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RESEARCH

MALE MORTALITY TREND, 2002-2012: A TIME SERIES STUDY OF A CAPITAL OF THE BRAZILIAN PANTANAL

TENDÊNCIA DA MORTALIDADE MASCULINA, 2002-2012: ESTUDO DE SÉRIE TEMPORAL DE UMA CAPITAL DO PANTANAL BRASILEIRO

TENDENCIA DE LA MORTALIDAD MASCULINA, 2002-2012: ESTUDIO DE SERIES TEMPORALES DE UNA CAPITAL DEL PANTANAL BRASILEÑO

Jeane Cristina Anschau Xavier de Oliveira Fraga [1]
Áurea Christina de Paula Corrêa [2]
Lenir Vaz Guimarães [3]
Luanna Arruda e Silva [4]
Isabele Torquato Mozer [5]
Renata Marien Knupp Medeiros [6]

[1] RN. PhD in Nursing. Federal University of Mato Grosso – UFMT, Department of Nursing. Cuiabá, MT – Brazil.
[2] RN. PhD. Professor. UFMT, Department of Nursing, Postgraduation Nursing Program. Cuiabá, MT – Brazil.
[3] Nutritionist. PhD. Professor. UFMT, Department of Collective Health, Postgraduation Public Health Program. Cuiabá, MT – Brazil.
[4] RN. MS Student. UFMT, Department of Nursing, Postgraduation Nursing Program. Cuiabá, MT – Brazil.
[5] RN. MS in Nursing. Professor. UFMT, Department of Nursing. Cuiabá, MT – Brazil.
[6] RN. PhD Student. Professor. UFMT, Department of Nursing. Cuiabá, MT – Brazil.

Corresponding author: Jeane Cristina Anschau Xavier de Oliveira Fraga.
E-mail: jeane.anschau@hotmail.com
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ABSTRACT

Objective: To analyze the trend of male mortality in Cuiabá-Mato Grosso, in men between 20 and 59 years old, in the period 2002-2012. **Method:** time series ecological study. The standardized rates of male mortality were calculated according to groups of causes. For the analysis of the trend of the time series, the linear regression Prais-Winsten model was used. **Results:** Malignant Neoplasms presented an increasing trend (rate of increase: 3.2% per year and IC95% 0.2 to 6.4) and External Causes to decrease (Rate of increase: -2% year and 95% CI -2.8 to -1.2). **Conclusion:** The Mortality Rates in this population are still extremely high. In this sense, it is important to emphasize the need for articulation between services, focusing on the prevention of deaths, especially those that are avoidable and those that affect the youngest male population.
Keywords: Time Series Studies; Mortality; Men's Health.

RESUMO

Objetivo: *analisar a tendência da mortalidade masculina em Cuiabá-Mato Grosso em homens entre 20 e 59 anos, no período de 2002-2012.* ***Método:*** *estudo ecológico de série temporal. Foram calculados os coeficientes padronizados da mortalidade masculina segundo grupos de causas. Para análise da tendência da série temporal foi utilizado o modelo de regressão linear de Prais-Winsten.* ***Resultados:*** *observou-se tendência ao crescimento das neoplasias malignas (taxa de incremento: 3,2% ao ano e IC95% 0,2 a 6,4) e redução das causas externas (taxa de incremento: -2% ao ano e IC95% -2,8 a -1,2).* ***Conclusão:*** *os coeficientes de mortalidade nessa população ainda se apresentam extremamente altos. Nesse sentido, é importante ressaltar a necessidade da articulação entre os serviços, focando a prevenção das mortes, especialmente as evitáveis e as que acometem a população masculina mais jovem.*
Palavras-chave: *Estudos de Séries Temporais; Mortalidade; Saúde do Homem.*

