

# Profile and trend of risk factors for traffic accidents in schoolchildren in Brazilian capitals: PeNSE 2009, 2012 and 2015

*Perfil e tendência dos fatores de risco para acidentes de trânsito em escolares nas capitais brasileiras: PeNSE 2009, 2012 e 2015*

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**ABSTRACT:** *Introduction:* Land transport accidents (LTA) are the second cause of death in schoolchildren aged 13 to 17 years. The study aims to describe the risk factors for LTA in schoolchildren from the National School Health Survey (PeNSE) of 2015 and to evaluate the trend of selected indicators in the last three editions of PeNSE. *Methodology:* A descriptive study on risk factors for LTA in 2015, with PeNSE data and time series trends analysis, with age-adjusted regression tests of the 2009, 2012 and 2015 editions, in Brazilian capitals. *Results:* In 2015, 26.3% of ninth grade schoolchildren, mostly between 13 and 15 years of age, reported having been in a motor vehicle driven by someone who consumed alcohol and 32.4% had driven a motor vehicle; 30.7% of adolescents did not use seat belts in the back seat; and 16.8% of schoolchildren who ride motorcycles did not wear helmets. There was also a worsening of the indicators between 2009 and 2015, regarding driving a motor vehicle (1.0 percentage points) and having been driven by vehicle for consumption of alcoholic beverages (1.1 percentage points). *Discussion:* The LTA occurrence results from the interaction between roads, vehicles and users, and has a strong correlation with behavior. *Conclusions:* The results show the need to invest in educational measures, associated with supervision, the improvement of road infrastructure, research and improvement of legislation. The monitoring of risk factors in schoolchildren substantially contributes to support intersectoral public policies interventions to reduce morbidity and mortality in traffic.

**Keywords:** Accidents, Traffic. Child. Adolescent. School health. Adolescent behavior.

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**RESUMO: Introdução:** Os acidentes de transporte terrestre (ATT) são a segunda causa de morte em escolares de 13 a 17 anos. O presente estudo visou descrever os fatores de risco para ATT em escolares da Pesquisa Nacional de Saúde do Escolar (PeNSE) de 2015 e avaliar a tendência de indicadores selecionados nas três últimas edições da PeNSE. **Metodologia:** Estudo descritivo sobre fatores de risco para ATT no ano de 2015, com dados da PeNSE e análise de tendência das séries temporais, com testes de regressão ajustados por idade, das edições de 2009, 2012 e 2015, nas capitais brasileiras. **Resultados:** Em 2015, 26,3% dos escolares do nono ano, na maioria entre 13 e 15 anos, relataram terem sido conduzidos em veículo motorizado dirigido por alguém que consumiu bebida alcoólica e 32,4% relataram terem dirigido veículo motorizado; 30,7% dos adolescentes não usaram cinto de segurança no banco de trás; e 16,8% dos escolares usuários de motocicleta não usaram capacetes. Observou-se ainda tendência de piora dos indicadores entre 2009 e 2015, referentes a dirigir veículo motorizado (1,0 pontos percentuais) e ter sido conduzido em veículo por alguém que consumiu bebida alcoólica (1,1 pontos percentuais). **Discussão:** A ocorrência de ATT resulta da interação entre vias, veículos e usuários, tendo forte correlação com o comportamento. **Conclusões:** Os resultados apontam a necessidade de investir em medidas educativas, associadas a fiscalização, a melhoria das vias, pesquisas e aprimoramento da legislação. O monitoramento dos fatores de risco em escolares contribui substancialmente para apoiar intervenções das políticas públicas intersetoriais para a redução de morbimortalidade por trânsito.

**Palavras-chave:** Acidentes de trânsito. Criança. Adolescente. Saúde Escolar. Comportamento do adolescente.

## INTRODUCTION

Traffic injuries and deaths are a global problem, with serious social, psychological, economic, social security and environmental impacts<sup>1,2</sup>. They are responsible for more than 1 million deaths and 50 million injuries each year, worldwide. It represents an expense of 3% of gross domestic product (GDP), and in low- and middle-income countries this cost exceeds 5% of GDP<sup>3</sup>.

