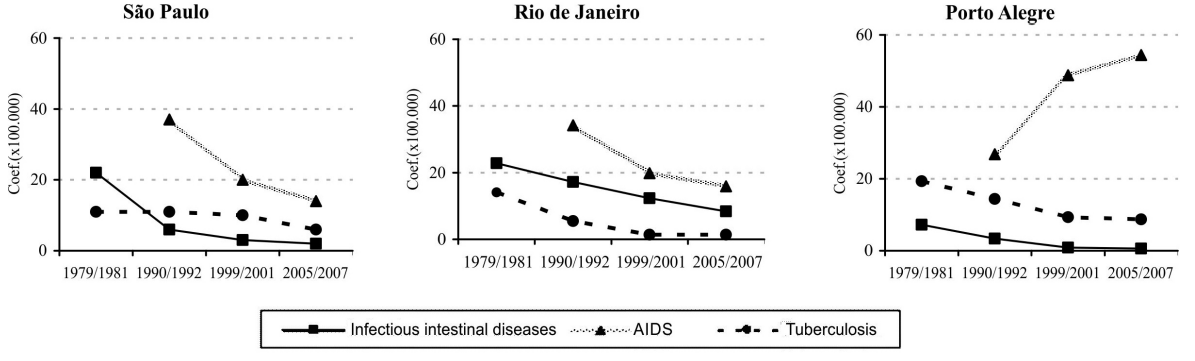
Source/*Fonte*: DATASUS (crude data/*dados brutos*).
[1] International Classificatiom of Diseases (ICD) – 9th Revision (until 1995); 10th Revision (since 1996); [2] São Paulo (SP); [3] Rio de Janeiro (RJ); [4] Porto Alegre (RS)
[1] Classificação Internacional de Doenças - 9ª Revisão (até 1995); 10ª Revisão (a partir de 1996); [2] São Paulo (SP); [3] Rio de Janeiro (RJ); [4] Porto Alegre (RS).

such coefficients are overestimated, due to the phenomenon known as under-reporting of live births.

Infectious and parasitic diseases (IPD)

Of all IPD deaths in 1979/81, tuberculosis led to more deaths among residents of Rio de Janeiro and Porto Alegre, with standardized coefficients of 23 and 19 deaths per 100,000 men, respectively. In the end of the time series, mortality from these causes decreased sharply (Figure 1).

By observing the decreasing trend, a greater reduction in mortality was expected between 1979 and 2007. However, this situation changed with the onset of the Acquired Immunodeficiency Syndrome (AIDS) in the early 1980s. This diseased was coded in the ICD-9th Revision[10] as an acquired defect of cellular immunity and included in the chapter of Endocrine, Nutritional and Metabolic Diseases and Immunity Disorders. In 1983, with the knowledge about its viral etiology, cases should have been part of the Viral Diseases and categorized under IPD.



Source/*Fonte*: DATASUS (crude data/*dados brutos*).
**In 1990/1992, AIDS was not included in the IPD.*
**A AIDS, em 1990/1992, não pertencia ao capítulo das DIP.*

Figure 1 - Average standardized mortality rates (per 100,000 males) due to infectious and parasitic diseases according to main categories * and triennium, in Sao Paulo, Rio de Janeiro and Porto Alegre, Brazil, 1979 to 2007.
Figura 1 *- Coeficientes médios de mortalidade masculina padronizados por doenças infecciosas e parasitárias segundo principais categorias* e triênio. São Paulo, Rio de Janeiro e Porto Alegre, 1979 a 2007.*

However, as there were morbidity and mortality statistics published, the World Health Organization (WHO) recommended that AIDS should remain in the previous classification, so as not to affect comparability. In 1996, with the adoption of the ICD-10th Revision[11], AIDS became part of the IPD, resulting in an increase in mortality from these diseases, in 1999/2001[18].

In 1990/92, AIDS caused 37 deaths per 100,000 men in the male population of São Paulo; in Rio de Janeiro, 34 deaths per 100,000 men; and in Porto Alegre, 27 deaths per 100,000 men. In the following three-year period, mortality had already decreased 46% in São Paulo and 42% in Rio de Janeiro, whereas it increased 85% in Porto Alegre. In 2005/07, in São Paulo and Rio de Janeiro, the decreasing trend remained, with coefficients equal to 14 and 16 deaths per 100,000 men, respectively; while it totaled 54 deaths per 100,000 men in Porto Alegre (Figure 1).