RESUMEN

Objetivo: *analizar la tendencia de la mortalidad masculina en Cuiabá, Mato Grosso, en hombres entre 20 y 59 años, entre 2002 y 2012.* ***Método:*** *estudio ecológico de series temporales. Se calcularon los coeficientes estandarizados de la mortalidad masculina según grupos de causas. Para el análisis de la tendencia de la serie temporal se utilizó el modelo de regresión lineal de Prais-Winsten.* ***Resultados:*** *Se observó tendencia de crecimiento para las neoplasias malignas (Tasa de incremento: 3,2% al año e IC95% 0,2 a 6,4) y reducción en las causas externas (Tasa de incremento: -2% al. año e IC95% -2,8 a -1,2).* ***Conclusión:*** *Los coeficientes de mortalidad en esa población todavía son sumamente altos. En este sentido, es importante realzar la necesidad de la articulación entre los servicios, enfocando la prevención de muertes, especialmente las evitables y las que afectan a la población masculina más joven.*
Palabras clave*: Estudios de Series Temporales; Mortalidad; Salud del Hombre.*

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INTRODUCTION

In most countries, men are more likely to die in their first year of life than women, and continue to be more likely to die in any period of their lives. Their health behavior presented play an important role in the etiology of their death causes, since this population tends to develop more risky and hazardous behavior than the female population.[1]

As a result, men usually seek care in medium and high complexity health services, since their diseases and grievances are frequently in an advanced stage.[2] These diseases, in most cases, are related to external or unnatural causes, such as accidents and violence, circulatory system diseases and malignant neoplasias, as shown by the high mortality level of these problems.[3]

Considering this context, the importance of working with this population to promote prevention and health care stands out, since it is currently understood that primary care should be the doorway for men into the health services[2], so they can find the guidance and care they need.

Currently, there have been discussions about the (sociocultural and institutional) barriers that interfere in the way men deal with their own health. Some of these barriers stand out, such as issues related to gender stereotypes and sociocultural constructions that dictate the role men should play in society.[2] Men, oftentimes, prefer to risk their physical health and well-being not to be associated with traits they or others might perceive as feminine. [1] This constitution of a hegemonic manliness[4] understood as the ideal cultural standard of the masculinity of a certain period, place and culture, that defines the ideal men and the standard according to which every man is judged, negatively interferes in the self-care of this population.[4]

When it comes to institutional barriers, one can mention the invisibility of men to primary health care services. SUS (ABS/SUS – Unified Health System), has been prioritizing actions targeted at mothers and children, and as a result, these places have been more femininely decorated and prepared.[2] The incompatibility between the working hours of the ABS/SUS units and the time of day in which the male population is working, in addition to the lack of training of health professionals to care for them, have also been highlighted as institutional barriers that interfere in the access men have to these services.[2]

Brazil, Australia and Ireland are the only countries to adopt national strategies, to combat these obstacles and foment male health care, with actions focused on the male public and its needs. The same did not take place in the United States, where men's health has been discussed for nearly two decades, but there are still no government actions directed to this end.[5]

In Brazil, in 2005, the main causes of the mortality of men from 20 to 59' years of age were: external causes (67,856 deaths); grievances related to the circulatory system (30,031 deaths), and malignant neoplasias (18,509).[6]

A similar situation was found in Cuiabá, Mato Grosso (MT), in 2002, where the two main causes of death of men from 20 to 59 years of age were all results of violence (homicides and traffic accidents, 265 deaths). One must also highlight the early deaths from the following causes: chronic-degenerative diseases, among which grievances from circulatory system diseases caused 134 deaths; and malignant neoplasias, which caused 41 deaths, and were more frequent in the respiratory and digestive tracts.

Considering this context, the Brazilian government adopted a strategy to confront the inequalities related to the health of the male population, launching the National Policy of Integral Care for Men's Health (PNAISH) in 2009. This policy aimed at offering integral health care for the male population, and focused its actions in five central axes: access and welcoming; reproductive and sexual health; paternity and care; prevalent diseases; and prevention of violence and accidents.[7]

To implant this policy, the Ministry of Health selected 26 municipalities with high mortality rates as priorities of the PNAISH. Among them, was Cuiabá, the capital of the state of Mato Grosso (MT).

