

Premature mortality caused by the main chronic noncommunicable diseases in the Brazilian states

Mortalidade prematura pelas principais doenças crônicas não transmissíveis nos estados do Brasil
Mortalidad prematura por las principales enfermedades crónicas no transmisibles en los estados de Brasil

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ABSTRACT

Objective: To verify the variation of the premature mortality rate caused the group of the main chronic noncommunicable diseases. **Method:** This is a time-series ecological study, which used secondary data of the Mortality Information System, from 2006 to 2014, from the 26 federal units and from the Federal District. Deaths caused by circulatory system diseases, cancer, diabetes and chronic respiratory diseases were included. The trend of adjusted mortality rate was analyzed by segmented linear regression. **Results:** Premature mortality tended to be reduced in most states, except for Maranhão and Rio Grande do Norte, which presented a stable premature mortality rate. Bahia, Pernambuco, Sergipe, Roraima and all the states from the South, Southeast and Central-West Regions reached the goal of reducing 2% per year in premature mortality caused by main diseases. **Conclusion:** Most of the states showed a reduced mortality rate and are reaching the proposed target. **Descriptors:** Noncommunicable Diseases; Chronic Disease; Mortality, Premature; Public Health; Ecological Studies.

RESUMO

Objetivo: Verificar a variação da taxa de mortalidade prematura pelo conjunto das principais doenças crônicas não transmissíveis. **Método:** Estudo ecológico de séries temporais, que utilizou dados secundários do Sistema de Informações sobre Mortalidade, de 2006 a 2014, das 26 unidades federativas e do Distrito Federal. Foram incluídos óbitos que tiveram como causa básica doenças do aparelho circulatório, câncer, diabetes e doenças respiratórias crônicas. A tendência da taxa ajustada de mortalidade foi analisada pela regressão linear segmentada. **Resultados:** Houve tendência de redução da mortalidade prematura na maioria dos estados, exceto Maranhão e Rio Grande do Norte, que apresentaram estabilidade da taxa de mortalidade prematura. Os estados da Bahia, Pernambuco, Sergipe, Roraima e todos das regiões Sul, Sudeste e Centro-Oeste atingiram a meta de redução de 2% ao ano na mortalidade prematura pelas principais doenças. **Conclusão:** A maioria dos estados apresentaram redução da taxa de mortalidade e estão atingindo a meta proposta. **Descritores:** Doenças Não Transmissíveis; Doença Crônica; Morte Prematura; Saúde Pública; Estudos Ecológicos.

RESUMEN

Objetivo: Verificar la variación de la tasa de mortalidad prematura por el conjunto de las principales enfermedades crónicas no transmisibles. **Método:** Estudio ecológico de series temporales, en que se utilizaron datos secundarios del Sistema de Información sobre Mortalidad, de 2006 a 2014, de las 26 Unidades Federativas y del Distrito Federal. Se incluyeron muertes con causa básica las enfermedades del aparato circulatorio, cáncer, diabetes y enfermedades respiratorias crónicas. La tendencia de la tasa ajustada de mortalidad se analizó por la regresión lineal segmentada. **Resultados:** Hubo tendencia de reducción de la mortalidad prematura en la mayoría de los estados, excepto Maranhão y Rio Grande do Norte que presentaron estabilidad de la tasa de mortalidad prematura. Los estados de Bahia, Pernambuco, Sergipe, Roraima y todos de la Región Sur, Sudeste y Centro-Oeste alcanzaron la meta de reducción del 2% al año en la mortalidad prematura por las principales enfermedades. **Conclusión:** La mayoría de los estados presentan reducción de la tasa de mortalidad y están alcanzando la meta propuesta. **Descriptor:** Enfermedades no Transmisibles; Enfermedad Crónica; Mortalidad Prematura; Salud Pública; Estudios Ecológicos.