In Brazil, land transport accidents (LTA) are the second cause of death among the most frequent external causes in young adult males. In 2015, they were responsible for 38,651 deaths, and among students aged 13 to 17, there were 1,653 deaths, 40.1% of which occurred in motorcyclists, thus revealing a greater vulnerability of this group<sup>4</sup>.

The problem is multicausal and resulting from the combination of factors related to the pathways, the environment, the vehicles, the users and how they interact. Of these, we highlight the increase in the fleet of vehicles, especially motorcycles<sup>5,6</sup>; insufficient and discontinuous surveillance; the fragility of the current transport model and the high frequency of inadequate pipelines, which together responsible for much of the early death, trauma, sequelae and disabilities in Brazilians<sup>2,3,5,7-9</sup>.

Among the inadequate conducts that result in traffic accidents, we highlight the association of alcohol and driving; excessive speed; failure to use safety equipment such as front and rear seat belts, helmets, child restraints, airbags and other equipment<sup>10,11</sup>.

The monitoring of these events is an important strategy to support health prevention and promotion policies, since traffic accidents are for the most part predictable and avoidable.

Among the most used information sources for monitoring the morbidity and mortality of these events in Brazil are the Mortality Information System (*Sistema de Informações sobre Mortalidade – SIM*) and the Hospital Information System of the Unified Health System (*Sistema de Informações Hospitalares do Sistema Único de Saúde – SIH/SUS*), both managed by the Ministry of Health; information from the Federal Highway Police regarding accidents and deaths on federal highways; and finally the information of the National Traffic Department (*Departamento Nacional de Trânsito – DENATRAN*) on the fleet of vehicles. The Surveillance System for Violence and Accidents (*Sistema de Vigilância de Violências e Acidentes – VIVA*), the National Health Supplement Survey by Household Sample (*Suplemento Saúde da Pesquisa Nacional por Amostra de Domicílios – PNAD*) in 2008<sup>12</sup>, the National Health Survey (*Pesquisa Nacional de Saúde – PNS*)<sup>13</sup> and the National School Health Survey (*Pesquisa Nacional de Saúde do Escolar – PeNSE*) in 2009, 2012 and 2015, which aims to identify the prevalence of risk factors and health protection of Brazilian adolescents<sup>14</sup>.

National studies on risk factors related to traffic accidents in schoolchildren are rare in the country, and generally analyze data from previous PeNSE surveys<sup>10,13,15</sup>. The data analysis by PeNSE 2012 identified that 12.9% — with a 95% confidence interval (95% CI) 10.0 – 16.5 — of schoolchildren under 17 years of age reported being frequently driven to school (4 times or more), in addition to being commonly driven by drivers who had consumed alcohol<sup>15</sup>.

The present study aimed to describe risk factors for traffic accidents in schoolchildren, as well as the trends available in the last three editions of the National Survey of School Health in 2009, 2012 and 2015. It seeks to support public policies aimed at surveillance and prevention of traffic injuries and deaths, whose results are highly sensitive to intersectoral interventions, mainly focused on alcohol risk factors and direction, speed and use of protective equipment.

## METHOD

A descriptive study on risk factors for traffic accidents in 2015 and trend analysis of two PeNSE indicators in the three editions (2009, 2012 and 2015) of the survey conducted in public and private schools. The first edition was representative of the Brazilian capitals; the second edition expanded the representativity for Brazil and its regions; and the last survey, in 2015, included, for the ninth year, in addition to the previous strata, the federated units and the Federal District. As for the description of the indicators for 2015, we considered the students of the ninth grade of primary education in public and private schools, with representativeness for Brazil. For the trend analysis, data stratified by Brazilian capitals were considered in 2009, 2012 and 2015.

The sample size calculation, in all editions, considered the proportion estimate of 50% and a type I or  $\alpha$  error probability of 0.05. The sample was based on the conglomerate selected in two stages: the first stage was in schools; and the second, in eligible classes in selected schools (ninth grade).

The individual questionnaire was distributed to students who answered it in a palmtop in 2009, and in a smarhphone in other issues under the supervision of trained researchers. The three editions of the PeNSE survey (2009, 2012 and 2015) were preceded by approvals from the National Commission for Research Ethics (*Comissão Nacional de Ética em Pesquisa – CONEP*), respectively No. 11.537/2009, 16.805/2012 and 1.006.467/2015. All students agreed to the Informed Consent. The details of the survey methodology can be accessed in other PeNSE publications for 2009, 2012 and 2015.