However, the existence of a national policy does not necessarily translate into concrete actions planned to confront problems related to men's health. Even though Cuiabá-MT was selected as one of the cities for the test implantation of the PNAISH, a study conducted to verify the process of implementation of this policy there found that, although the municipal management followed through with their commitment of implanting the policy, the rates of male mortality persisted, and in the daily life of routine health services, few actions were conducted targeting the male population.[8]

In addition, a research investigating the implantation process of the PNAISH in Cuiabá has found that the policy was implanted without awareness of the local reality of male health, that is, the planning of the actions to effectively implant the PNAISH was not based on epidemiological studies about the male population of the city.[9]

To this end, the epidemiological profile of the population must be understood as part of the planning that must precede the implantation of a policy. To do so, time series studies can be beneficial, as they allow one to predict future disease distribution patterns in the population and the factors that may be able to change the structure for better or worse. They also allow health managers to predict the death rates in their region, making it possible to elaborate health promotion initiatives. To foresee such a landscape, it is necessary to consider not only what took place in the last year, but also the recent changes this policy suffered through time.[10]

This study is justified by the death rate in this population, which makes clear that this is a public health problem, and also

by the few actions of care targeted at the male population, which may be one of the factors leading to the lack of information about this population's epidemiological profile. Considering this, the results of this research intend to contribute for the monitoring and the decrease of the mortality rates, collaborating with information that can give support to the municipal plans to confront and control grievances directly related to male mortality. Additionally, this study also produces knowledge that can offer elements for the managers and technicians of the Unified Health System so that they can plan and organize interventions that can monitor risk factors, thus guiding the integral health care of the male population. The information presented here may give support to other studies that are conducted in similar contexts to those of Cuiabá-MT.

Therefore, this study aimed at analyzing the trends in the mortality of men from 20 to 59 years of age, in Cuiabá-MT, in the period from 2002-2012, according to its main cause groups.

METHODOLOGY

This is an ecological study, a time series analysis of the trends of mortality indicators in the male population from 20 to 59 years of age, considering men who lived and died in Cuiabá-MT from 2002 to 2012. The age group from 20 to 59 years of age was selected because it is a priority for the PNAISH actions. Data were collected from the System of Information on Mortality (SIM), directly from the database of the SUS IT Department (DataSUS).

To analyze the time series of male mortality, death records were used; they were previously categorized in groups according to the causes, which were: infectious and parasitic diseases (AOO - B99), malignant neoplasias (C00-D48), circulatory system diseases (I00 - I99), respiratory system diseases (J00-J99), and external causes (V01-Y98), categories that came from the tenth version of the ICD – International Classification of Diseases –, created by the World Health Organization (WHO). The categories were chosen according to the forms of health indicator qualification, organized by the Intermanagerial Network of Health Information (RIPSA).[11] The group "other defined causes" was excluded, since it is composed of a large group of causes that, when individually evaluated, have no statistical significance when compared to the other groups of causes.

Firstly, general and specific cause mortality rates were calculated, respectively, through the following formulas: GMR=(number of deaths/population)x1,000 and SCMR= (number of deaths from a specific cause/population)x100,000[11] Later, the standardization of rates was conducted through the direct method, [12], which consists in the multiplication between the values of the standard population (in this study the standard population was the Brazilian population according to the numbers of the 2010 census, to eliminate the effects of age differences) and the mortality from specific cause rates that were expected. Later, the number of expected cases from each population was divided by the number of people in the standard population, and the standard mortality rates were found.[12] Populational data were obtained from the Brazilian Institute of Geography and Statistics (IBGE), as they were made available in the dataSUS website.[13] These numbers made up the dependent variables (Y).

