

Pneumonia mortality in Brazilian children aged 4 years and younger

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Abstract

Objective: To evaluate the trend of pneumonia mortality in Brazilian children aged 4 years and younger from 1991 to 2007.

Methods: We conducted a retrospective study based on the database of the IT Department of the Brazilian Unified Health System (DATASUS), from which we obtained the number of deaths from pneumonia and the population aged 4 years and younger living in the five Brazilian regions and in the whole country. Mortality rate was calculated according to the number of deaths from pneumonia divided by the population, multiplied by 1,000 for the age group under 1 year old and by 10,000 in the age group from 1 to 4 years. The linear regression test was used to evaluate the time trend of mortality.

Results: There was a significant decrease in pneumonia mortality rates during the study period in both age groups and all regions of the country. In Brazil, the mean annual reduction in mortality rates in the population under 1 year old and between 1 and 4 years was 0.12 and 0.07, respectively. The South and Southeast regions showed the greatest reductions (-0.14 and -0.18 for < 1 year and -0.07 and -0.09 for 1 to 4 years). The smallest decreases were in the North and Northeast regions (-0.04 and -0.07) in children younger than 1 year, and in the North and Central West (-0.03 and -0.04) in the age group between 1 and 4 years.

Conclusions: There was a significant reduction in pneumonia mortality in children aged 4 years and younger across the country from 1991 to 2007; however, a discrepancy between the different regions remains evident.

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Introduction

Childhood pneumonia has been a global public health problem because of its high mortality and morbidity rate. Pneumonia causes the largest number of deaths among children between 0 and 5 years of age in the world.^{1,2} It is estimated that each year approximately 2 million children die from pneumonia worldwide, mainly in developing countries.¹

With the purpose of reducing the mortality caused by pneumonia and other prevalent diseases, the World Health Organization (WHO) has encouraged wider vaccination coverage and implementation of several intervention strategies, such as the Integrated Management of Childhood Illness (IMCI). As a consequence of these measures, there was reduction in the pneumonia mortality in children

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under 5 years according to studies conducted in India and China.^{3,4}

These measures were also implemented in Brazil. In addition, in the last decade, there has been improvement in primary health care of children as well as in the quality of life of the lower classes. All these factors may have decreased the mortality rate of Brazilian children, mainly in terms of deaths from pneumonia. A study conducted in the metropolitan region of Salvador (state of Bahia) showed a 91.9% reduction in the mortality rate of children between 0 and 4 years of age from 1980 to 2002.⁵ Another regional study conducted in the municipality of Caxias do Sul (state of Rio Grande do Sul) showed a reduction in the mortality from respiratory diseases in children under 5 years between 1996 and 2001 (from 0.58 to 0.36 deaths per 1,000 children).⁶ However, no nationwide study has been conducted in Brazil on the time trend of pneumonia mortality in children under 5 years. We also could not find in the literature studies investigating regional differences regarding time trends in pneumonia mortality in children younger than 5 years in the last two decades.

The objective of the present study is to determine the time trend of pneumonia mortality in Brazilian children aged 4 years and younger 1991 and 2007 in the whole country and in its five regions trying to identify possible differences in this trend between the regions.

Methods

The present study is a retrospective and analytical study based on the database of the IT Department of the Brazilian Unified Health System (DATASUS).⁷ We obtained the number of deaths from pneumonia and the population of children under 1 year and between 1 and 4 years of age in the five geographical regions of Brazil and the whole country. The study was conducted from January 1991 to December 2007. Pneumonia code was based on the ninth revision of the International Classification of Diseases (ICD-BR-9) in the period from 1991 to 1995, and the 10th revision (ICD BR-10) in the period from 1996 to 2007. Data were independently collected by two people using a standard table. Data collection was checked by two other people.