The variables evaluated in the present study were:

- seatbelt use in the front seat: percentage of schoolchildren who reported wearing a seatbelt in the front seat, whose question was: “*IN THE LAST 30 DAYS, how often did you wear a seat belt while riding as a passenger in the front seat of a car, van or taxi?*”;
- seatbelt use in the backseat: percentage of schoolchildren who reported wearing a seatbelt in the back seat, whose question was: “*IN THE LAST 30 DAYS, how often did you wear a seat belt while riding as a passenger in the back of a car, van or taxi?*”;
- helmet use: percentage of schoolchildren who reported wearing a helmet, whose question was: “*IN THE LAST 30 DAYS, how often did you wear a helmet when riding a motorcycle?*”;
- driving a motorized transport vehicle: percentage of schoolchildren who reported the frequency of driving a motorized transport vehicle; whose question was “*IN THE LAST 30 DAYS, how many times have you driven a motorized transport vehicle (car, motorcycle, boat)?*”;
- riding in a car or other motor vehicle driven by someone who had consumed alcohol: percentage of schoolchildren who reported driving in a car and other motor vehicles driven by someone who had consumed alcohol for at least 1 day in the 30 days prior to data collection; whose question was “*IN THE LAST 30 DAYS, how many times have you been in a car or another motor vehicle driven by someone who had consumed alcohol?*”.

All of these variables were considered in the descriptive study of 2015, but in relation to the trend study, only the variables “driving a motorized transport vehicle” and “being in a car or other motor vehicles driven by someone who had consumed alcohol” were considered to maintain comparability over the years’ different editions of the research.

In the analysis of the data, a description of risk factors for traffic accidents was considered *a priori* in students of the ninth year of public and private schools of the 2015 survey, by gender and administrative sphere of the school. Next, the prevalence, with respective 95%CI, of the risk indicators for traffic accidents was estimated for the total number of adolescents, in general and by region. Finally, the trend of comparable indicators for each period of the survey was assessed using age-adjusted regression tests. Data analysis was performed in STATA software version 14.0, considering the complex sampling of the study.

## RESULTS

This study included 60,973 schoolchildren who were attending the ninth year of public and private schools in Brazilian capitals in 2009, 61,145 in 2012 and 51,192 in 2015. Of these, 51.4% were female, the average age was 14,2 years and most of them were attending public schools (75.5%) (data not shown in tables).

A description of the risk factors for the occurrence of traffic accidents was initially made, aiming to outline a profile in 2015. Regarding the use of seat belts in Brazil, approximately 20% of the students reported not having used this equipment in the front seat. The analysis by gender shows a higher prevalence of non-use of the front seat belt among girls (21.4%) and in public schools, with 20.8% against 14.3% in private schools (Table 1). Regarding the non-use of the seat belt in the back, the prevalence was higher than the use in the front seat. In Brazil, approximately 30% of students reported not having used seat belts in the backseat, ranging from 33.0% among girls to 28.3% among boys. As for the type of school, the highest prevalence was in private ones, 36.1%, compared to 29.7% in public schools, a reverse profile to that observed in the variable described previously (Table 1).

Table 1 presents data on helmet use. In Brazil, 83.2% of students reported using this protective equipment, 84.9% of boys and 81.5% of girls. Regarding the type of school, the highest prevalence was observed in public schools, with 83.4%, against 81.8% in private ones.

In Brazil, 32.4% of students reported having driven a motor vehicle, with a much higher prevalence among boys (45.2%) than among girls (20.3%). Among students of public schools, 33.9% have already driven vehicles, while in private schools, 23.6% (Table 1).

In relation to the students who reported having already walked in motor vehicles whose driver had ingested alcoholic beverages, the prevalence in Brazil was 26.3%.

Table 1. Traffic safety indicators for schoolchildren of the ninth grade, according to gender and type of school. National School Health Survey, 2015.