To conduct time series studies, one of the possibilities of analysis considers the straight line between the best adjustment and the points of the time series one wants to use for trend estimations. The resulting equation is: Y = a+bX. "Y" refers to the standardized mortality rates, "x" to the years measured, "a" to the intersection between the straight line and the vertical axis and "b" to the inclination of said line. For each unit increase or decrease in the "x" scale, the value for "y" increases/decreases an amount of "b". Therefore, if "b" is positive, the line will be ascending, if "b" is negative, the line will be decreasing, if "b" is zero, the line will be parallel to the "x" axis, and any variation of "x" will not change "y". The latter result would indicate a stationary tendency. To determine the value of "b", the Prais-Winsten model is used. This model is a linear regression analysis developed to estimate trends and time series associations.[10]

Therefore, to characterize time trends, the logarithmic transformation of the Y coefficient was the first thing to be calculated, as it allows for a reduction of the heterogeneity of the regression analysis residue variation, that is, considering the numbers that indicate the difference between the points of the average line and those of the time series, making it easier to access the annual growth ration of the current time series.[10] After the logarithmic transformation of (Y) coefficients, the Prais-Winsten analysis was conducted through the STATA 11.1 software, to obtain the time series regression equation. The analysis of the simple linear regression is not adequate to be used with time series, due to the serial self-correlation found in the measurement of populational data. Therefore, it is necessary to resort to specific linear regression analysis procedures created to this end, one of which is the Prais-Winsten technique.[10] Thus, it was possible to calculate the value of the "b" coefficient and of the standard error "SE" of the regression analysis, as well as to calculate the annual growth rate and the confidence interval (95%) through the formula: annual growth rate = -1 + 10^b;IC (95%) of this rate = – 1 + 10^(b ± t*EP), where "t" is the tabulated value from Student's t test.[10]

This study was approved by the Committee of Research Ethics of the Júlio Muller University Hospital, under the number CAAE: 41468814.7.0000.5541 and protocol 953.428.

RESULTS

The records of 6,050 male deaths that took place from 2002 to 2012 were studied, resulting on an average of 550 deaths a year, with an average general mortality rate of 3.7 deaths for each 1,000 men. Table 1 shows the annual growth rate (AGR) and the trend of male mortality, according to groups of causes.

Table 1 - Trend and early growth rate of general male mortality, according to groups of causes, among the male population from 20 to 59 years of age, Cuiabá – MT, 2002-2012

Variable	Annual Growth Rate (%)	IC95%	p-value*	Trend
General Mortality	-1.2	-2.3 a -0.1	0.031	Decreasing
Infectious and Parasitory Diseases	-5.2	-7.3 a -3.0	0.000	Decreasing
External causes	-2	-2.8 a -1.2	0.000	Decreasing
Circulatory system diseases	-0.4	-2.3 a 1.6	0.646	Stationary
Respiratory system diseases	1	-6.8 a 9.4	0.781	Stationary
Malignant neoplasias	3.2	0.2 a 6.4	0.037	Growing

*Prais-Winstein Regression (p>0.005).

A decrease was found in the trend of the general mortality rate, with an AGR of 1.2% (IC 95%: --2.3 to -0.1). Infectious and parasitic diseases decreased even more, with an AGR of -5.2% (IC 95%; -7.3 to -3.0). External causes also presented a decrease, with an AGR of -2.0 and IC 95% (-2.8 to -1.2). Malignant neoplasias were the only group of causes with a growing trend, presenting an AGR of 3.2% and IC 95% (0.2 to 6.4).

These trends can be seen graphically represented in Figures 1 and 2. On figure 1, the decreasing trend of the general mortality rates, for which the AGR was negative (-1.2), can be observed. In 2002, the general mortality rate was of 4.15 deaths for every 1,000 (one thousand) men, while in the end of the studied period, in the year of 2012, the general mortality rate was that of 3.48 deaths for every 100,000 men.

In Figure 2, it can be seen that the most common causes of male mortality are external causes. During the studied period, this group of causes presented a declining trend, with an AGR of -2 regarding the external cause mortality rate (ECMR). In 2002, the ECMR showed 205 deaths for every 100,000 men, whereas in 2012, there were 167 deaths for every 100,000 men.

Cardiovascular diseases are the most common causes of death among the male population, and presented a tendency to remain stationary. In turn, the mortality rates associated to malignant neoplasias presented a distinct behavior, tending to increase in the studied period, with an AGR of 3.2. Respiratory system disease death rates oscillated little during the studied period, being thus considered as stationary. Infectious and parasitic diseases, on the other hand, decreased, with a 5.2 AGR. In their case, the mortality rates fell from 50 deaths for every 100,000 men in 2002 to approximately 30 deaths for every 100,000 men in 2012.

