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Adolescent drivers in Brazil: prevalence and associated factors estimated from the National Adolescent School-based Health Survey (PeNSE 2012)

Motoristas adolescentes no Brasil: Prevalência e fatores associados estimados a partir da Pesquisa Nacional de Saúde do Escolar (PeNSE 2012)

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ABSTRACT: ***Introduction:*** There is evidence that adolescent drivers can represent risks to themselves, to passengers and to society in general. ***Objective:*** To estimate the prevalence of history of driving among adolescent students (under the age of 18) and associated factors, in Brazil, in 2012. ***Methods:*** This study analyzed data from the National Adolescent School-based Health Survey (PeNSE), held in 2012. The prevalence of history (at least once in the past 30 days) of driving motorized vehicles (cars, motorcycles or boats) by students aged less than 18 years old, as well as crude and adjusted odds ratios (OR) related to frequent driving (four or more times in the past 30 days) as the outcome, were estimated. ***Results:*** Among the 106,621 interviewed students, 27.0% (95%CI 22.9 – 31.5) reported having driven a motorized vehicle, and 12.9% (95%CI 10.0 – 16.5) reported being a frequent driver (four or more times). Factors associated with frequent driving were: older age, male, mothers with higher schooling, living in a household with fewer members, living in the North and Northeast regions, living with someone who has a motorcycle or a car, when their school is not located in a state-capital, drinking alcohol and not wearing a seatbelt. ***Conclusion:*** The higher prevalence of history of driving among adolescent students in Brazil and the identified associated factors might help authorities to prioritize policies and to reinforce the adherence to traffic legislation among specific groups.

Keywords: Automobile driving. School health. Adolescent. Adolescent behavior. Cross-sectional studies. Traffic accidents.

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RESUMO: ***Introdução:*** Existem evidências de que a direção entre adolescentes pode representar riscos para os condutores, passageiros e sociedade em geral. ***Objetivo:*** Estimar a prevalência e os fatores associados à história de direção de veículo motorizado por adolescentes escolares (menores de 18 anos de idade) no Brasil, em 2012. O estudo foi realizado com os dados da Pesquisa Nacional de Saúde do Escolar (PeNSE), realizada em 2012. Foram estimadas as prevalências da história (pelo menos uma vez nos últimos 30 dias) de dirigir veículo motorizado (carro, motos, barcos) por escolares com menos de 18 anos, assim como as razões de chance brutas e ajustadas, tendo a direção frequente (quatro vezes ou mais nos últimos 30 dias) como desfecho. ***Resultados:*** Entre os 106.621 adolescentes entrevistados, 27,0% (IC95% 22,9 – 31,5) referiram ter dirigido veículo motorizado, e 12,9% (IC95% 10,0 – 16,5) referiram direção frequente (quatro vezes ou mais). Os fatores mais associados à direção frequente foram: maior idade, sexo masculino, maior escolaridade da mãe, residir em domicílio com menor número de moradores, nas regiões Nordeste e Norte, com alguém que possui carro e/ou moto em casa, estudar em escola no interior, consumir bebida alcoólica e não aderir ao uso do cinto de segurança. ***Conclusão:*** A alta prevalência e os fatores associados a essa prática podem munir gestores para priorizar políticas e reforçar a aplicação da legislação de trânsito em grupos específicos.

Palavras-chave: Condução de veículo. Saúde escolar. Adolescente. Comportamento do adolescente. Estudos transversais. Acidentes de trânsito.

INTRODUCTION

Transport accidents are the main causes of death among adolescents in the world[1]. In Brazil, among adolescents aged 10 to 19 years old, land transport accidents (LTA) were the first cause of death among women (4.47 deaths per 100 thousand inhabitants) and the second among men (19.62 deaths per 100 thousand inhabitants), in 2011[2]. Studies have described that age and absence of a driver's license are factors associated with the higher probability of getting involved in an accident[3-5]. An analysis conducted in New Zealand revealed that the risk of injury resulting from LTA was 11 times higher among unlicensed drivers, at any age, in comparison to licensed ones[6]. Besides, young unlicensed drivers are more prone to developing inadequate behaviors while driving, such as driving after drinking alcoholic drinks, excessive speed, dangerous driving and non-use of safety equipment[7,8]. Additionally, the risk of accidents while adolescents are driving increases considerably when they are accompanied by other adolescents[9].

In Brazil, drivers' licenses are regulated by the Brazilian Traffic Code (CTB). One of the requirements to obtain the license to drive an automotive and electric vehicle is legally attributable, that is, being 18 years old or more[10]. However, a study with students aged less than 18 years old in Brazilian capitals showed that, in 2009, 18.5% (95%CI 18.0 – 19.1)

of them reported having driven a motorized vehicle at least once in the past 30 days before the interview[11].

Increasing knowledge about this subject can assist the prevention of illegal driving and the promotion of good traffic practices. The objective of this study is to estimate the prevalence and factors associated with the history of school-aged adolescents aged less than 18 years old driving a motorized vehicle in Brazil, in 2012.

