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## Hospitalizations by the Brazilian Health System due to traffic accidents

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### Abstract

The road traffic accidents are a worldwide problem that has led several countries and organizations to gather efforts to reverse the current scenario. Annually, it makes millions of deaths, leaving many other people with physical or psychological disturbances. The understanding of scenarios related to non-fatal victims of traffic provides managers improved means to plan and implement preventive actions. Based on indicators and absolute numbers, this work presents the Brazilian scenario of non-fatal victims of traffic accidents. The data indicate that men and young people are the biggest victims, and that each hospitalization costs (on average) to the public treasury more than R\$ 1,300.00. The Northeast region as the highest cause for concern, requires immediate action to mitigate damages caused by traffic in their society.

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## 1. Introduction

In 2010, 1.24 million deaths occurred due to traffic accidents (TA), distributed in 185 countries worldwide. If no action is taken, it is expected that by 2030, the number of fatalities reach 2.4 million. This fact led the United Nations to launch the Decade for Road Safety 2011-2020, with the aim of reducing by at least 50% the number of injuries and fatalities (WHO, 2013a; WHO, 2013b).

Worldwide, traffic accidents are the leading external cause of death for people between 15 and 29 years, the second cause between 5 and 14 years, and the third cause for the range between 30 and 44 years. Countries with medium or low income, concentrate about 90% of the deaths, despite the fact that they represent less than half of the world's automotive fleet. When considering non-fatal casualties, it is estimated that between 20 and 50 million people survive traumas and injuries caused by traffic accidents. (WHO, 2013a; OMS, 2009).

### 1.1. Brazilian scenario

In Brazil, more than 40,000 people had lost their lives in 2011 due to some trauma from TA. Considering records since 1980, nearly one million deaths have been recorded in the Brazilian territory (MS/SVS/DASIS/SIM, 2013).

In the late 1990s, an inflection on the evolution of AT deaths occurred in Brazil: i) by 1997, a significant increase in the number of deaths was recorded, especially between the years 1993 and 1997. ii) after the implementation of the Brazilian Traffic Code, more precisely between 1997/1998 and 2000, it was noted a decrease in these numbers, primarily because of the rigor of the new code and the deployment of safety campaigns. iii) However, from the 2000s, a continuous and systematic growth of mortality rates is observed (Waiselfisz, 2013).

In addition to the significant number of deaths that are record in Brazil, another factor that deserves more attention is related to the number of non-fatal casualties who suffer injuries, often followed by irreversible physical consequences, besides the psychological ones. Ferraz et al. (2008 and 2012) already presented data showing the seriousness of these facts. In view of this, it is necessary to know not only the scenario related to traffic deaths but also the one related to hospitalizations of victims, and from there on, establish public policies and actions in order to mitigate the existing framework.

### 1.2. Objective

This work has as main objective to analyze the attendances for traffic accidents, according to the hospitalization of the Unified Health System (SUS), between 1998 and november/2013. Specifically presents: a) the characteristics of people being hospitalized; b) the average length of hospitalization; c) the cost of hospitalization; d) the estimated number of beds occupied by victims of traffic accidents in Brazil; f) and the spatial distribution of hospitalizations.

## 2. Methodology

This research was developed in an exploratory way, and its methodology is divided into two stages, which were: a) acquisition of data on hospitalizations due to road accidents; b) preparation of graphs and maps for further analysis of the results obtained.

### 2.1. First stage

The data on morbidity and mortality of the Brazilian population are provided by the Ministry of Health, through the Datasus portal ([www2.datasus.gov.br](http://www2.datasus.gov.br)), from tabulations made in TABNET software. Information regarding the morbidity is generated by the document released for Hospitalization (AIH).

For tabulation of morbidity data, the following variables were selected: epidemiological and morbidity external causes by place of hospitalization (1998 to 2007 and from 2008 until november/2013). The worksheets were generated delimiting information for victims of road accidents (ICD-10: V01-V89) by gender, age, length of hospital stay, and total costs of hospitalization.

2.2. Second stage

After the data collection, these were processed with the aid of a worksheet, providing tables and graphs presented here. From the tables, it was possible to calculate the indicator accidentality (hospitalizations/10,000 inhabitants), which were used for elaboration of thematic maps in Ilwis software version 3.0.