DISCUSSION

In this study, the rate of deaths caused by malignant neoplasias presented an increasing trend, while the trend of general mortality and of deaths caused by external causes was decreasing, and the mortality rates for circulatory system diseases continued stable throughout the studied period. Firstly, it is essential to highlight that a reduction in mortality does not necessarily mean a diminution of the incidence and prevalence of the health diseases and/or health grievances.[14] A decreasing trend, it should be noted, does not mean an effective diminution in male mortality, since the analysis of the profile of male mortality in Cuiabá-MT continues to show high numbers of male deaths.

Some factors and actions can be mentioned in an attempt to explain the modest trend of male mortality decrease shown in this research.

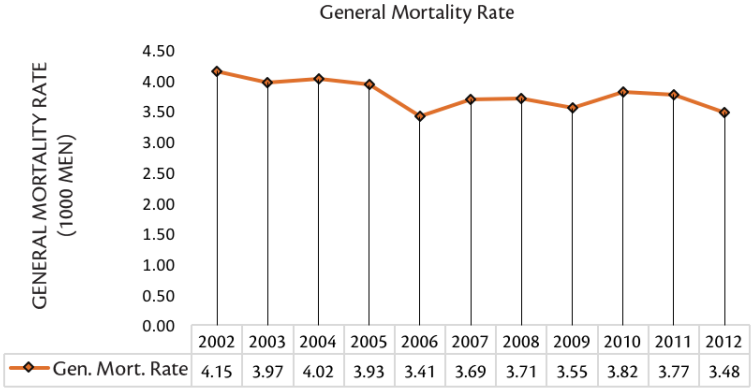
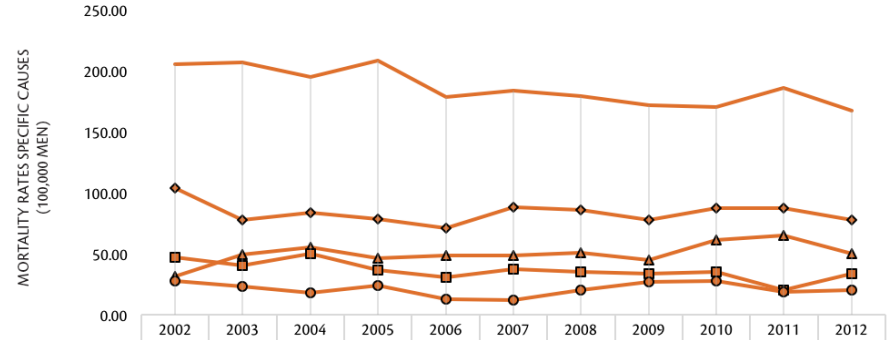


Figure 1 - Time series of the standard general mortality rate for the male population of Cuiabá-MT, from 20 to 59 years of age, in the period from 2002 to 2012.



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
ECMR*	205.02	206.41	195.02	208.10	178.25	183.23	179.21	171.17	170.37	185.88	167.02
CSDMR**	103.67	77.69	83.26	78.31	70.59	87.66	85.62	77.75	87.42	87.36	77.37
MNMR***	31.72	49.51	55.51	46.41	48.48	48.77	51.11	45.08	61.26	65.06	49.74
IPDMR****	47.19	40.37	50.26	36.25	30.66	37.57	35.18	33.97	35.09	20.45	33.77
RSDMR*****	27.85	22.85	18.00	23.93	12.83	11.86	19.91	26.79	27.44	18.59	20.26

Figure 2 - Time series of the standard general mortality rate according to specific causes of death for the male population of Cuiabá – MT, from 20 to 59 years of age, in the period from 2002 to 2012.
* ECMR: External Cause Mortality Rate.
** CSDMR: Circulatory System Disease Mortality Rate.
*** MNMR: Malignant Neoplasia Mortality Rate.
**** IPDMR: Infectious and Parasitic Disease Mortality Rate.
***** RSDMR: Respiratory System Disease Mortality Rate.