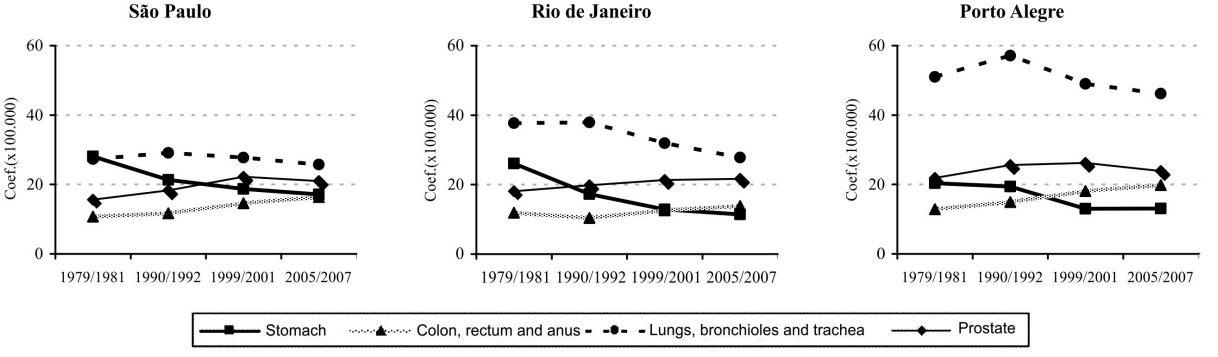
Neoplasms

In the beginning of the time series, the speed of occurrence of male deaths from neoplasms was more intense in Porto Alegre (212.4 deaths per 100,000 men), followed by São Paulo, with 166.7 deaths per 100,000 men. The main locations of tumors were the stomach; lungs, bronchioles and trachea; prostate; and colon, rectum and anus. In São Paulo, stomach cancer was the most frequent with 28 deaths per 100,000 men, whereas lung, bronchiolar and tracheal cancer were the most frequent in Rio de Janeiro and Porto Alegre, totaling 37.7 and 51 deaths per 100,000 men, respectively. This group of tumors ranked second in São Paulo, while stomach cancer ranked second in Rio de Janeiro, followed by prostate cancer. In Porto Alegre, coefficients of prostate and stomach cancer ranked second and third, respectively (Figure 2).

In 2005/07, despite the decrease of 6% in São Paulo, lung, bronchiolar and tracheal neoplasms were the most frequent ones in male mortality, followed by prostate; stomach; and colon, rectal and anal cancer. In Rio de Janeiro and Porto Alegre, the same trend was observed and deaths from lung, bronchiolar and tracheal cancer decreased 26% and 9%, respectively; despite this slight reduction, mortality in Porto Alegre remained very high. A decrease in mortality from stomach cancer was observed in the three cities, with a variation between 36% and 56%. In their turn, male deaths from colon, rectal and anal cancer increased 53% in São Paulo and Rio de Janeiro and 16% in Porto Alegre (Figure 2).

Circulatory system diseases (CSD)

Deaths from CSD were the most important ones, occurring at a rate close to 500



Source/*Fonte*: DATASUS (crude data/*dados brutos*).

Figure 2 - Average standardized male mortality rates (per 100,000 males) due to neoplasms according to main anatomical sites of the tumor and triennium, in Sao Paulo, Rio de Janeiro and Porto Alegre, Brazil, 1979 to 2007.
Figura 2 - *Coeficientes médios de mortalidade masculina padronizados por neoplasias segundo principais localizações anatômicas do tumor e triênio. São Paulo, Rio de Janeiro e Porto Alegre, 1979 a 2007.*

deaths per 100,000 men, in 1979/81. Until 2005/07, they decreased almost 50% in the three cities (Table 1). Among the causes of death, those that most frequently affected men were cardiac ischemic diseases (CID), with coefficients varying between 207 and 222 deaths per 100,000 men, in 1979/81, in the three cities. Acute myorcardial infarction stood out in this group, with a trend similar to that of CSD. Cerebrovascular diseases (CVD) were another group that stood out, beginning the time series with 126, 136 and 162 deaths per 100,000 men in Porto Alegre, São Paulo and Rio de Janeiro, respectively. Following the decreasing trend, CVD fell nearly 50% in São Paulo and Rio de Janeiro and 30% in Porto Alegre (Figure 3).