An evaluative and critical analysis was made with the purpose of understanding the scenario of the UHS care for victims of traffic accidents.

3. Results and considerations

3.1. Hospitalizations according to gender and age

Between 1998 and 2013, the hospitalizations due to traffic accidents (TA) in Brazil followed the same world tendency of the deaths, where men are the main victims. Throughout this period, males represented more than 70% of hospitalized victims due to traffic accidents, as shown in Figure 1.

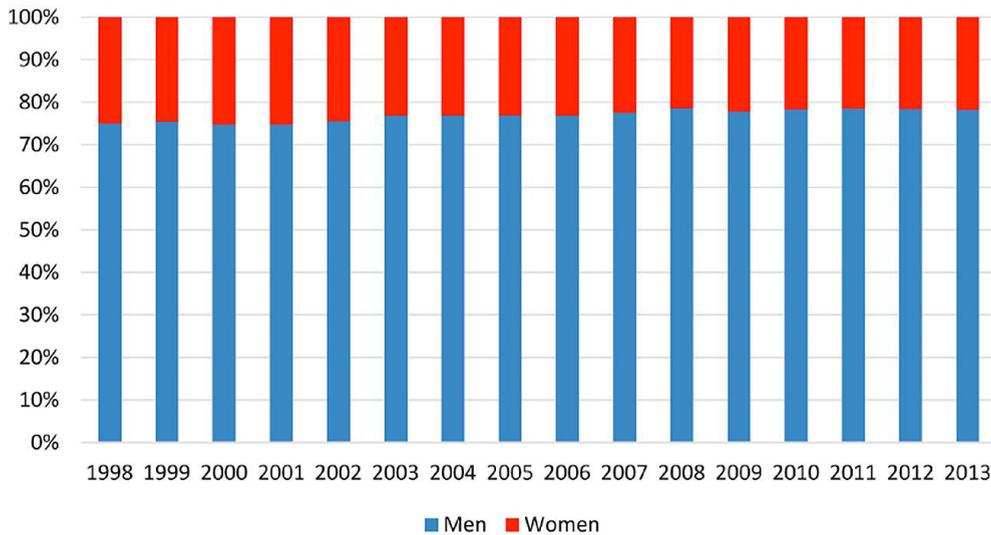


Fig. 1. Proportion (%) of hospitalizations according to gender. Source: MS/SIH/SUS (2014)

When calculating the indicator hospitalizations/10,000 inhabitants, it is observed that between 1998 and 2001, the most exposed group was the older than 80 years, followed by young people between 20 and 29 years (Table 1). In 1998, the occurrence of hospitalizations among the elderly was 37.2% higher (13.6 hospitalizations/10,000 inhab.) compared to those younger (9.89 hospitalizations/10,000 inhab.). This scenario began to reverse after 2002. Another factor was the increased rates involving young people between 15 and 19 years and adults aged 30 to 39 years, from 2010.

According to Vasconcellos (2010), the occurrence of accidents with economically active persons may be related to the fact that they have higher mobility and, consequently, higher risk exposure. This fact may explain the high rate recorded with people between 20 and 39 years.

Table 1. Accidentality rates (hospitalizations/10,000 inhab.) according to age group.

Year	Age (years)											
	< 1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 29	30-39	40 - 49	50-59	60-69	70-79	≥80
1998	2.6	2.9	4.1	4.3	7.0	9.9	8.1	7.3	6.7	7.0	8.3	13.6
1999	2.5	3.1	4.2	4.4	7.7	10.5	8.6	7.7	7.3	7.6	9.6	14.2
2000	2.4	3.4	4.8	4.8	7.1	10.1	8.2	7.2	6.8	7.2	8.6	11.7
2001	2.1	3.0	4.5	4.6	6.7	9.5	7.7	6.7	6.4	6.7	7.9	12.0
2002	1.9	2.7	4.5	4.3	6.7	9.7	7.4	6.4	6.0	6.0	7.1	9.7
2003	1.9	2.5	4.1	4.0	6.4	9.6	7.3	6.3	5.7	5.5	6.5	8.8
2004	1.6	2.3	4.1	3.8	6.2	9.8	7.3	6.3	5.8	5.6	6.3	8.9
2005	1.7	2.4	4.3	4.1	6.4	10.3	7.4	6.4	6.1	5.9	6.3	9.0
2006	1.8	2.3	3.8	4.1	7.6	9.9	7.6	6.5	5.9	5.8	7.1	9.2
2007	1.2	1.8	3.4	3.9	7.5	10.0	7.5	6.3	5.3	5.0	6.0	7.6
2008	1.3	1.3	2.4	2.9	6.4	8.3	6.1	5.0	4.2	4.0	4.4	4.7
2009	1.6	1.9	3.0	3.6	8.0	10.7	7.9	6.5	5.5	4.9	5.3	6.0
2010	1.8	2.2	3.6	3.9	9.1	13.0	9.7	7.7	6.2	5.4	5.7	6.5
2011	1.7	2.1	3.4	3.9	10.1	13.3	10.2	8.2	6.7	5.7	5.8	6.1
2012	1.8	2.1	3.4	3.9	10.4	13.3	10.5	8.6	7.2	6.4	6.3	6.4