It is not possible to separate the health situation in a country from its social and economic conditions, since one influences the other. Therefore, it is highly relevant to place the recent changes Brazil has been going through when it comes to economy, social statuses, and health conditions.

A determining factor that may have influenced in the decreasing general mortality rate trend among the male population is related to the economic setting in Brazil at this moment. The states and cities, in the last decades, have had their economy and health investments improved, as well as did the areas of education and public safety. The increase of credit lines, the higher purchasing power and the income distribution among Brazilian citizens allowed for many people to leave the poverty lines. The decrease in unemployment rates, the growth of the IGDP, the favorable international setting with record exportations and the positive commercial balance can also be highlighted.[15]

Affirmative and assistance policies, such as university internships for low income families and/or African descendants in Brazil, the Bolsa Família (government welfare program), the PROUNI, among other actions implemented by the government in the last years, can also be mentioned as possible explanation for this setting, since the more the population has access to education and higher incomes, the more they will be likely to invest in caring for their own health.

In parallel, the actions and policies developed by the Ministry of Health in the last decade must be considered as potential factors of the modest change in the death rates of the Brazilian population, especially that of males.

Among these ministerial strategies, the strengthening of the ABS/SUS must be highlighted, originating from the National Primary Health Care Policy (PNAB), whose objective is to be the main doorway for users to the services offered by Sus.[16] Many policies are developed and promoted in ABS/SUS, aiming to improve the population's health, such as: HYPERDAY (program for the control of hypertension and diabetes), PNAISH, the Program for Immunization, Smoking, Tuberculosis and Hansen's disease Control.[16] Certainly, all these programs and actions have been positively affecting the life conditions of the male population.

In 2009, the Project for the Expansion and Consolidation of Family Health (PROESF) was created. This program promoted the expansion of coverage, qualification and consolidation of the Family Health Strategy (FHS) in many cities and in the Federal District.[17] The repercussion of this project involved an increase of the ESF units in Cuiabá, which were 18 in 2002 – covering an estimated 62,100 people and 62 in December 2012, when it was covering nearly 213,900 people.[18]

The decreasing trend in the mortality rates due to infectious and parasitic diseases may indicate a better vaccine coverage, immunizing the population against many diseases. The vaccinations, which take place in ABS/SUS, can have positive effects in adult life. A study that aimed to describe the vaccine coverage in Brazil between 1980 and 2012 indicated that the coverage was elevated during routine vaccinations and campaigns, which strongly contributed to the decrease of immunopreventable health problems.[19]

Another result found in this study indicated a decreasing trend of male deaths due to external causes. The Statute of Dis-

armament, Law 10,826, passed in 2003[20], may have contributed to decrease the number of deaths by fire arms. After all, this statute made it so the number of fire arms bought diminished, as well as decreased the commercialization of illegal ones, consequently leading to the reduction of deaths by fire arm.[21]

The fire arm gathering by the government, conducted by the Public Safety Secretariat, together with the strengthening of the municipalities caused by the creation of municipal guards, councils and secretariats of public safety, can certainly have contributed as well to diminish the mortality caused by this type of weapon, consequently helping decrease the rates of deaths by external causes.[21]

When it comes to traffic accidents, Law 11,705, from June 19, 2008, popularly known as Prohibition (although it only adds more severe penalties for driving under the influence)[22], as well as the intensification of inspection by the cities, can also have contributed to the decrease in external cause deaths.

Other Ministry of Health initiatives, such as Decree 737, from May 16, 2001 – the National Policy for the Decrease of Accident and Violence Morbimortality –, and the National Policy of Urgency Care, from 2003, might have also contributed.

Thus, it can be said that these actions (the Disarmament Law, the Prohibition, and the public policies), although they are each targeted at a different problem, may have all collaborated to decrease number of deaths by external causes in Cuiabá. However, it is necessary to conduct a study before and after the institution of each one of these policies, in order to achieve more precise conclusions.