INTRODUCTION

According to the World Health Organization (WHO), chronic noncommunicable diseases (CNCD) kill an estimated 38 million people each year, accounting for 70% of all deaths in the world⁽¹⁾. Circulatory system diseases (CSD), cancer, chronic respiratory diseases (CRD) and diabetes account for 80% of these deaths by CNCD. Although people of all ages are affected by these diseases, the risk of premature death in those aged 30–69 was 22% in 2000 and 18% in 2016. Despite the reduction, mortality risk is still high, especially in middle and low-income countries⁽²⁾.

In Brazil, in 2011, CSD, cancer, CRD and diabetes accounted for 63.7% of the total premature deaths⁽³⁾. In 2016, the risk of death in individuals aged 30 to 69 years due to these causes was 16.6%⁽²⁾. This is a serious public health problem, identified in the Strategic Action Plan for Coping with Noncommunicable Chronic Diseases in Brazil (2011–2022), which aims to reduce the premature mortality rate by 2% per year until 2022. For this, the development of health promotion strategies, the reduction of risk factors (smoking, inadequate feeding, obesity, physical inactivity and excessive alcohol consumption) and support for the treatment of diseases are planned⁽⁴⁾.

Most of the previous studies that showed data on premature mortality in Brazil analyzed states⁽⁵⁾ and regions^(6–7) alone or included only cardiovascular diseases in the analyses^(8–9). At national level, a time-series study⁽³⁾ analyzed the trends of premature death for the four major CNCDs in each federal unit and found unfavorable scenarios between 2000 and 2011. Data from the Global Burden of Disease used in an ecological study⁽¹⁰⁾ showed reduced rates of premature mortality for CSD, CRD and cancer and an increase in the rate for diabetes between 1995 and 2015.

The assessment of the risk of premature mortality is an important tool in the follow-up of CNCDs. Its indicators contribute to the planning and monitoring of actions to prevent and treat these diseases, as well as to assess the impact of health promotion policies and control of risk factors. The study of the variation of premature mortality rates allows to infer the effectiveness of public health policies, to indicate population groups at risk and redirect control and monitoring actions. The choice of the study period allows to evaluate the variation in the premature mortality rate before and after the publication of the Coping Plan of CNCDs, in 2011.

OBJECTIVE

To verify the variation of premature mortality rate (from 30 to 69 years) caused by the four main CNCDs (circulatory system diseases, cancer, diabetes and chronic respiratory diseases) in the Brazilian federal units and Federal District, from 2006 to 2014.

METHOD

Ethical aspects

Because these are databases with aggregated information, according to Resolution No. 510/2016 of the National Health Council, there is no need for approval of the Research Ethics Committee.

Design, location of the study and study period

This is time-series ecological study, with data from the Mortality Information System (SIM – Sistema de Informações sobre Mortalidade) of the Ministry of Health, according to the 26 Brazilian states and the Federal District.

Population, inclusion and exclusion criteria

Data from deaths of residents of Brazilian states by CNCDs — classified by the 10th Revision of the International Classification of Diseases as circulatory diseases (Codes I00–I99), malignant neoplasms (Codes C00–C97), respiratory system diseases (Codes J30–J98) and diabetes *mellitus* (Codes E10–E14) — in individuals aged 30 to 69 years, considered the causes of premature mortality, from 2005 to 2015. Cases with unknown gender and age data were excluded. The number of deaths was compensated for by ill-defined causes (Codes R00–R99). This procedure followed a previous protocol⁽¹¹⁾, considering the large number of deaths caused by ill-defined causes, especially in the states of the North and Northeast regions.

Analysis of results and statistics

For the grouping of the premature causes of mortality, specific mortality rates were calculated according to the age range per 100 thousand inhabitants. Data on the population of each state were obtained from the 2010 Census and from population estimates (2005 to 2009; 2011 and 2015) available on Datasus (www.datasus.gov.br). After this procedure, the rates were adjusted by direct method, using the 2010 Brazilian Census population as reference.