Source: Adapted MS/SIH/SUS (2014) and IBGE (2014)

### 3.2. Values and days of hospital staying

In Table 2, it is possible to observe the evolution of amounts paid to public or private hospitals, which have UHS admissions of patients due to traffic accidents.

Between 1996 and 2012, there is a clear increase in the number of hospitalizations by UHS. In 1996, 108,988 people were hospitalized due to traffic accidents (0.06% of the population). In the year 2012, this number was 46.2% higher, which means that 159 216 Brazilian hospital beds were occupied by one or more days by a victim of traffic accident (0.08% of the population). Unfortunately, the expectation is that in 2013 the number of admissions and the duration of hospitalization exceed those recorded in 2012, noting that the average per admission has already been overcome.

Throughout the period analyzed, the average (simple) in hospital stay was 6 days. This mean includes both people who had minor injuries and were discharged within hours after the accident, as those who stayed for days, weeks or even months. It is not considered in this case, the period of specialized outpatient care after discharge.

In relation to amounts paid in accordance with the Authorization of Discharge (AOD), in 1998, these figures were approaching 57 million reais and in 2012 it exceeded 210 million, representing an increase of almost 30%. Until November 2013, the amounts were close to overcome those recorded in 2012, indicating continuity in the growth rate of these amounts.

A significant increase can be observed when considering the average amount per hospitalization. In 1996, each hospitalization cost the public treasury, on average, slightly more than R \$ 520.00. In 2013, this average exceeded R \$ 1,300.00, ie, the cost of a victim that was treated by UHS, became 150% more expensive in 15 years, with a slightly higher growth rate of 10% per year approximately.

It should be noted that these values do not match the total amount allocated to the health care setting, since, depending on the unit, they receive other budgetary funds, and there may be other deductions or payments not considered here. Thus, according to the Ministry of Health (2014) “*this value should be considered as the approved production value*”, which distorts the actual amounts related to hospitalizations. In view of this, it is estimated that the amounts are much higher than those obtained here.

This situation leads to reflect that besides the increase in the number of hospitalizations, most likely, there was an increase in the severity of accidents and injuries, making it necessary to use drugs and perform more complex procedures, thus requiring more financial resources.

Table 2. Database of hospitalizations due to traffic accidents.

Year	Number of hospitalizations	Days of hospitalizations	Staying average (days)	Value AOD (R\$)	Average value per hospitalization (R\$)
1998	108,988	731,911	6.7	56,910,738.76	522.17
1999	117,712	788,710	6.7	82,416,824.05	700.16
2000	119,585	729,533	6.1	76,884,428.85	642.93
2001	114,181	711,449	6.2	74,694,225.61	654.17
2002	112,007	694,056	6.2	79,132,693.68	706.50
2003	109,696	698,053	6.4	89,201,774.84	813.17
2004	112,520	714,143	6.3	102,975,553.40	915.18
2005	118,667	734,114	6.2	113,079,878.00	952.92
2006	120,977	736,047	6.1	115,602,957.17	955.58
2007	118,511	762,163	6.4	125,744,572.65	1,061.04
2008	95,162	607,170	6.4	107,658,847.86	1,131.32
2009	123,503	766,157	6.2	154,968,757.31	1,254.78
2010	146,066	896,991	6.1	187,266,598.43	1,282.07
2011	153,632	943,929	6.1	200,382,130.63	1,304.30
2012	159,216	990,334	6.2	210,882,263.39	1,324.50
2013*	154,903	976,361	6.3	210,853,583.46	1,361.20

Source: Adapted MS/SIH/SUS (2014)

### 3.3. Geographical distribution of hospitalizations in the Brazilian territory

When considering hospitalizations in relation to the population, in 1998, the rate had a ratio of 6.74 hospitalizations/10,000 inhabitants, and came to be 21.8% higher in 2012, at which time 8.21 hospitalizations/10,000 inhabitants were registered.

