Mortality rate in children caused by traffic accidents according to geographical regions – Brazil, 1997 - 2005

Mortalidade de crianças por acidente de trânsito segundo região geográfica – Brasil, 1997 a 2005

Abstract

Fatal injuries in children caused by motor vehicle accidents represent a common situation in many countries worldwide. The present study addresses the mortality rate in children as vehicle passengers in Brazil, from 1997 to 2005. To evaluate mortality rates, the number of deaths was collected from the National Mortality Information System (SIM) and the population size was obtained using the Brazilian Bureau Census (IBGE) data available at DATASUS. Mortality rates were estimated in three-year periods and analyzed according to age groups (younger than 1 year old, 1-4 years old, 5-9 years old) and geographical regions using a 95% confidence interval. Overall results showed mortality rates of 5.68, 7.32 and 6.78 (per 1,000,000) for the 1997-1999, 2000-2002 and 2003-2005 periods, respectively for the whole country. Children younger than 1 year old had a mortality rate of 10.18 (per 1,000,000), which was higher than for the other age groups. For the period analyzed, the highest rates were observed for the Mid-West and South regions of Brazil, with rates of 13.88 and 11.47 (per 1,000,000), respectively. These results show the risk of fatal injury in children caused by motor vehicle accidents and may contribute to the establishment of educational campaigns aiming injury prevention in children as vehicle passengers.

Keywords: Mortality. Rate. Traffic. Accidents. Children. Risk.

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Resumo

Lesões fatais em crianças causadas por acidentes de trânsito representam um problema em muitos países. Este estudo analisou a taxa de mortalidade em crianças passageiras de automóveis menores de 10 anos de idade no Brasil, entre 1997 e 2005. Para isso, o número de mortes foi obtido diretamente no banco de dados do Sistema de Informação sobre Mortalidade (SIM) e os dados da população são projeções intercensitárias a partir censo demográfico do Instituto Brasileiro de Geografia e Estatística (IBGE) disponíveis pelo *site* do DATASUS. Foram calculadas, para os triênios compreendidos no período em estudo, as taxas de mortalidade por acidente de trânsito entre crianças passageiras de automóveis segundo faixa etária (menor que 1 ano, 1 a 4 e 5 a 9) e região geográfica. Os resultados mostraram taxas de mortalidade de 5,68, 7,32 e 6,78 (por 1.000.000), respectivamente, para os períodos 1997-1999, 2000-2002 e 2003-2005 para todo o Brasil. Crianças menores de 1 ano de idade apresentam taxa de mortalidade de 10,18 (por 1,000,000), maior que as observadas para as outras faixas etárias. Para o período 1997-2005, as maiores taxas foram observadas nas regiões Centro-Oeste e Sul, representando, respectivamente, 13,88 e 11,47 (por 1.000.000). Tais resultados mostram a situação de risco da criança em relação a acidentes de trânsito como passageiras de automóveis e contribuem para a elaboração de campanhas educativas de prevenção de lesões.

Palavras-chave: Mortalidade. Acidente. Trânsito. Crianças. Risco.

Introduction

Traffic accident injuries are a common cause of mortality and morbidity among children in the world. According to the latest data available from the National Highway Traffic Safety Administration[1], there were 2,000 children (aged 3-14 years old) injured by Motor Vehicle Crashes (MVC) in 2006 in the USA. MVC injuries currently represent a public health concern in many developed and developing countries[2-4]. Such injuries are often related to the unintentional misuse of children restraint systems (CRS) [5] or even associated with the non-use of any CRS[6].

Epidemiological data of external causes of death vary strongly across countries making the local analysis an important tool to investigate and promote effective interventions[7]. As a result of an intervention program in Sweden, Ekman et al. (2001)[2] found a decrease in mortality rates in the 1970-1996 period after the promotion of CRS usage in the front and rear seat of vehicles. Turner et al. (2005)[8] also found a significant reduction in injury risk in children after community-based program interventions to increase the use of CRS. Thelot (2008)[9] evaluated injuries in French children caused by traffic accidents in a metropolitan region in 2006, highlighting that the epidemiological description of causes of fatalities is necessary to prevent those injuries.

So far, the situation of fatalities caused by MVC in children in the condition of vehicle passengers is unknown in Brazil, besides the already mentioned epidemiological transition of causes of death in children[10,11]. Currently in Brazil, external causes of death classified in the XX Chapter of the 10th revision of the International Classification of Disease (ICD-10) are the leading causes of death in children in comparison to infectious and respiratory diseases that were the main causes of death in children in the 70's[10].