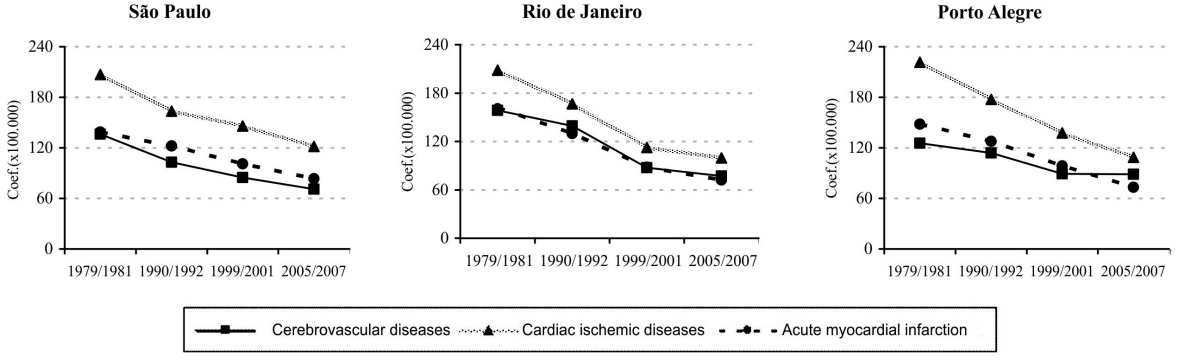
Digestive system diseases (DSD)

Between 1979 and 2007, male deaths from DSD decreased 10% in São Paulo and 30% in the other two cities (Table 1). Initially, alcoholic liver disease was the main responsible for these deaths, with rates close to 29 deaths per 100,000 men in São Paulo and Rio de Janeiro, and 36 deaths per 100,000 men in Porto Alegre; throughout the time series, the greatest reduction occurred in Rio de Janeiro (84.2%)[13]. Additionally, there was a decrease in the number of deaths from liver cirrhosis and fibrosis which, in the initial three-year period, had caused deaths at a rate close to that of alcoholic liver disease. In the end of the time series, its progression changed and Porto Alegre, which had the highest risk of death, showed a reduction of 85%, becoming the city with the lowest risk of death.

External causes

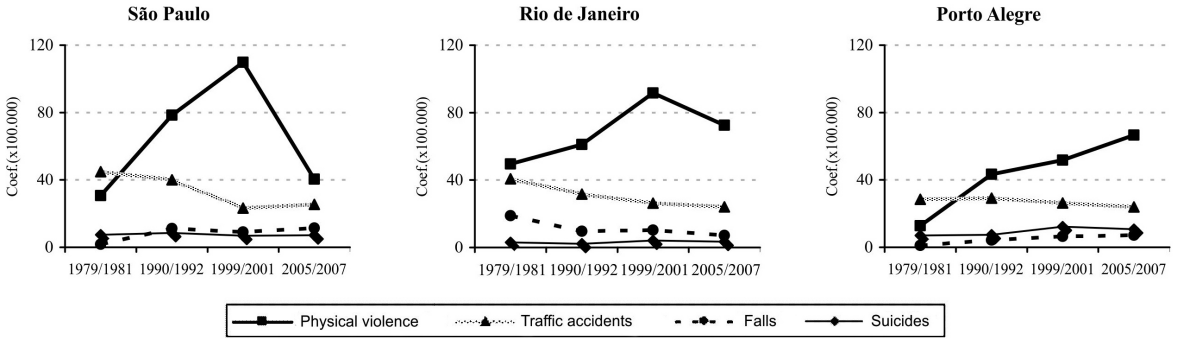
External causes represented a large portion of male deaths. Their progression occurred in a heterogeneous way among capitals. The greatest reduction between 1979 and 2007 took place in São Paulo (11%). In Rio de Janeiro, this reduction totaled 2%, while Porto Alegre had the lowest risk in 1979/81, although the rate of deaths increased 4.5% in this city, totaling 123 deaths per 100,000 men, higher than the estimate for São Paulo and lower than that for Rio de Janeiro (Table 1).

In 1979/81, the highest risk of male deaths resulted from traffic accidents in São Paulo and Porto Alegre (45 and 28.5 deaths per 100,000 men, respectively). In Rio de Janeiro, in this three-year period, the highest mortality rate was due to physical violence, totaling 50 deaths per 100,000 men. In Porto Alegre and São Paulo, physical violence totaled 13 and 31 deaths per 100,000 men, respectively. Until the last three-year period, there was a reduction in the number of deaths from traffic accidents, in the three



Source/*Fonte*: DATASUS (crude data/*dados brutos*).

Figure 3 - Average standardized mortality rates (per 100,000 males) due to circulatory system diseases according to main categories and triennium, in Sao Paulo, Rio de Janeiro and Porto Alegre, Brazil, 1979 to 2007.
Figura 3 - *Coeficientes médios de mortalidade masculina padronizados por doenças do aparelho circulatório segundo principais categorias e triênio. São Paulo, Rio de Janeiro e Porto Alegre, 1979 a 2007.*



Source/*Fonte*: DATASUS (crude data/*dados brutos*).