In Table 3, it is possible to check the indexes hospitalizations/10,000 inhabitants, according to the Federal Units (FUs) of Brazil, for the years 1998 and 2012 as well as the percentage change between them. It is noteworthy that, as presented by Waiselfisz (2013) regarding the problems faced with the database of traffic fatalities, the information system of hospitalizations is also subject to errors and underreporting. This may justify some overly expressive data represented in percentage variation.

According to these data, the state of Pernambuco experiences the most disturbing scenario, since its indicator grew 1141.7% between 1998 and 2012, with rates of 0.46 and 5.71 (admissions / 10,000 inhabitants), respectively. Data from four other states have drawn attention because they have a growth higher than 100%. They are: Roraima, Maranhão, Paraíba and Rio Grande do Norte. As mentioned earlier, these data may result from errors or underreporting, or the increase may be related to improving the quality of data and not only the increase in the number of victims.

The results also showed positive aspects. The state of Amazonas, for example, was the one who recorded the best result, a decline in the number of hospitalizations, which rose from 4.10 to 1.85 hospitalizations/10,000 inhab. The states of Rio de Janeiro, Rio Grande do Sul, Sergipe and Tocantins also performed well and reduced the number of

hospitalizations. The spatial distribution of these indicators, however, presents a worrying scenario. In Figure 2 it is possible to observe the increase of these rates also by comparing the years 1998 and 2012.

Regarding Brazilian regions, the only one that performed well was the Southeast region, which decreased their rate of 2012 at 3.22% compared to 1998. The Northeast was the one that registered the worst rate, from 3.99 hospitalizations/10,000 inhab., in 1998, to 7.91 hospitalizations/10,000 inhab., in 2012, an increase of 98.3%.

Table 3. Accidentality indicators in 1998 and 2012 (hospitalizations/10,000 inhab.).

Federal Units	1998	2012	2012/1998 (%)
Acre	6.03	9.95	65.0
Alagoas	6.44	6.93	7.6
Amapá	5.68	9.50	67.4
Amazonas	4.10	1.85	-54.9
Bahia	4.44	5.13	15.4
Ceará	6.59	12.98	97.1
Distrito Federal	3.73	6.23	66.9
Espírito Santo	8.44	10.54	24.9
Goiás	8.28	11.80	42.5
Maranhão	1.97	8.66	340.2
Mato Grosso	5.61	10.87	93.7
Mato Grosso do Sul	6.84	8.68	27.0
Minas Gerais	8.73	9.24	5.8
Pará	3.64	5.44	49.2
Paraíba	4.34	11.38	162.3
Paraná	5.94	9.33	57.1
Pernambuco	0.46	5.71	1141.7
Piauí	5.26	9.33	77.4
Região Sul	5.70	7.62	33.7
Rio de Janeiro	11.77	6.41	-45.5
Rio Grande do Norte	4.23	8.90	110.3
Rio Grande do Sul	5.37	4.13	-23.1
Rondônia	11.63	12.22	5.1
Roraima	4.87	22.70	366.1
Santa Catarina	5.92	10.69	80.6
São Paulo	8.16	9.25	13.3
Sergipe	4.92	4.43	-10.0
Tocantins	2.70	2.19	-18.7
Brazil	6.74	8.21	21.8

Source: Adapted MS/SIH-SUS (2014) e IBGE (2014)

The Midwest, South and North regions recorded an increase of 50.8%, 33.7%, and 25.3%, respectively, staying above the national average (21.8%). In Brazil, in 1997, for each 10,000 inhabitants 6 were hospitalized due to a traffic accident. In 2012, that number rose to 8, an increase of 21.8% over the period of 15 years.