As a contribution to educational programs on road transportation, the aim of the present paper was to evaluate the tendency of mortality rates in Brazilian children, aged

Table 1 - Traffic accident mortality rate (per 1,000,000 children) according to geographical region and period.
Tabela 1 *- Taxa de mortalidade por acidente de transito (por 1.000.000 crianças) segundo região geográfica e período.*

Period	North	Northeast	Mid West	Southeast	South	Brazil
1997-1999	2.07	5.36	13.07	3.15	12.02	5.68
2000-2002	4.62	6.37	16.57	5.69	11.24	7.32
2003-2005	3.55	5.83	13.55	5.58	11.15	6.78
1997-2005*	3.44	5.85	13.88	4.83	11.47	6.60

* standardized mortality rate

from 0 to 9 years, according to geographical regions, from 1997 to 2005.

Methods

Information on deaths was obtained from the National Mortality Information System (SIM)[12] of Brazil's Ministry of Health Database, available on two CDs. Data were obtained according to children's age (0-9 years old) and geographical regions of Brazil (North, Northeast, South, Southeast and Mid-West). All data were collected from January/01/1997 to December/31/2005, and the analysis was conducted in three--year periods (1997-1999, 2000-2002 and 2003-2005).

Ages ranging from 0 to 9 were grouped (< 1, 1-4 and 5-9). Groups were based on the fact that different CRS are designed according to age group. Although the use of the correct CRS model depends on a child's height and weight, the basic criteria used to determine the type of CRS rely on children's age.

In order to collect the specific cause of death from the SIM database, International Classification of Diseases (ICD-10) codes were used. For the present study, Chapter XX of ICD, 10th revision, was analyzed with focus on the V40 - V49 group, related to car occupant injury caused by traffic accident.

Within the V40-V49 category, some subdivisions were excluded from the study for not being related to children as vehicle occupants. The excluded subdivision were: driver's injury, person on outside of the vehicle injured, and person injured while boarding or alighting.

Statistical Analysis

To estimate mortality rates, the population size was obtained from the Brazilian Bureau Census (Institute of Geography and Statistics - IBGE)[13] for each geographical region and age group, available on the DATASUS website, using the population projection for each year, from 1997 to 2005. Rates were compared using ratios (R) with the respective 95% confidence intervals ($_{95\%}$CI).

Results

In the 1997 - 2005 period, there were 2,009 deaths in children younger than 10 years old caused by MVC in the condition of car passengers. The general mortality rate was estimated as 6.60 per 1,000,000 children. Table 1 shows the tendency of mortality rates across the three-year periods and geographical regions.

According to Table 1, the rate increased 20% over the period of 9 years (1997-2005) with a significant increase of 30% from the first (1997-1999) to the second period (2000-2002) (R = 1.30, $_{95\%}$CI: 1.15 – 1.43) for the whole country. The rate decreased slightly from the second (2000-2002) to the third period (2003-2005) with R = 1.04 ($_{95\%}$CI: 0.84 – 1.02), remaining relatively stable in this period.

Regarding geographical regions of Brazil, standardized rates were calculated and higher rates were found for the Mid-West and South regions, estimated as 13.88 and 11.47 (per 1,000,000), respectively.

When analyzing rate variation within periods, there was a considerable increasing

trend in mortality rates for the Southeast region from 1997-99 to 2000-2002 (R = 1.81, $_{95\%}$CI: 1.41 – 2.21) remaining stable in the third period (2003-2005). In the South region, the mortality rate remained practically stable for the whole period. Meanwhile, the mortality rate oscillated for the other regions, increasing from 1997-1999 to 2000-2002, and decreasing slightly after that.

Mortality coefficients according to age and geographical regions in the three-year periods are shown in Figure 1.

There was an increasing trend in the mortality rate for children younger than 1 year old in the North and Southeast regions for all periods. The opposite was observed in the South and Mid-West regions, where the mortality rate decreased continuously for this age group. A different behavior occurred in the Northeast region where the rate decreased considerably from the first (1997-1999) to the second period (2000-2002), but increased after that.

For the whole period analyzed (1997-2005), rates were estimated as 10.18, 6.11 and 6.30 (per 1,000,000) for the < 1, 1-4 and 5-9 years old age groups, respectively.