The main study variable was pneumonia mortality rate (number of deaths from pneumonia/population) multiplied by 1,000 for the age group under 1 year old and by 10,000 in the age group from 1 to 4 years. We also calculated the relative reduction in pneumonia mortality rate (1991 vs. 2007: the death rate in 2007 minus the mortality rate in 1991) divided by the mortality rate in 1991 multiplied by 100.

Simple linear regression was used for the analysis of time trends. The regression coefficient represents the mean annual change in pneumonia mortality rate. Statistical

analysis was performed using the software Stata 9 (Stata corp., College Station, USA).

Results

The time trend of pneumonia mortality rates showed a significant decrease in all regions of Brazil from 1991 to 2007, both in the age group under 1 year old and in the age group between 1 and 4 years (Figures 1 and 2). This trend was more clearly evident since 1995-1996. The South and Southeast regions showed the greatest reductions in pneumonia mortality rates during the period of the study, with a mean annual reduction of 0.14 and 0.18 in children under 1 year, and 0.07 and 0.09 in children between 1 and 4 years of age, respectively (Table 1).

As for the relative reduction in pneumonia mortality rates comparing 2007 and 1991, there was also a discrepancy between the Brazilian geographical regions. In the population under 1 year of age, the nationwide reduction rate was 73.6%, while in the Central West, Northeast, North, Southeast, and South regions the rates were 86.4, 84.3, 67.3, 54.3, and 26.7%, respectively. In children aged between 1 and 4 years, these rates were 56.3% for the whole country and 74.8, 68.5, 28.7, 44.2, and 28.2%, respectively, in the above mentioned regions.

Discussion

The present retrospective study found a decline in the pneumonia mortality rate in children in all regions of Brazilian during the study period, both in the age group under 1 year

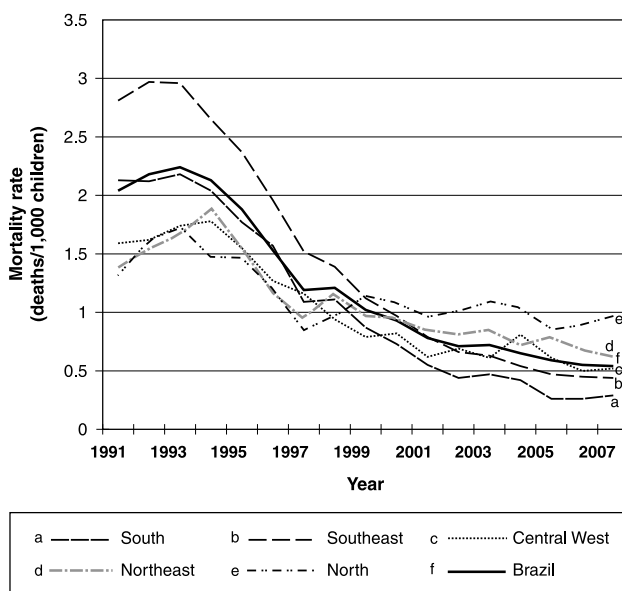


Figure 1 - Time trend of pneumonia mortality rate in children under 1 year of age in Brazil and its geographical regions from 1991 to 2007