In Figure 2, in 1998, most states were ranked in indices represented by lighter color shades, which shows a more positive scenario (the lighter the color, the lower the index) and therefore, a lower gravity and number of accidents. The highest rates were recorded in the states of Rio de Janeiro (11.77 hospitalizations/10,000 inhab.) and Rondônia (11.63 hospitalizations/10,000 inhab.). However, in 2012 most states received more bold colors, indicating a worrying distribution of these indicators, with a strong increase in a large portion of the states. Roraima recorded the highest rate, ie 22.7 hospitalizations/10,000 inhabitants.

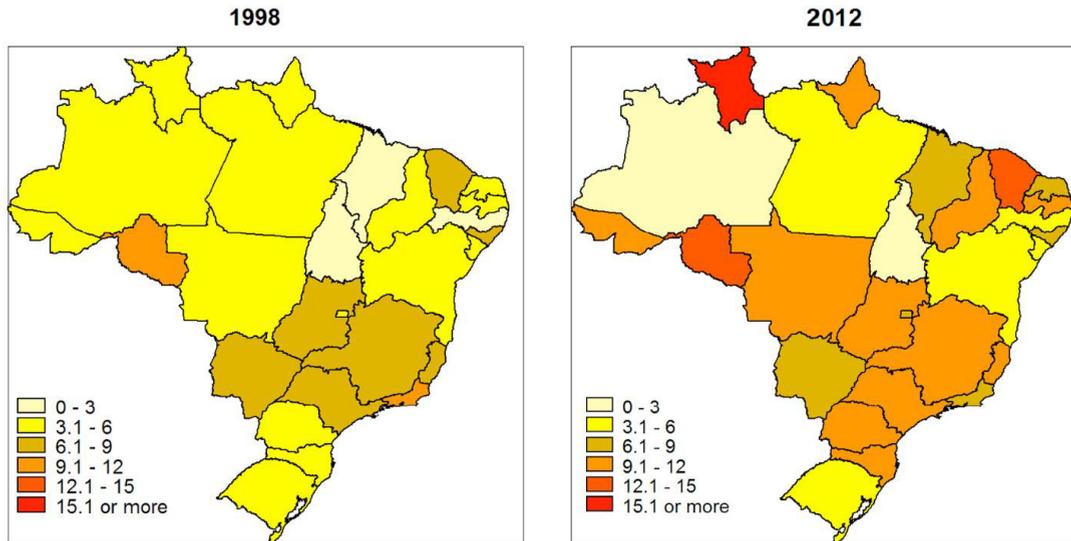


Fig. 2. Map of the spatial distribution of the number of hospitalizations due to traffic accidents (hospitalizations/10.000 inhab.)

### 3.4. Hospital Beds

Between the years 2005-2012, the UHS has provided an average of 1.81 beds per 1,000 inhabitants in the entire period (MS/SAS/CNES, 2014). Only in 2012, 450,000 beds were provided and, according to Pires et al. (1997), probably two thirds of the hospital beds were being used by TA victims, equivalent to about 300,000 beds.

### 4. Final Considerations

Generally the results of this research show that men between 20 and 29 years are the biggest victims of Brazilian traffic, who is the group of population that is economically active. With this, the country loses many years of work of these citizens who, as a provisional or perennial form, lost their ability to work.

Traffic accidents have produced hospitalizations with high costs. It was found that, even based on figures considered to be underestimated, the average hospitalization costs are around R \$ 1,300.00 to the public treasury. Brazilian states recorded high growth rates in the indices of hospitalization. About 300,000 beds are occupied by victims of traffic annually.

Clearly, traffic accidents are a serious public health problem; take lives prematurely, maim people, and expand the number of professional and personal disabilities, affecting society as a whole, the family of the injured and, the Unique Health System.

Therefore, investment in prevention of traffic accidents is imperative. This would reduce the costs directly related to accidents as well as the number of hospital beds occupied by their victims. Consequently, there would be the release of beds in the Unique Health System for hospitalizations due to other illnesses, and a lower demand for specialized care centers. Soon, the money saved can be allocated to contribute not only to issues related to traffic, but for the improvement of public health in Brazil, to the extent that the supply of hospital beds occupied by victims of traffic accidents increases.

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