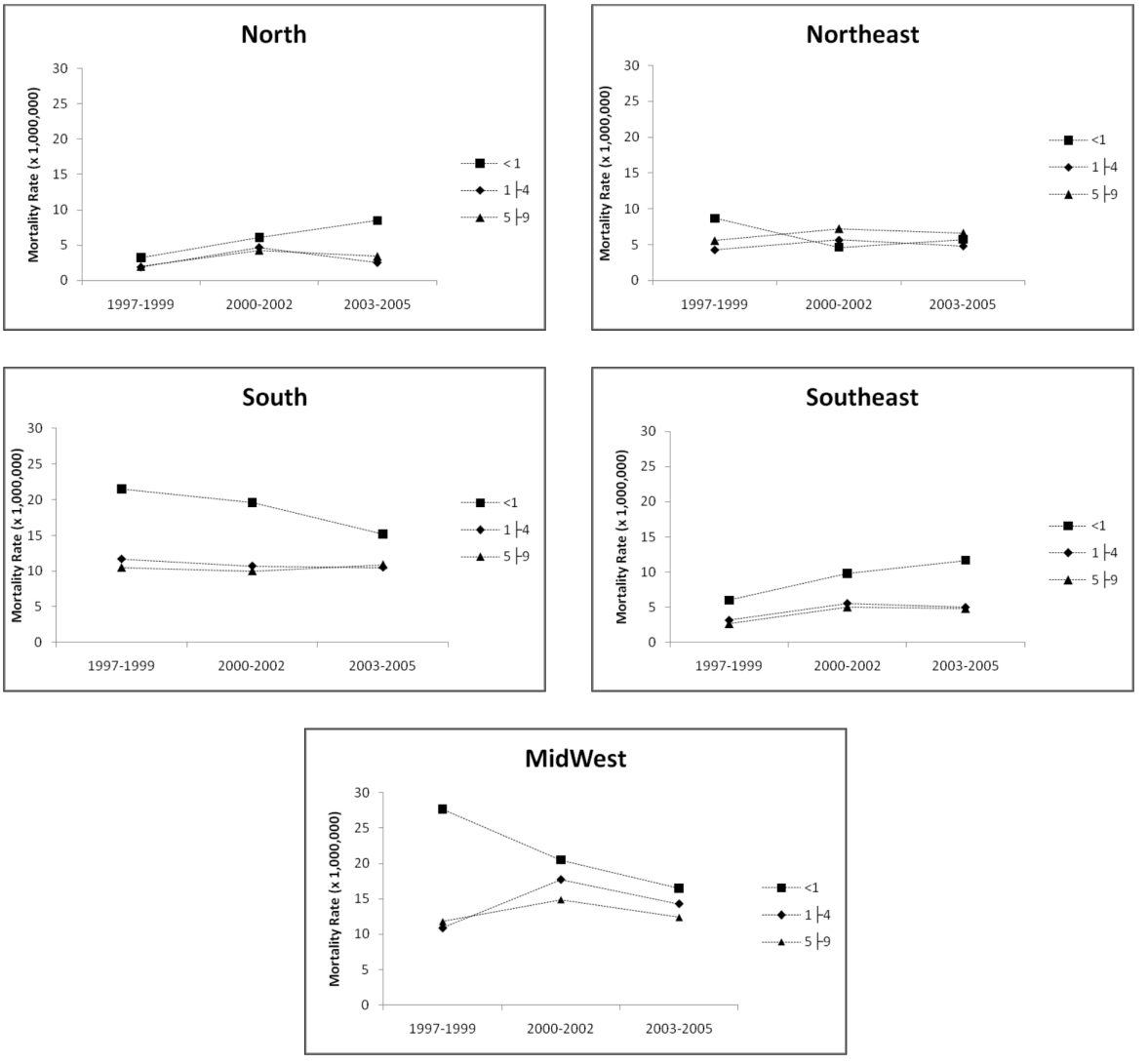

Figure 1 - Mortality rates in children (0-9 years old) according to age and region in the 3-year period study.
Figura 1 *- Taxa de mortalidade em crianças de 0 a 9 anos segundo idade e região em períodos de três anos.*

Discussion

The current study provided information on mortality rates for children from 0 to 9 years old as vehicle passengers. Analyzing the trend of mortality rates in Brazil, the number of fatal injuries in children caused by MVC was found to have increased considerably from 1997 to 2005.