For smoothing the adjusted mortality rate, the centered mean was used in three terms. Thus, the period considered in this study was from 2006 to 2014. These rates were used to calculate the trend, with segmented linear regression, through the Joinpoint software, version 4.5.0.1 (Statistical Research and Applications Branch), provided by the North-American National Cancer Institute. This method allows to describe trends and identify the years in which change has occurred. From the inclination of the regression line, we estimated the percentage of annual change, its statistical significance and the 95% confidence interval (95% CI).

RESULTS

Figure 1 shows the premature mortality rates, due to the CNCD group, per 100,000 inhabitants for each state, per region of the country. At the beginning of the period, in the state of Rio de Janeiro, rates were the highest in Brazil. However, at the end of the study period, most states had rates close to 350 deaths per 100,000 inhabitants. The Federal District was the place with the lowest premature mortality rate at the end of the study (2014). The states of the North region were the ones that had the lowest death rate due to premature mortality at the beginning of the study period (2006).

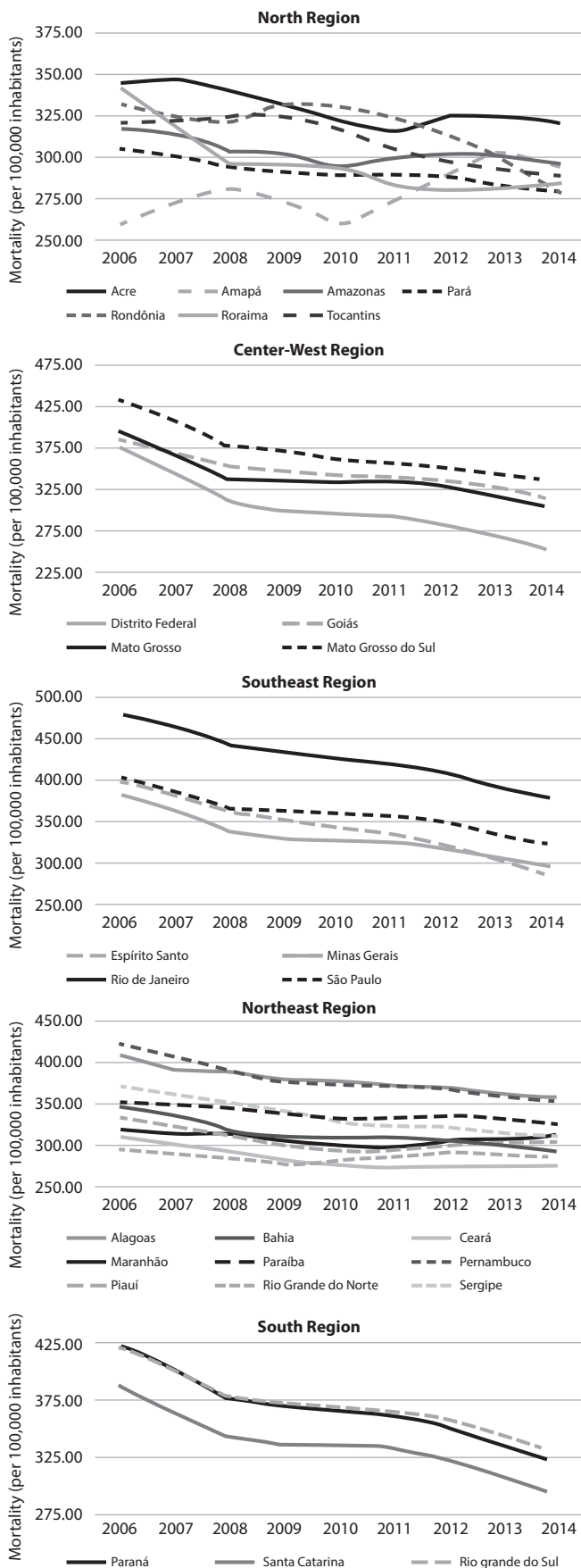


Figure 1 – Temporal trend of premature mortality rate by state, according to regions of Brazil, 2006-2014, Florianópolis, Brazil, 2018