Indicator	Total % (95%CI)	Gender % (95%CI)		Type of school % (95%CI)	
		Male	Female	Public	Private
Did not wear a seat belt in the front seat	19.7 (19.0 – 20.3)	17.8 (17.1 – 18.6)	21.4 (20.6 – 22.4)	20.8 (20.1 – 21.5)	14.3 (13.1 – 15.4)
Did not wear a seat belt in the back seat	30.7 (30.1 – 31.5)	28.3 (27.73 – 29.29)	33.0 (31.9 – 34.0)	29.7 (28.9 – 30.6)	36.1 (34.6 – 37.5)
Use of helmet	83.2 (82.4 – 84.1)	84.9 (84.1 – 85.7)	81.5 (80.4 – 82.6)	83.4 (82.5 – 84.3)	81.8 (79.9 – 83.7)
Driven a motor vehicle	32.4 (31.7 – 33.1)	45.2 (42.2 – 46.2)	20.3 (19.6 – 21.0)	33.9 (33.1 – 34.7)	23.6 (22.0 – 25.2)
Been in a motor vehicle whose driver consumed alcohol	26.3 (25.8 – 26.9)	27.4 (26.7 – 28.2)	25.2 (24.5 – 26.0)	26.2 (26.9 – 26.8)	26.9 (25.7 – 28.1)

95%CI: 95% confidence interval.

The proportions according to gender range from 27.4% in males to 25.2% in females. Regarding the type of school, the prevalence in private schools was 26.9% and in public ones, 26.2% (Table 1).

Regarding the trend, comparing the PeNSE editions of 2009, 2012 and 2015, two risk indicators were considered, as they maintained comparability in the three editions of the survey. There was a tendency to increase these indicators for traffic accidents. The prevalence of adolescents driving motor vehicles increased from 18.5% in 2009 to 24.8% in 2015 (mean variation 1.0 percentage points – p.p.), with the percentage being higher among male adolescents (36, 0% for boys and 14.1% for girls in 2015) and public school students (26.7% for public schools and 19.7% for private ones, in 2015). In addition, the mean variance for motor vehicle driving was also higher in these categories: males (1.1 p.p.) and public schools (1.3 p.p.) (Table 2).

With regard to riding a motor vehicle driven by someone who consumed alcoholic beverages, there was also an increase in prevalence, from 18.7% in 2009 to 25.4% in 2015

Table 2. Trend of risk factors for traffic accidents in schoolchildren of the ninth grade as primary education in Brazilian capitals, according to gender and type of school. National School Health Survey 2009, 2012 and 2015.

Indicators		Year			Mean variation*
		2009	2012	2015	
		% (95%CI)	% (95%CI)	% (95%CI)	
Driven motor vehicles (last 30 days)	Total	18.5 (18.0 – 19.1)	22.4 (21.7 – 23.2)	24.8 (23.9 – 25.7)	+1.0**
	Boys	29.3 (28.3 – 30.2)	33.6 (32.4 – 34.8)	36.0 (34.7 – 37.3)	+1.1**
	Girls	9.0 (8.5 – 9.5)	11.6 (11.0 – 12.3)	14.1 (13.3 – 14.8)	+0.8**
	Public	18.6 (18.0 – 19.3)	23.3 (22.5 – 24.2)	26.7 (25.6 – 27.8)	+1.3**
	Private	18.2 (17.2 – 19.2)	19.8 (18.5 – 21.1)	19.7 (18.4 – 21.0)	+0.1**
Been in motor vehicles driven by someone who consumed alcohol (last 30 days)	Total	18.7 (18.1 – 19.2)	23.8 (23.1 – 24.6)	25.4 (24.6 – 26.2)	+1.1**
	Boys	19.6 (18.8 – 20.4)	23.9 (22.9 – 24.8)	25.7 (24.8 – 26.7)	+1.0**
	Girls	17.8 (17.1 – 18.6)	23.8 (22.9 – 24.7)	25.1 (24.1 – 26.0)	+1.2**
	Public	17.3 (16.7 – 17.9)	22.8 (21.9 – 23.6)	25.1 (24.1 – 25.9)	+1.3**
	Private	23.8 (22.7 – 24.9)	26.9 (25.6 – 28.2)	26.3 (24.8 – 27.8)	+0.3**

95%CI: 95% confidence interval; \*mean annual variation in percentage points adjusted for age; \*\*statistically significant variation ( $p < 0.001$ ).