Figure 4 - Average standardized mortality rates (per 100,000 males) due to external causes according to main categories and triennium, in Sao Paulo, Rio de Janeiro and Porto Alegre, Brazil, 1979 to 2007.

Figura 4 - *Coeficientes médios de mortalidade masculina padronizados por causas externas segundo principais categorias e triênio. São Paulo, Rio de Janeiro e Porto Alegre, 1979 a 2007.*

capitals. The progression of deaths from physical violence significantly increased 420% in Porto Alegre and 32% and 46% in São Paulo and Rio de Janeiro, respectively (Figure 4).

In a discrepant way, suicides caused more male deaths in Porto Alegre, with an increase of 53% between 1979 and 2007. In the end of the time series, this mortality from suicide was double the coefficient of São Paulo and three times that of Rio de Janeiro (Figure 4).

Discussion

When compared to Brazil, the cities of São Paulo, Rio de Janeiro and Porto Alegre are undergoing a more advanced stage of demographic transition, with indicators similar to those of developed countries, i.e. higher proportions of women and elderly individuals in the population, higher life expectancy at birth and lower fecundity rates. The level of socioeconomic development and health service availability in the three capitals is similar. Thus, the differences in mortality identified are probably associated with other factors.

In addition to socioeconomic consequences, the demographic transition causes changes in morbidity and mortality and, as a result, in health conditions. Due to the fast growth in the number of elderly individuals, non-communicable diseases become more frequent[19]. This phenomenon is known as epidemiological transition and it is characterized by the replacement of traditional diseases by non-communicable diseases, resulting in a significant reduction in child mortality and increase in the rates of chronic degenerative diseases[19,20]. External causes contribute to the transformation of the health context, accounting for a large number of injuries and deaths and becoming an important public health problem.

Standard male mortality showed a decreasing trend throughout the time series. The highest risk estimates were found in Rio de Janeiro, where there was the greatest reduction as well (22.8%). In São Paulo, the lowest values and a reduction of 21% were observed. In Porto Alegre, the risk of male death decreased 21.5%.

Between 1979 and 2007, the three main causes of male death were cardiovascular diseases, neoplasms and external causes. Cardiovascular diseases were more intense from the age of 40 years and their highest coefficients were found among the elderly. Neoplasms were the second main cause of death among boys and elderly individuals. Higher estimates of risk of death from violent causes were observed in young adults and they were the main cause of death in children and adolescents.

By comparing standard coefficients in

men and women, the estimate of risk of male death in the first three-year period was 57%, 65% and 79% higher in São Paulo, Rio de Janeiro and Porto Alegre, respectively. In the final three-year period, the differences increased to 74%, 75% and 83%, respectively. The excess number of male deaths has been explained not only from a biological perspective (a higher frequency of more severe diseases and greater vulnerability), but also according to social and behavioral characteristics. Biologically speaking, in the case of certain diseases, it could be said that age is a risk cofactor, especially for circulatory diseases and neoplasms; on the other hand, behavioral factors such as the smoking habit could be contributing to excess mortality from lung cancer in men[2]. Likewise, risky driving and more aggressive behavior in men could be increasing their mortality from traffic accidents and physical violence[1].

Rio de Janeiro was the most violent city, with higher adjusted risks of death from external causes in almost all three-year periods, except for 1999/2001, when São Paulo ranked first. In the analysis by age, in 2005/07, deaths from physical violence were the main external cause until the age of 49 years; traffic accidents predominated between 50 and 74 years; and deaths from falls were more frequent than traffic accidents at 80 years and older. In general, in the three capitals, in the end of the time series, deaths from physical violence were more prevalent than traffic accidents and there was a significant increase in Porto Alegre. The differences and similarities indicated among the cities allude to the discussion about the question of the urban context promoting violence, due to the population and wealth concentration and impersonal social relations, among other factors that may contribute to the increase in violence[21]. More specific studies are required to better understand the evolution of the aspects associated with deaths from external causes in different urban patterns and they are useful to prevent this problem and to implement preventive measures.