Table 1 shows the annual percentage change in the premature mortality rate per federal unit per region from 2006 to 2014. In the South region, there was a significant reduction in the rate of premature mortality in the studied period: 2.9% per year in Paraná, 2.5% in Rio Grande do Sul and 2.8% in Santa Catarina. In the Southeast region, Minas Gerais showed two variations of premature mortality (2006 to 2008 and 2008 to 2014), which showed a significant decrease of 5.5% and 2.1% per year, respectively. Espírito Santo, Rio de Janeiro and São Paulo showed a significant reduction of 3.6%, 2.7% and 2.4% per year, respectively, from 2006 to 2014.

In the Center-West, all states and the Federal District exceeded the target of 2% per year reduction in premature mortality due to all four major CNCDs. However, there were two variations of premature mortality (2006 to 2008 and 2008 to 2014) in all of them. Goiás and Mato Grosso had a significant reduction of variation in only one period (2008 to 2014), of 1.6% and 1.5% per year, respectively. The Federal District showed a reduction of 8.7% per year, from 2006 to 2008, and of 3.1% per year from 2008 to 2014. Mato Grosso do Sul showed a significant decrease of 6.48% per year between 2006 and 2008, and 2% per year between 2008 and 2014.

In the Northeast, the states of Bahia, Pernambuco, Sergipe, Alagoas, Ceará and Piauí showed a significant reduction in the premature mortality rate. However, only the first three met or exceeded the target of 2% reduction per year in premature mortality due to the four major CNCD. Alagoas and Paraíba showed a significant reduction in the premature mortality rate in the studied period, of 1.5% and 0.9%, respectively. The other states showed two variations of significant reduction, in distinct periods: Bahia, 1.3% per year, between 2008 and 2014; Ceará, 2.9% per year, from 2006 to 2010; Pernambuco, 4.3% per year, from 2006 to 2008, and 1.4% per year, between 2008 and 2014; Sergipe, 2.8% per year, from 2006 to 2010, and 1.6% per year from 2010 to 2014. Maranhão and Piauí showed stability in the premature mortality rate, with a significant decrease in it, of 1.5% and 3.1%, from 2006 to 2011 and 2006 to 2010, respectively, and an increase of 1.7% and 1% per year, from 2011 to 2014 and 2010 to 2014.

In the North region, only Roraima exceeded the target of reducing premature mortality by 2% per year by all four major CNCDs, with two mortality variations (2006 to 2008 and 2008 to 2014), with a significant reduction of 7% in the first period. There was a significant decrease in the states of Acre (1.1%) and Pará (1%) in the studied period. Amapá showed a significant increase of 1.5% per year from 2006 to 2014. The other states of the North region showed two variations in the premature mortality rate: Amazonas reduced it significantly by 1.7% per year from 2006 to 2010; Rondônia showed two variations (2006 to 2011 and 2011 to 2014), with a significant reduction of mortality rates only in the second period, 5% per year; Tocantins had two variations, only one with a significant reduction of 2.5% from 2009 to 2014.

DISCUSSION

All the states of the South, Southeast and Center-West regions, as well as the states of Bahia, Pernambuco, Sergipe and Roraima,

Table 1 – Percentage of annual change in the premature mortality rate per federal unit and regions, Brazil, 2006-2014