(mean annual variation of 1.1 p.p.). The trend was positive for both genders and school types, being higher for girls (mean annual variation of 1.2 p.p.) and for students of public schools (mean annual variation of 1.3 p.p.) (Table 2).

Table 3 shows the prevalence and the average variation of risk indicators for traffic accidents by capitals. Regarding the motor vehicle direction indicator, most capitals showed a statistically significant increase, except for Vitória, Curitiba and Florianópolis, whose trends were negative. The capitals with the highest prevalence of motor vehicle driving in 2015 were Boa Vista (38.8%), Teresina (34.4%) and Porto Velho (31.3%), and those with the highest average variations were Manaus, Teresina, João Pessoa and Maceió, with 1.9 p.p. each (Table 3).

As for the indicator “riding a motor vehicle driven by someone who consumed alcohol”, there was also an upward trend in most capitals, except for Natal and Vitória, where this change was not statistically significant. For this indicator, the capitals with the highest prevalence in 2015 were Cuiabá (33%), Goiânia (31.2%) and the Federal District (31%) and the ones with the highest mean variations were Cuiabá, with 1.8 pp, and the Federal District, with 1.6 p.p. (Table 3).

## DISCUSSION

In 2015, a quarter of ninth grade schoolchildren, most between the ages of 13 and 15, reported having been driven in a motor vehicle driven by someone who consumed alcohol; nearly a third reported driving a motor vehicle; one-third of teenagers did not wear seat belts in the back seat; and a fifth of schoolchildren using motorcycles did not wear helmets. There was also a deterioration in the trend of indicators between 2009 and 2015, referring to “driving a motor vehicle” and “having been driven in a motor vehicle driven by someone who consumed alcohol”.

The PeNSE constitutes the most important research in the country in the monitoring of risk factors in schoolchildren, and the worsening of traffic indicators deserves to be highlighted once it indicates increased risk in the occurrence of accidents with serious injuries and deaths. Considering that traffic accidents are the second cause of mortality in this age group (12.3%), second only to violence (39.6%)<sup>4</sup>, and are responsible for a large load of years of life lost adjusted by death or disability (DALY), according to a recent Global Burden of Disease study<sup>16</sup>, the problem becomes even more relevant.

It is noteworthy that 18.5% of adolescents reported motor vehicle driving, with the majority of those interviewed between 13 and 15 years of age, a fact of concern, since in Brazil, one must be 18 years old or older to obtain a driver’s license. In spite of the lack of studies on the subject, driving without a license presupposes an increased risk, since the individual does not possess the technical qualification certified by the competent authority, which is preceded by theoretical and practical educational aspects, and depending on the age, there is also a possible inadequate physical condition, such as smaller height and weight, increasing the risk of accidents. Data from the SIM of 2015 clearly showed the results of this risk,

Tabela 3. Risk factors for traffic accidents in schoolchildren of the ninth grade of elementary schools in Brazilian capitals. National School Health Survey 2009, 2012 and 2015.