With regard to the high mortality rates due to external causes found in adolescents and young adults, Yunes and Zubarew[22] indicated that early deaths from violence lead to health expenses and a reduction in population productivity. Additionally, these authors reported that all forms of violence are the main cause when calculating Years of Potential Life Lost (YPLL). They emphasized that violence in adolescence is avoidable and preventable and that there are certain key risk factors associated with each other, such as individual characteristics, family experiences, interpersonal relationships, access to firearms, alcohol and other drug use, and exposure to violence in mass media, among other political, cultural and social factors. According to Laurenti et al.[2], physical violence has been pointed out as the most difficult external cause to prevent and control, as its determining causes are usually associated with social inequalities, a negligent and inefficient government in terms of the adoption of basic social policies, and urban contradictions. Organized crime related to illegal drug trade and alcohol and drug use is an aggravating factor in great urban centers. These factors emphasize the concept that violent causes of death are not associated with biological factors, but rather with behavioral and cultural questions, which contribute to the high male mortality and great difference between sexes.

With regard to neoplasms, in the end of the time series, Rio de Janeiro had the lowest standardized coefficient, whereas Porto Alegre had the highest one. The fact that mortality from cancer increases with age and that, likewise, there is an increase in the proportion of elderly individuals in the population and a reduction in mortality from traditional diseases has led certain authors to discuss whether the increase observed is real or apparent. According to San Martin, cited by Laurenti et al.[2], the question is about whether this increase is due to population aging or if it is the result of better diagnostic techniques or even the greater search for more efficient treatments and better certification of causes of death.

It should be emphasized that male mortality from neoplasms also exceeded that of females (slightly more than 50%) throughout the time series, in the three capitals. By analyzing some of the most frequent locations of tumors in men, high estimates of risk of lung, bronchiolar and tracheal; prostate; and stomach cancer were observed. The same findings were mentioned by Hallal et al.[23], in the state of Rio Grande do Sul, and in a publication on Brazil issued by the Ministry of Health[24]. Mortality from lung, bronchiolar and tracheal tumors showed slight variations between 1979 and 2007. Its association with smoking and the higher incidence of cases and deaths in men are well known. In 2005/07, in São Paulo, the mean coefficients of mortality varied from five deaths per 100,000 men aged between 40 and 44 years to 311 deaths per 100,000 men aged 80 years and older; in Rio de Janeiro, these rates were six and 273 deaths per 100,000 men respectively; and, in Porto Alegre, seven and 507 deaths per 100,000 men, respectively. The higher rates of male deaths in Porto Alegre agree with the known higher male prevalence of smoking that exists there[14]. Such significant mortality was also found in a publication by the *Rede Interagencial de Informações para a Saúde* (RIPSA – Inter-Agency Health Information Network)[14] and for the male population of the state of Rio Grande do Sul in a study by Malta et al. (2007)[25].

Prostate neoplasms became relevant from the age of 40 years; however, the highest coefficients are found among the elderly. Prevention campaigns have become more intense as a result of the greater universalization of preventive tests and increasing high risk estimates in men. Mortality from stomach cancer decreased throughout the time series in the three capitals, a trend that has been previously indicated by Fonseca[26] and Latorre[27]. The etiology of this type of cancer is not well known, although Fonseca[26] mentions the replacement of traditional food preservation techniques (use of salt and smoking) by refrigeration, which would be a protective factor. Habits such as the consumption of fatty and manufactured foods and the *Helicobacter pylori* bacterium are among the risk factors[28].

Mortality from esophageal cancer stood out in Porto Alegre, which had mean standardized coefficients of 15, 13, 12 and 11 deaths per 100,000 men in the sequence of three-year periods, respectively. There are significant discrepancies when these values are compared with those found in the other capitals, as the mortality rate was 11 deaths per 100,000 men in the beginning of the time series, in São Paulo, not exceeding nine per 100,000 men in the following three-year periods; while, in Rio de Janeiro, it was eight per 100,000 men in the beginning, decreasing to six per 100,000 men subsequently. There are studies that associate the incidence of esophageal cancer with consumption of yerba mate (*Illex paraguayensis*)[29]. The hot infusion made with ground dried leaves from this plant has been considered as a possible cause of esophageal cancer in South America, because of the high incidences found in Southern Brazil, Uruguay and Northeastern Argentina. There are two possible mechanisms for the yerba mate to increase the risk of esophageal cancer: one is the *Ilex paraguayensis* plant extract, which might have carcinogenic substances, although this hypothesis has not been confirmed yet; the other is that yerba mate might not have carcinogenic substances, but the high temperature of consumption would promote carcinogenesis, associated with alcohol and tobacco use[29].