Region	State	Average annual change percentage over the period 2006-2014	Annual change percentage			
			Period	Variation	Period	Variation
Northeast	Alagoas	-1.5 [^] (-1.8;-1.1)				
	Bahia	-2.0 [^] (-2.9;-1.1)	2006-2008	-4.2 (-8.4;0.2)	2008-2014	-1.3 [^] (-2.1;-0.5)
	Ceará	-1.5 [^] (-1.7;-1.2)	2006-2010	-2.9 [^] (-3.4;-2.4)	2010-2014	-0.1 (-0.6;0.5)
	Maranhão	-0.3 (-0.7;0.1)	2006-2011	-1.5 [^] (-2.0;-0.9)	2011-2014	1.7 [^] (0.4;3.0)
	Paraíba	-0.9 [^] (-1.1;-0.6)				
	Pernambuco	-2.1 [^] (-2.6;-1.7)	2006-2008	-4.3 [^] (-6.5;-2.1)	2008-2014	-1.4 [^] (-1.8;-1.0)
	Piauí	-1.0 [^] (-1.4;-0.7)	2006-2008	-3.1 [^] (-3.8;-2.3)	2008-2014	1.0 [^] (0.3;1.8)
	Rio Grande do Norte	-0.2 (-0.9;0.4)	2006-2009	-1.7 (-3.6;0.3)	2009-2014	0.7 (-0.2;1.6)
	Sergipe	-2.2 [^] (-2.5;-1.9)	2006-2010	-2.8 [^] (-3.4;-2.3)	2010-2014	-1.6 [^] (-2.2;-1.0)
North	Acre	-1.1 [^] (-1.7;-0.5)				
	Amapá	1.5 [^] (0.3;2.7)				
	Amazonas	-0.7 [^] (-1.3;-0.1)	2006-2010	-1.7 [^] (-2.8;-0.5)	2010-2014	0.3 (-0.9;1.5)
	Pará	-1.0 [^] (-1.2;-0.7)				
	Rondônia	-1.9 [^] (-2.9;-0.8)	2006-2011	0.0 (-1.3;1.4)	2011-2014	-5.0 [^] (-8.1;-1.8)
	Roraima	-2.4 [^] (-3.7;-1.2)	2006-2008	-7.0 [^] (-12.7;-0.9)	2008-2014	-0.9 (-2.0;0.3)
Tocantins	-1.4 [^] (-1.9;-1.0)	2006-2009	0.3 (-1.1;1.7)	2009-2014	-2.5 [^] (-3.1;-1.8)	
Southeast	Espírito Santo	-3.6 [^] (-4.1;-3.2)				
	Minas Gerais	-3.0 [^] (-4.0;-1.9)	2006-2008	-5.5 [^] (-10.4;-0.4)	2008-2014	-2.1 [^] (-3.0;-1.1)
	Rio de Janeiro	-2.7 [^] (-3.0;-2.4)				
	São Paulo	-2.4 [^] (-2.9;-1.8)				
Central-West	Distrito Federal	-4.5 [^] (-6.1;-2.9)	2006-2008	-8.7 [^] (-15.9;-0.9)	2008-2014	-3.1 [^] (-4.6;-1.5)
	Goiás	-2.2 [^] (-3.1;-1.4)	2006-2008	-4.0 (-8.0;0.2)	2008-2014	-1.6 [^] (-2.4;-0.9)
	Mato Grosso	-2.7 [^] (-4.1;-1.4)	2006-2008	-6.5 (-12.6;0.1)	2008-2014	-1.5 [^] (-2.7;-0.3)
	Mato Grosso do Sul	-3.1 [^] (-3.5;-2.7)	2006-2008	-6.4 [^] (-8.5;-4.2)	2008-2014	-2.0 [^] (-2.4;-1.6)
South	Paraná	-2.9 [^] (-3.5;-2.3)				
	Rio Grande do Sul	-2.5 [^] (-3.1;-1.9)				
	Santa Catarina	-2.8 [^] (-3.5;-2.0)				

reached or exceeded the goal of reducing 2% per year in premature mortality caused by all four major CNCDs. Maranhão and Rio Grande do Norte showed stability in this rate.