	Driven motor vehicles (last 30 days)				Been in motor vehicles driven by someone who consumed alcohol (last 30 days)			
	2009	2012	2015	Mean variation*	2009	2012	2015	Mean variation*
	%	%	%	%	%	%	%	
<b>North</b>								
Porto Velho	23.0	28.8	31.3	1.2**	17.7	23.3	26.5	1.4**
Rio Branco	18.2	19.4	26.6	1.3**	16.6	21.2	21.8	0.8**
Manaus	17.6	21.8	29.2	1.9**	14.4	18.4	22.5	1.4**
Boa Vista	31.5	32.7	38.8	1.2**	19.8	26.2	27.0	1.1**
Belém	17.3	24.7	24.4	1.2**	17.7	20.8	21.6	0.7**
Macapá	19.4	25.2	25.7	0.9**	20.4	27.4	23.7	0.5**
Palmas	28.3	31.9	30.9	0.5**	20.0	29.2	29.4	1.5**
<b>Northeast</b>								
São Luís	17.3	24.5	26.8	1.6**	17.3	22.0	24.5	1.2**
Teresina	23.6	30.1	34.4	1.9**	20.8	24.9	29.3	1.5**
Fortaleza	15.2	23.7	27.5	1.8**	15.6	21.7	24	1.4**
Natal	18.9	24.2	23.3	0.6**	19.3	22.1	22.3	0.5
João Pessoa	19.2	26.9	30.7	1.9**	16.8	22.6	24.7	1.3**
Recife	20.0	23.7	26.7	1.1**	18.6	24.8	23.6	0.8**
Maceió	17.0	24.1	28.5	1.9**	17.8	22.3	25.9	1.4**
Aracaju	21.3	26.6	29.1	1.4**	20.5	26.4	26.8	1.1**
Salvador	18.3	21.6	21.7	0.5**	18.6	24.2	24.8	1.0**
<b>Southeast</b>								
Belo Horizonte	16.5	19.1	21.5	0.8**	21.3	26.6	28.6	1.2**
Vitória	15.7	18.8	15.3	-0.4**	18.8	25.2	21.2	0.4
Rio de Janeiro	19.7	21.4	24.9	0.9**	18.4	23	25.6	1.2**
São Paulo	17.8	20.6	21.5	0.8**	18.3	22.9	24.0	1.1**
<b>South</b>								
Curitiba	21.2	21.9	21.5	-0.3**	19.9	24.7	24.4	0.6**
Florianópolis	19.0	21.1	19.8	-0.2**	19.8	27.4	24.0	0.6**
Porto Alegre	14.5	18.9	25.3	1.1**	17.7	22.1	22.8	0.8**
<b>Midwest</b>								
Campo Grande	21.2	28.3	29.4	1.1**	21.3	28.0	28.5	1.1**
Cuiabá	22.8	27.3	29.7	1.4**	22.1	31.5	33.0	1.8**
Goiânia	22.4	27.5	30.2	1.1**	23.4	29.5	31.2	1.3**
Distrito Federal	17.1	20.8	24.7	1.2**	21.6	27.5	31.0	1.6**

\*Mean annual variation in percentage points adjusted by age; \*\*statistically significant variation ( $p < 0.05$ ).



pointing out that of the total number of deaths due to LTA (1,635 deaths) in schoolchildren aged 13 to 17 years, 257 (15.7%) were adolescents and, therefore, did not have a driver's license. It is also worth noting that, of this total, the highest percentage of deaths among unqualified teenagers was in motorcyclists (85.6%; 220 deaths)<sup>4</sup>.

In 2015, 655 deaths of motorcycle occupants occurred among schoolchildren, resulting in 40.1% of total LTA deaths in this group<sup>4</sup>. Motorcycles are considered one of the most dangerous forms of motorized transport due to their small size and direct exposure to impact, which makes their occupants more vulnerable to multiple and more severe traumas<sup>2,17,18</sup>. Accidents on motorcycles result in a 30-fold higher risk of death when compared to occupants of other types of motor vehicles<sup>19,20</sup>.

Duarte et al. observed that the factors associated with early management in adolescents were: age (older); male; higher education of the mother; study in school in the country side; consumption of alcoholic beverage; lack of seat belts use; and living with a smaller number of residents in the north-eastern and northern regions with someone who owns a car and/or motorcycle<sup>16</sup>.

Another indicator that increases vulnerability to LTA is that of adolescents being driven by a driver who ingested alcohol. Alcohol affects the driver's reflexes and increases risk choices, such as transgression of traffic laws. High concentrations of alcohol in the blood produce several neuromotor changes, from decreased attention, false perception of speed, euphoria and difficulty in discerning luminosities, to drowsiness and reduced peripheral vision<sup>8</sup>. Therefore, the association of alcohol and driving becomes an important cause of death among victims of traffic accidents<sup>21</sup>. In Brazil, according to results of the system of Surveillance of Risk Factors and Protection for Chronic Diseases by Telephone Inquiry (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico – Vigitel*) 2015, the frequency of adults who reported driving motor vehicles after drinking varied from 3 to 14% in Brazilian capitals, predominantly in Palmas, Florianópolis, Goiânia, Distrito Federal and Teresina<sup>22</sup>. At PeNSE, this practice was more common in the midwest region of the country. In Brazil, studies show that between 30 and 40% of the fatal victims of traffic accidents had consumed alcohol<sup>9,23</sup>.