With regard to non-communicable diseases, it should be emphasized that, despite the decreasing trend, deaths from CSD ranked first among the main causes of death in the three cities, in the group of three-year periods, in all age groups from the age of 45 years. CSD, malignant neoplasms and external causes were the main causes of male death, whose ranking varied according to age group, location and three--year period. These findings were similar to those described by other studies[24,30-32]. It is known that non-communicable diseases have a multi-factorial etiology and share

risk factors in common (smoking, physical inactivity, inadequate diet, obesity and alcohol drinking, among others) of a behavioral nature that can be modified[33,34]. These diseases require continuing care services and increasing costs, in view of population aging and changes in morbidity and mortality patterns[35].

Although chronic degenerative diseases and violence have greatly contributed to male mortality, in 1979/81, the IPD were an important cause of mortality, despite their lower frequency when compared to the previous decades. There was a reduction in mortality from IPD in the three capitals, between 1979 and 1992. However, in 1999/2001, coefficients began to increase again until 2005/07, when mortality from IPD became lower than the previous three-year period, except in Porto Alegre. Nonetheless, the rate of this mortality was higher than that of 1990/92. If AIDS had not been included in the group of IPD in 1996, its reduction could have been more significant. In the 1980s, AIDS was associated with men, especially homosexual ones. Despite the growing number of cases of heterosexual transmission, the incidence of this disease continued to be higher in men[2], which could be observed when the excess male mortality was analyzed through time. In 1990/92, mortality from AIDS in men was 517%, 580% and 671% higher than women, in São Paulo, Rio de Janeiro and Porto Alegre, respectively. In the end of the time series, the percentages of excess male deaths decreased to 180%, 200% and 170% in these cities, respectively. An important fact is the increase in mortality from AIDS, which was three to four times higher in the 15-to-19-year age group, in Porto Alegre, in 2005/07, when compared to the other two capitals. In the remaining age groups, when Porto Alegre and São Paulo were compared with each other, the ratios were between three and seven, sometimes 11 times higher, in the 75-to-79-year age group. Both the state of Rio Grande do Sul and its capital have had the highest coefficients of mortality from this disease in the country[14]. According to the RIPSA[14], in 2005, in the Southern region, the male mortality rate from AIDS was 17% higher than that of the Southeastern region. The causes for such higher mortality from AIDS in Southern Brazil have not been identified yet. The great genetic variability of circulating subtypes of the human immunodeficiency virus (HIV) and the high prevalence of seropositives infected with the subtype C in this area differ from what occurs in the major part of this country. In this way, there are studies being conducted to assess the response to antiretroviral treatment, especially in this region, as different viral subtypes can cause distinct responses to several treatments[36,37].

The findings obtained reveal an excess number of male deaths from preventable causes. Some of these causes showed that, in addition to the biological factor, there is an association with male behavior and lifestyle. More detailed investigations are required, although the male mortality context described can be the foundation for the development of specific policies and actions aimed at men's health promotion in Brazil.

Final Considerations

In addition to careful data selection, the standardization of mortality coefficients of the three areas was considered to be necessary, so that they could be compared with each other. This procedure is not always used, restricting the number of studies comparable through time and among different locations.

Considering the fact that the majority of male deaths are primarily caused by chronic degenerative diseases and violence and that their occurrence is partly attributed to behavioral and cultural factors, it should be emphasized that investments in prevention are essential and must have positive effects. Epidemiological studies are useful to identify factors and to understand the mechanisms that cause men to have higher coefficients of mortality. Hypotheses have been raised and they could partly explain these differences. Apart from genetic and hormonal factors, it is known that certain

biological, social and behavioral determinants associated with gender imply different risks of disease and death between men and women.

The hegemonic model of manhood encourages men to adopt a more aggressive and riskier behavior, such as risky driving; high prevalences of smoking, alcohol and drug use; a high-fat diet and less concern for health. On the other hand, there are cultural traits that discourage men from showing a more passive, sensitive and vulnerable behavior, as this is considered to be typically feminine. Therefore, men use health services less frequently and end up ignoring the first signs and symptoms of diseases. These attitudes expose them to more violence, injuries, diseases and early death.

In addition to preventive actions, men should be encouraged to use health services more frequently, leading to early diagnosis and increased access to treatment, which translate into a reduction in the number of deaths and the harmful health differences between sexes.

References

1. Case A, Paxson C. Sex differences in morbidity and mortality. *Demography* 2005; 42(2):189-214.

2. Laurenti R, Buchalla CM, Mello Jorge MHP, Lebrão ML, Gotlieb SLD. *Perfil epidemiológico da saúde masculina na Região das Américas: uma contribuição para o enfoque de gênero.* São Paulo: Centro Colaborador da OMS para a Classificação de Doenças em Português; 1998.