The results indicated that the overall goal of reducing the premature mortality rate due to the four main CNCDs is being achieved in most Brazilian states. Compared to the world scenario, deaths due to CNCDs for the age group of 30 to 69 years tend to be reduced in the next years⁽¹²⁾. This progress is also favorable to achieve the United Nations Organization's Goals for Sustainable Development in 2015, which provide for a one-third reduction in premature mortality by CNCDs through prevention and treatment by 2030⁽¹³⁾. This reduction comes from the implementation of public health policies to prevent and control chronic diseases, as well as their risk factors^(10,14), such as smoking, alcohol consumption, unhealthy diet, physical inactivity and environmental carcinogens^(3,15-16). These actions were recommended by the WHO⁽¹⁷⁾ and proposed in the Strategic Action Plan for Coping with Chronic Noncommunicable Diseases in Brazil^(10,14).

Tobacco use and alcohol consumption are responsible for a number of health problems, including liver disease, cancer and mental disorders, which creates costs for society with health care, absenteeism at work and loss of productivity⁽¹⁸⁾. The implementation of the National Tobacco Control Policy adopted regulatory measures to control smoking and the marketing of

cigarettes through advertising campaigns, minimum sale price and increased taxation, as well as smoke-free environments with sanitary inspection, and broader treatment of smokers in SUS^(3,15).

The incentive to healthy life habits, in relation to physical activity and food⁽¹⁹⁾, has also contributed to the decline of premature mortality. The Health Academy Program, which has invested in bodily activities together with the community^(3,15), had an impact on the increase in physical activity during free time, from 30.3% in 2009 to 37.6% in 2016, in the capitals of the country. However, the prevalence of practice decreases with advancing age, being more frequent among young people from 18 to 24 years⁽²⁰⁾.

Governmental projects, such as the *Food Guide for the Brazilian Population*⁽²¹⁾ and *Brazilian Regional Foods*⁽²²⁾, encourage actions to promote the regular consumption of regional and in natura foods and the reduction of soft drinks and sugary beverages, in order to halt the development of CNCD and obesity. In addition, public strategies for the reduction of ultraprocessed industrialized foods, with excess sugar, fat and sodium^(15,20) have been frequent in the national media. Despite these actions, in the last ten years, diabetes increased 61.8% and hypertension 14.2%⁽²⁰⁾.

To reduce morbidity and mortality due to cancer, the Ministry of Health has directed national surveillance, early diagnosis and control of the major neoplasms (breast cancer and cervix) in all regions⁽¹¹⁾. A study with previous results from the National Health

Survey showed improvement in the screening and prevention of cervical cancer (Pap smear) in women aged 25 to 64 years, jumping from 78% in 2008 to 82.9% in 2013. In the Brazilian capitals, improvements were observed in mammography coverage, which in 2008 was 54% in women aged 50-69 years, increasing to 73.4% in 2010, and rising to 78% in 2013⁽¹⁴⁾.

Interventions for care delivery and health promotion in the Unified Health System may be boosting the achievement of the objectives proposed by the Strategic Action Plan for Coping with Chronic Noncommunicable Diseases in Brazil^(10,14). Expansion of primary care, improved delivery of health services, and distribution of drugs to the population at risk (such as cardiovascular diseases) are strategies that have shown a reduction in mortality by the four CNCDs⁽²³⁾. In this sense, after the implementation of the integral health care model, with the expansion of primary care by the Family Health Strategy, positive health impacts were observed in the Brazilian population⁽²⁴⁾. However, the prevalence of people living with CNCDs has compromised the performance of primary care professionals who do not review their practices and maintain care centralized in the disease and in the biomedical model. In this aspect, health promotion, by prioritizing the expanded health-disease concept, shows a cost-effective population intervention in confronting CNCDs, with intersectoral actions and community empowerment⁽²⁵⁾.