Many other studies have evaluated traffic accident mortality in Brazil including children, adults and all categories of traffic accidents as pedestrians, bicycles, motorcycles and trucks,[14-17] thus not addressing the situation of mortality specifically for children as car passengers. When considering the analysis of children as car occupants, this study was pioneer on the evaluation of mortality rates.

In many countries, MVC have become a public health concern due to their importance as a cause of morbidity and mortality[18]. However, in a study that highlighted the disproportional information on number of traffic accidents in developing countries compared to developed ones, better in the latter, Nantulya and Reich (2002)[19] emphasized that intervention policies would be effective for injury prevention only if based on local evidence and research.

According to WHO (2009)[20], transportation safety for children is still a neglected issue in many countries. In Brazil, the lack of information on epidemiological data may contribute to the inadequacy of educational programs to promote injury prevention in MVC. As already stated by other authors[2,7,8,9], local information and epidemiological data are essential for the effectiveness of interventions in developed and developing countries. The inaccurate information on health in developing countries has to be considered as a scenario that hinders the efficacy of intervention programs[21].

All geographical regions in Brazil follow the same road traffic laws. However, in the present study, higher mortality rates were observed for the Mid-West and South regions (Table 1). The information available may be considered as underestimated due to poor access to victim's files, as already reported by Mello Jorge et al. (2002)[16]. The authors observed that external causes of deaths were better assessed after reanalyzing fatality profiles in three different states of Brazil, indicating substantial variation in data information throughout Brazilian municipalities. According to those authors[16], many efforts are needed to improve medical and police information regarding the real causes of deaths, especially those related to road traffic injuries.

Regarding to the reporting system on health information, the proportion of well-defined causes of death registered for the Northeast region, among children under 1 year old, was 40% and 54% in 1997 and 2004, respectively. The same situation was observed for the North region, where the proportion of well-defined causes of death registered was only 56% and 77% in 1997 and 2004, respectively[22]. Better death information was obtained though for the South, Southeast and Mid-West regions, being particularly better in the latter, with a proportion of undefined causes of death close to 5.8 in 2004. The proportion of undefined causes for the South, Southeast, North and Northeast regions were 6.2, 8.5, 20.8 and 23.7, respectively[23]. This may explain the higher rates for mortality in children as vehicle passengers for the South and Mid-West regions found in this study, where a better health data reporting system is available.

Considering social economic status, it is important to consider that high infant mortality rates are also related to poor access to education, sanitary infrastructure and basic health services. In this case, the North and Northeast regions present high mortality rates in children as reported by FIBGE (2002)[24]. According to Alves and Belluzo (2004)[21], a broad imbalance regarding children mortality rates was found across Brazilian municipalities suggesting that intervention policy priorities vary largely in each region.

According to our findings, children younger than 1 year old showed to be at risk to sustain serious injury in MVC. Lardelli-Claret et al. (2006)[25] also showed

that younger children are among the age range that most sustain serious injuries in motor vehicle accidents.

A recent study conducted in a Southern city of Brazil (Maringá – PR) to address the rate of use of car restraint systems among children up to 4 years old found that younger children tended to be seated on their mother's lap rather than in rearward facing car seats, as it is expected for children up to 1 year old[26]. According to Oliveira et al. (2009)[26] a significant association was found between the use of car seats and children's age, in that children under 15 months are less likely to use car restraint systems. The non use of CRS in younger children definitely represents a risk factor for the higher mortality rate in this age group, as observed in our results.

The determination of mortality rates according to the five geographical regions of Brazil and to children age groups might allow the identification of the target population to receive intervention programs as a promotion of injury prevention for road users. The current study may serve as a basis for future comparison of mortality rates caused by MVC in children, considering the change regarding transportation of children in Brazil recently, where car seats are mandatory and enforcements are applied if children are not properly restrained (according to the regulation released in September 2010 as established by Resolution 277). The use of CRS is expected to increase among Brazilian families after the new regulation, decreasing, consequently, the number of deaths in children as vehicle passengers.

This study aimed to evaluate the trends of mortality rates caused by MVC in children younger than 9 years-old and car passengers. It has limitations, due to the impact caused by the undefined causes of death on MVC mortality rates in the different regions of Brazil.

Conflicts of interest: The Authors declare not having any conflicts of interest for the present paper.

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