3. Gómez EG. *Equidad, Género y Salud* [documento publicado na Internet] marzo 2001. División de Salud y Desarrollo Humano, Programa Mujer, Salud y Desarrollo. Organización Pan-Americana de la Salud/ Organización Mundial da Saúde. Disponível em: http://www.eclac.cl/mujer/noticias/noticias/4/8274/ equigensa1.PDF. [Acessado em 20 de setembro de 2008].

4. Schraiber LB, Gomes R, Couto MT. Homens e saúde, na pauta da Saúde Coletiva. *Ciênc Saúde Coletiva* 2005; 10(1): 7-17.

5. Korin D. Nuevas perspectivas de género en salud. *Adolesc Latinoam* 2001; 2(2): 67-9.

6. Luck M, Banford M, Williamson P. *Men's Health: perspectives, diversity and paradox*. Reino Unido: Blackwell Publishing; 2000. Disponível em: http://books. google.com/books?printsec=copyright&lr=&id=Q1y8UJi ZBQUC&hl=pt-BR#PPP1,M1 [Acessado em 12 janeiro de 2009]

7. White A. Men's health: the challenges ahead. *The Journal of Men's Health & Gender* [periódico na internet] (periódico renomeado para *Journal of Men's Health*) 2004; 1(4): 296-9. Disponível em: http:// www.sciencedirect.com/science?_ob=ArticleURL&_ udi=B7GW7-4DXKH93-7&_user=5674931&_rdoc=1&_ fmt=&_orig=search&_sort=d&view=c&_acct= C000049650&_version=1&_urlVersion=0&_userid=56 74931&md5=8da711b6f7e61607a3ba95e132d74ab2. [Acessado em 14 dezembro de 2008]

8. Morgenstern H. Ecologic studies in Epidemiology: Concepts, Principles and Methods. *Ann Rev Public Health* 1995, 16: 61-81.

9. Gordis L. *Epidemiologia*. Rio de Janeiro; Revinter; 2004.

10. OMS. *Classificação Internacional de Doenças. 9ª Revisão*. São Paulo: Centro da OMS para Classificação de Doenças em Português. Ministério da Saúde/USP; 1975.

11. Organização Mundial da Saúde. *Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde, 10ª Revisão*. São Paulo: Centro Colaborador da Organização Mundial da Saúde para Classificação de Doenças em Português: USP, 1995.

12. Instituto Brasileiro de Geografia e Estatística [base de dados na Internet]. *Censos demográficos do Brasil, 1980, 1991 e 2000*. Disponível em: http://www.ibge.gov.br [Acessado em 10 novembro de 2008]

13. Departamento de Informática do SUS [base de dados na Internet]. Brasília (DF): Ministério da Saúde. Disponível em: http://www.datasus.gov.br [Acessado em 15 janeiro de 2009]

14. Rede Interagencial de Informações para a Saúde. *Indicadores e Dados Básicos 2008* [base de dados na Internet]. Brasília: Organização Pan-Americana da Saúde. Disponível em: http://tabnet.datasus.gov.br/cgi/ idb2008/matriz.htm?saude=http%3A%2F%2Ftabnet. datasus.gov.br%2Fcgi%2Fidb2008%2Fmatriz.htm&bo taook=OK&obj=http%3A%2F%2Ftabnet.datasus.gov. br%2Fcgi%2Fidb2008%2Fmatriz.htm. [Acessado em 18 janeiro de 2009].

15. Laurenti R, Mello Jorge MHP, Lebrão ML, Gotlieb SLD. *Estatísticas de Saúde*. 2 ed. rev. e atual. São Paulo: EPU; 2005.

16. RIPSA. Rede Interagencial de Informações para a Saúde. *Indicadores e Dados Básicos* (IDB)/Ripsa. Brasília: Organização Pan-Americana da Saúde; 2004.

17. Laurenti R, Mello Jorge MHP, Gotlieb SLD. *O Sistema de Informações sobre Mortalidade: passado, presente e futuro.* São Paulo: Centro Colaborador da OMS para a Família de Classificações em Português; 2006. 107 p. (Série divulgação, n.11).

18. Buchalla CM, Barbieri DD, Laurenti R, Teixeira PR, Reis RAO, Lima LOO. *A AIDS/SIDA: as estatísticas de mortalidade como fonte de informações.* São Paulo: Centro da OMS para Classificação de Doenças em Português; 1990. (Série Divulgação, n. 6).

19. Jamison D. *Disease control priorities in developing countries*. New York: Oxford University Press; 2006.

20. Bobadilha JL, Frenk J, Lozano R, Frejka T & Stern C. The epidemiological transition and health priorities In: *DT Janison Disease control priorities in developing countries.* Oxford Medical Publications: Oxford University Press, Oxford; 1993. pp. 161-87.