About a fifth of the schoolchildren reported not wearing a helmet, which is an effective equipment in the reduction of serious injuries due to traffic events<sup>24</sup>. This alarming finding is similar to the results of the Viva Survey 2014, when 20.9% of the motorcyclists assisted in emergency services were without a helmet, with lower frequency of helmet use occurring in Northeast and North capitals<sup>2</sup>. The National Health Survey also indicates a lower frequency of helmet use and a higher prevalence of injuries and deaths in these locations<sup>13,25</sup>.

The use of helmets is essential for the protection of occupants<sup>25,26</sup>. The World Health Organization (WHO) study has shown that wearing a helmet correctly reduces the risk of death by up to 40% and the chances of suffering serious head injuries by up to 70%<sup>20,27</sup>.

The analysis revealed a growth in non-use of seat belts among adolescents. Numerous evidences demonstrate the benefits of this use in the reduction of serious injuries and deaths

in traffic and are therefore recommended in all situations<sup>3,28</sup>. 19.7% of schoolchildren did not wear seatbelts in the front seat, and the frequency was even higher in the back seat (30.7%). These results were also found in PNAD 2008, which showed the importance of advancing educational strategies on the use of seatbelts in the back<sup>10</sup>. Absence of the belt at the time of the traffic accident results in a greater susceptibility to the serious risk of severe injury and death, as well as face fractures in rear passengers, mainly due to their being projected out of the vehicle<sup>28</sup>.

Children and teenagers are important in the strategy of convincing the family to use the belt. Thus, these results should be used by educators and health professionals and other sectors to expand educational strategies with this public. The non-use of the belt, in this age group, can generate a continuous cycle of low adherence to this habit of protection and parents have great responsibility in this behavior by their children<sup>10</sup>.

It should be noted that the worse performances in the indicators are more frequent among boys, which has already been pointed out by authors as a gender issue<sup>29</sup>, as corroborated by several studies<sup>30,31</sup>. Men are often more exposed to violent events and consequently have over-mortality from external causes, resulting in higher DALYs<sup>16</sup>.

The trend analysis for “driving a motor vehicle” and “being in a motor vehicle driven by someone who has consumed alcohol” indicator reveals a worrying situation that puts the lives of schoolchildren at risk. These findings reinforce the need to invest more and more in continuous surveillance, educational practices and community involvement, in order to reproduce an awareness of the risks and a reflection for parents about their responsibilities, aiming at a change of attitude and behavior .

The increased risk of alcohol and driving association has led Brazil to adopt one of the world’s most rigid legislation regarding alcohol tolerance. The main legal framework was the creation of the 2008 Dry Law, which in 2013 became even more rigid, determining zero tolerance for the level of alcohol in the body, i.e., the fine is applied to drivers caught driving with any amount of alcohol in the body. In addition, the alcohol and driving association is considered a priority strategy of the Life in Traffic Program (*Programa Vida no Trânsito – PVT*), the main prevention program for traffic deaths and injuries in Brazil<sup>21</sup>.

The main limitation of the study refers to the methodology that uses a self-report instrument and may not capture all situations. The study collected information among schoolchildren, which excludes adolescents who are not enrolled in the school.

## CONCLUSION

Traffic injuries are the second leading cause of death among schoolchildren, and the risk factors pointed out here indicate that adolescents have disregarded safe traffic practices. The theme represents a challenge for society and has been included in the goals of the Sustainable Development Objectives (SDO).

PeNSE showed worsening in most of the indicators related to risk factors for traffic accidents in schoolchildren, especially regarding the use of protective equipment (seat belts and helmets), as well as being subject to risk situations such as driving motor vehicles and being driven by drivers who consumed alcohol. It is considered that these epidemiological analyzes contribute to guide promotion policies with this population, since they point out a greater vulnerability of adolescents in relation to traffic.

The strengthening of the National Policy on Urban Mobility and the Policy for Reducing Morbidity and Mortality by Accidents and Violence, as well as the Health in School Program and the Life on the Road Program are important priorities for health promotion. It is important to emphasize the importance of municipalities, schools and communities, in general, to use PeNSE results to transform reality, reflecting on the inherent risks of the aforementioned practices.

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