The development of these strategies created conditions to reduce premature mortality in Brazil, even though there are still regional differences⁽⁹⁾. Most of the states of the Northeast (Alagoas, Ceará, Paraíba and Piauí) and North (Acre, Amazonas, Pará, Rondônia and Tocantins) regions, despite having reduced the rate, did not reach the reduction target. Only Maranhão and Rio Grande do Norte showed stability of the premature mortality rate by all four major CNCDs, while Amapá was the only state that showed an increase in it over the study period. Despite stability, premature mortality rates are high in Maranhão and Rio Grande do Norte and should be following the reduction flow to reach the predicted target. This unfavorable scenario in the North and Northeast shows differences in living conditions that favor risk factors, and the need to intensify regional and national surveillance and invest in projects for locoregional prevention and control of NCDs⁽⁹⁾. In spite of this, the Northeast has the highest coverage of health services by SUS (Tocantins > 90%, Paraíba and Piauí > 80%)⁽²⁶⁾, with most of the population registered in family health units⁽²⁷⁾. Considering that primary health care can reduce major CNCDs in the population, high coverage in these regions has not been reflected in policies to address these diseases.

The increase in mortality rates in Amapá over the studied period can be explained by the lack of access to medical attention, lack of medicines, poor infrastructure of primary health units and insufficient investment in health and education⁽²⁸⁾. Also contributing to this scenario are the greater exposure to risk factors, such as physical inactivity, due to high air humidity and high thermal sensation⁽²⁸⁾ and inadequate eating habits — possibly due to lack of knowledge and misuse of biome potentials⁽²⁹⁾, despite the diversity of fish and fruits in the region — and the high consumption of processed foods⁽³⁰⁾. A study with data from the National Health Survey showed that less

than 35% of adults regularly consume fruits, vegetables and beans, although 76.9% consume fish regularly⁽³¹⁾.

The indicator of premature mortality combines different health problems, which evolve in a differentiated way, and the attention to the subcomponents is fundamental, especially when analyzed per federal unit. New care strategies in the different health care management areas require qualified, sound and timely information so that the indicator is effective and, thus, prioritizes the prevention and treatment of the diseases that cause more deaths in each region. In this sense, it would be worth highlighting the warning so that the states that did not reach the target be prioritized and that the monitoring of the coping plan be more supported⁽³⁾.

Limitations of the study

The study has limitations regarding the quality of data recorded by the SIM. The exposed and calculated data may be influenced by the quality of the information recorded in the death certificates, even after compensation to correct this problem. However, because the data are publicly available, the analysis is not annulled, nor is the contribution of the results to the knowledge of the population's health situation and health surveillance. Another limitation is the comparison with other studies, since there are few that analyze the SIM data by the set of four main CNCDs; in general, the components of CNCDs are addressed separately.

Contributions to the field of nursing, health and public policy

The surveillance of premature mortality rates is an important tool to plan care actions for people with CNCD and to monitor their health conditions. Monitoring the mortality data allows the nurse to plan care actions and practices compatible with the population reality, as well as to redirect nursing care to prevent risks and deaths at all levels of health care. The results of this study reinforce the correct and positive direction of the public policies of the Plan of Action of Containment, in consonance with the terms of reduction of the premature mortality rate defined by the Objectives of Sustainable Development.

CONCLUSION

These findings allow us to affirm that the trend of premature mortality for the four major chronic diseases decreased, throughout the studied period, in most of the federal units of Brazil, except for the states of Maranhão (2011 to 2014), Piauí (2010 to 2014) and Amapá (2006 to 2014). The reduction in premature mortality rates was more pronounced in the states of the South and Southeast regions, and less significant in the North and Northeast.

Since most states have been reducing their rates, and some regions/states have achieved the 2% reduction target per year, new targets could be proposed in order to further reduce this health situation that causes restrictions to a productive age group. As for the increase in premature mortality rates in Maranhão, Piauí and Amapá, it is recommended to treat these states as a priority, especially with the implementation of projects that stimulate the effective reduction of CNCDs.

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