21. Mello-Jorge MHP, Gawryszewski VM, Latorre MRDO. Análise dos dados de mortalidade. Rev. Saúde Pública, 31 (4 Suplemento): 5-25, 1997.

22. Yunes J, Zubarew T. *Mortalidad por causas violentas en adolescentes y jóvenes: un desafio para la Región de las Américas*. Rev. bras. Epidemiol. Vol.2, n.3, pp. 102-171, 1999.

23. Hallal ALC, Gotlieb SLD, Latorre MRDO. Evolução da mortalidade por neoplasias malignas no Rio Grande do Sul, 1979-1995. *Rev Bras Epidemiol* 2001; 4(3): 168-77.

24. Saúde Brasil 2007 - *Uma análise da situação de saúde.* Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde. Brasília: Ministério da Saúde; 2008.

25. Malta, DC et al. Tendência de mortalidade do câncer de pulmão, traqueia e brônquios no Brasil, 1980-2003. *J Bras Pneumol* 2007; 33(5): 536-43.

26. Fonseca LAM. *Mortalidade por câncer no Estado de São Paulo: perfil atual, distribuição geográfica e tendências temporais* (tese de doutorado). São Paulo: Faculdade de Saúde Pública da USP; 1996.

27. Latorre MRDO. A mortalidade por câncer de estômago no Brasil: análise do período de 1977 a 1989. *Cad Saúde Pública* 1997; 13(S1): 67-78.

28. Forman D, Newell DG, Fullerton F, Yarnell J W, Stacey R, Wald N, Sitas F. Association between infection with Helicobacter pylori and risk of gastric cancer: evidence from a prospective investigation. *BMJ* 1991; 302: 1302-5.

29. Barros SGS, Ghisolfi ES, Luz LP, Barlem GG, Vidal RM, Wolff FH et al . Mate (chimarrão) é consumido em alta temperatura por população sob risco para o carcinoma epidermóide de esôfago. *Arq Gastroenterol* 2000; 37(1): 25-30.

30. White A e Cash K. *A Report on the State of Men's health across 17 european countries*. School of Health & Community Care, Leeds Metropolitan University. England: *The European Men's Health Fórum, 2003.* Disponível em: http://www.emhf.org/resource_images/EMHF_Report_part_1.pdf. [Acessado em 20 de fevereiro de 2009]

31. Laurenti R, Mello Jorge MHP, Gotlieb SLD. Perfil epidemiológico da morbimortalidade masculina. *Ciência e Saúde Coletiva* 2005; 10(1): 35-46.

32. White A, Holmes M. Patterns of mortality across 44 countries among men and women aged 15-44 years. *J Mens Health Gend* 2006; 3(2): 139-51.

33. Willet WC, Koplan JP, Nugent R, Dusenbury C, Puska P, Gaziano TA. Prevention of chronic disease by means of diet and lifestyle changes. In: Jamison DT, Breman JG, Measham, Measham AR, Alleyne G, Evans DB, Jha P, Mills A et al. *Disease control priorities in developing countries.* World Bank; 2006. pp 833-50.

34. Malta DC, Cezário AC, Moura L, Morais Neto OL, Silva Jr JB. A construção da vigilância e prevenção das doenças crônicas não transmissíveis no contexto do Sistema Único de Saúde. *Epidemiol Serv Saúde* 2006; 15(1): 47-65.

35. Achutti A, Azambuja MIR. Doenças crônicas não-transmissíveis no Brasil: repercussões do modelo de atenção à saúde sobre a seguridade social. *Ciênc Saúde Coletiva* 2004; 9(4): 833-40.

36. Inocêncio LA, Pereira AA, Sucupira MC, Fernandez JCC, Jorge CP, Souza DFC et al. Brazilian Network for HIV Drug Resistance Surveillance: a survey of individuals recently diagnosed with HIV. *J Int AIDS Soc* 2009; 12: 20.

37. Ministério da Saúde, s.d. Departamento de DST/AIDS e hepatites virais. Projeto de pesquisa: *Caracterização do polimorfismo do HIV-1 de subtipos B e C e seu impacto na susceptibilidade aos inibidores de protease em pacientes em tratamento na região Sul do Brasil*. Coordenador: Tomoko Sasazawa Ito. Disponível em: http://sistemas.aids.gov.br/ct/projetos/redes_pesquisa4.asp?ano=2007&numero=279. [Acessado em 20 de março de 2010]

Received: 03/02/11
Final version: 14/04/11
Approved: 11/05/11