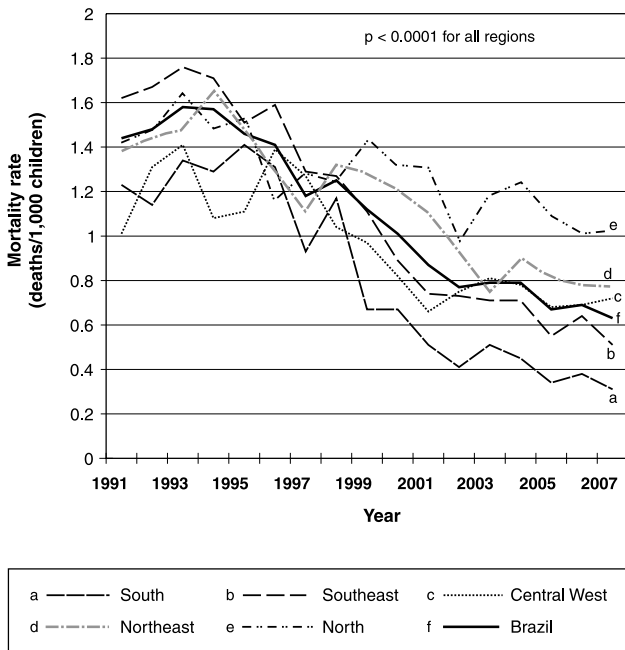


Figure 2 - Time trend of pneumonia mortality rate in children aged 1-4 years in Brazil and its geographical regions from 1991 to 2007

old and in the age group between 1 and 4 years old. The mean annual reduction in the pneumonia mortality rates was 0.12 year old for the population younger than 1 year and 0.07 for those children between 1 and 4 years old. In the South and Southeast regions, the reduction was more pronounced in both age groups. The smallest decreases were in the North and Northeast regions for children younger than 1 year and in the North and Central West regions for the age group between 1 and 4 years.

This reduction in mortality rates is consistent with the trend observed in some developing countries like China and India. As a consequence of the implementation of the IMCI program, there was reduction in the pneumonia mortality of children under 5 years according to a study conducted in India.³ Comparing areas with prevention programs to control areas, there was a significant reduction in mortality of children under 5 years after 1 year of intervention (8.1 vs. 17.5 deaths per 1,000 children). A similar study conducted in China after implementation of mortality control programs showed reduction in the pneumonia mortality rate from 40.1 deaths per 1,000 live births in 1990 to 31.8 per 1,000 in 1991.⁴

The design of the present study does not allow any conclusions about the causes of the reduction in the pneumonia mortality rate in the period studied. Several factors may have contributed to this phenomenon, such as the implementation of programs recommended by the WHO for the control of prevalent diseases in children and the inclusion of vaccination against *Haemophilus influenzae* type B and *Streptococcus pneumoniae* in the national immunization schedule, for example. Furthermore, the Brazilian Ministry of Health created the Community Health Agents Program (PACS) along with the Family Health Program (PSF), which provide preventive and therapeutic care to the population living in districts far from large hospitals.

The present study demonstrated discrepancy in terms of magnitude of the reduction in pneumonia mortality between the regions of Brazil. The regional differences are probably related to the implementation of these measures in a more effective manner in the South and Southeast compared to other regions. The lack of financial resources to health, education and sanitation, coupled with the lack of adequate government programs in some regions, may have contributed to this difference. Thus, there is relevant evidence that helps to set priorities regarding the public health policy aimed at homogeneously reducing mortality in Brazil.

Table 1 - Mean annual reduction in pneumonia mortality rates in children aged 4 years and younger in Brazil and its geographical regions from 1991 to 2007

| Age group* | Linear regression coefficient by region (95%CI) | | | | | |
|--------------|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | South | Southeast | Central West | Northeast | North | Brazil |
| < 1 year old | -0.14 (-0.16 to -0.12) | -0.18 (-0.21 to -0.15) | -0.09 (-0.10 to -0.07) | -0.07 (-0.08 to -0.05) | -0.04 (-0.06 to -0.02) | -0.12 (-0.14 to -0.09) |
| 1 a 4 years | -0.07 (-0.09 to -0.06) | -0.09 (-0.10 to -0.07) | -0.04 (-0.06 to -0.03) | -0.05 (-0.07 to -0.04) | -0.03 (-0.04 to -0.02) | -0.07 (-0.08 to -0.06) |

95%CI = 95% confidence interval.
* p < 0.000 for all age groups in all regions.

Conclusion

Even with the limitations of a retrospective study based on secondary data and exposed to inadequate completion of some records, we conclude that there was a reduction in pneumonia mortality in children under 5 years in the period from 1991 to 2007 in the whole country and in all regions of Brazil. However, there were regional differences in the magnitude of the reduction.

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