A study created to analyze the male mortality trends in Rio de Janeiro, from 1996 to 2011, also found that male mortality was decreasing, especially the mortality due to external causes, which was the type that decreased the most (6%).[15]

Regarding the mortality due to circulatory system diseases, a national research aimed at analyzing the trends of death by circulatory, ischemic, and cerebrovascular diseases, in the population from 30 to 39 years of age, from 1980 to 2012, identified that for both genders, the mortality rate due to these causes declined – especially for males. From 1980 to 2006, annual mortality by cardiovascular disease variations for the periods 1980-2006 and 2007-2012 was, respectively: -1.4% and -0.6% among males, and -1.7% and -1.0% among females. The death rate of ischemic heart diseases among men varied -1.1% to 0.1%, and -1.5% to 0.4% in the same period. Mortality due to cerebrovascular diseases also decreased in the period, with rates of -1.7% and -1.4% among men, and -2.0% and -1.9% among women.[23]

Internationally speaking, the death rates of circulatory system diseases have also been decreasing in countries such as the United States and Canada.[24] Some factors that may have favored this decrease are: the improvement of cause of death diagnose techniques; the increased urbanization; the diminished exposition to infectious agents; a better risk control (regrading hypertension, cholesterol, diabetes, weight, physical activities) and an improvement in health conditions.[23]

It may also be highlighted that medications for controlling hypertension are more widely available, capillary glycemia monitors are now found in the primary health care units at Cuiabá, and the creation of popular pharmacies, which allow the population to find medications for cheaper prices, can have influenced in the stationary trend of circulatory system disease mortality rates.[25]

Considering respiratory system diseases, their incidence has been especially associated to the chronic obstructive pulmonary disease, caused by types of exposure more typically found among the male population, such as smoking and occupational hazards, especially in the building sector.[15]

The increasing malignant neoplasia mortality trend may be intimately associated to demographic changes undergone by the population. A research conducted in Salvador from 1980 to 2011 also pointed out an increase in the trend of pulmonary cancer deaths, especially among males (0.32%).[26]

In Latin America, a research conducted in Chile found that, from 1990 to 2009, the standardized mortality rates for lung cancer among Chilean males, according to a time series, fell 19.9%. The authors attribute this reduction to changes in the prevalence of the habit of smoking and a diminution of long term arsenic exposure.[27]

Deaths caused by lung cancer may be partially related to behaviors typical of the male population, such as smoking, occupational exposure to agents such as asbestos and silica, unhealthy eating habits and the lack of physical activities.[28]

A study aimed at describing the distribution of colon and rectal cancer in Brazil by gender, from 1980 to 2009, found that the number of deaths from these diseases had an increasing trend in Brazil for both genders, with rates of 0.94 for men and 0.90 for women.[29]

The trend of general male mortality, as well as the trend of deaths by external causes and that of infectious and parasitic diseases, indicated a modest decrease during the analyzed period. The death rates for circulatory and respiratory system diseases remained stationary. Malignant neoplasias stood out as their mortality rates increased, differing from the patterns of decrease or stillness of the other causes. In summation, many factors were shown to be related to an increase and/or diminution of male mortality. Many of these factors can be affected by health promotion actions, which, if treated as priorities, will be able to positively impact male health, bringing this population a better quality of life and the consequent decrease in mortality rates. Thus, considering the knowledge of male mortality due to malignant neoplasias, this study suggests the investment in actions to decrease the number of deaths from this cause. Such actions may comprise health education for the male population, promote

the adhesion to healthy habits, the inspection of work environments with a high prevalence of men to promote work safety and diminish the risks factors present in these places.

This study was created through secondary data, and thus, is limited, since the information acquired from the SIM comes from death records, which may not be completely filled out. In spite of this limitation, it should be considered that the SIM has a high population coverage, and a high potential as a source of data to aid in the planning of health and the definition of priorities, in addition to allowing for intervention results to be evaluated.[30]

The results of this study highlight the relevance of monitoring male mortality rates and the challenges that must be recognized to confront the problem. To this end, it is important to highlight the need for articulation between services, focusing on the prevention of deaths, especially the avoidable ones, and those that affect the younger male population.

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