METHODS

TYPE OF STUDY

This is an analysis of data selected by the National Adolescent School-based Health Survey (PeNSE) 2012, whose methodology is described in another publication[12]. PeNSE is coordinated by the Brazilian Institute of Geography and Statistics, together with the Ministry of Health, and it aims at investigating factors associated with the health of Brazilian students.

STUDY POPULATION AND SAMPLE

The population of PeNSE 2012 refers to 9th graders of elementary school, who attend public or private schools, in the daily period, in urban or rural areas of Brazilian cities. The probability sample was stratified in several stages, and all of the students who were present in the selected classrooms were included. The sampling design enabled to estimate parameters for the capitals, the five regions (North, Northeast, Southeast, South and Center-West) and Brazil. In order to calculate the sampling size of PeNSE 2012 for each stratum, the following guidelines were adopted: 50% proportions, maximum error of 3% in absolute value and 95% confidence interval. This sample corresponded to 3,004 schools, 4,228 classrooms and 131,741 students. At the time the questionnaire was applied, 110,873 students were present,, and 109,104 of them answered the questionnaire; 106,621 were younger than 18 years old.

DATA COLLECTION INSTRUMENT

The questionnaire of PeNSE 2012 is self-applicable, and it includes sociodemographic characteristics, information about dietary habits, physical activities, smoking, use of alcohol and other drugs, body image and oral health, sexual behavior, violence and accidents. For this analysis, the following question was carefully analyzed:

"In the past 30 days, how many times did you drive a transport motorized vehicle (car, motorcycle, bass boat, boat etc.)?"

DATA ANALYSIS

Study variables

The used dependent variable was history of driving in the past 30 days. Explanatory variables (independent ones) were: Age, sex, race/color, living with mother or father, region of residency, parental schooling, number of people in the household and school administration (public or private). Also, alcohol consumption and use of seatbelt and helmet were analyzed.

Descriptive stage

The prevalence of driving in the past 30 days was estimated according to frequency cutoff points (0, 1, 2 – 3, 4 – 5, 6 times or more), and according to age and sex of the student.

Analytical stage

In the analytical stage, associations were identified between the selected explanatory variables and the outcome variable "history of frequent driving (past 30 days)": (0) did not drive; (1) drove four times or more. In this stage, adolescents who reported having driven 1 – 3 times in the past 30 days were excluded from the analysis in order to maximize contrast and eliminate possible contaminations caused by overestimating the practice of driving, which can be common among students at this age group. Univariate and multivariate logistic regression were estimated to access the independent effects of explanatory variables. For the analysis of associations between the practice of driving and other risk behaviors in traffic (alcohol consumption, not using a seatbelt and helmet), age and sex adjustment was prioritized. The Survey Data (svy) procedures from software STATA, version 11.2 (StataCorp) were used[13].

ETHICAL CONSIDERATIONS

The study did not put students at risk. Their participation was voluntary, after they agreed with the Informed Consent Form, based on the adolescents' autonomy ensured by

the Statute of the Child and Adolescent (Law n. 8,069/1990). PeNSE 2012 was approved by the national Research Ethics Commission (CONEP – Registration n. 16,805).

RESULTS

For the study population of students aged less than 18 years old in Brazil, the estimated prevalence of history of driving a motorized transport vehicle (car, motorcycle, bass boat, boat etc.) in the past 30 days was 27.0% (95%CI 22.9 – 31.5) (Table 1). In order to compare it with PeNSE 2009, when only capitals were included, the estimated prevalence in the capitals was of 22.2% (95%CI 20.8 – 23.7) (data not shown). By considering the adopted definition of "driving often" – reported driving four times or more in the past 30 days – it is observed that, in this population, 12.9% (95%CI 10.0 – 16.5) mentioned this practice (Table 1).

As expected, this prevalence is increasing when the student is closer to the age of 18 (Table 1). Among the analyzed students who were younger than 15 years old (between 11

Table 1. Prevalence of history of driving motorized vehicles within the last 30 days by students under the age of 18. Brazil, 2012.

	Prevalence (%)	95%CI
Driving a motorized vehicle (past 30 days)		
No	73.0	68.5 – 77.1
Yes (Once or more)	27.0	22.9 – 31.5
Frequency		
Once	8.1	7.8 – 8.5
2 – 3 times	6.0	5.1 – 7.1
4 – 5 times	3.2	2.9 – 3.7
6 times or more	9.6	7.1 – 12.9
Driving often (4 times or more) according to age (years)		
Total (< 18)	12.9	10.0 – 16.5
< 15	10.3	7.7 – 13.8
15	17.6	15.1 – 20.3
16	19.9	16.9 – 23.3
17	22.7	19.7 – 26.1
Driving often (4 times or more) according to sex		
Men	20.0	15.5-25.5
Women	6.4	4.4 – 9.1

and 14 years old, especially), it is observed that driving frequently in the past 30 days was mentioned by 10.3% (95%CI 7.7 – 13.8), while at the age of 17 this percentage increased to 22.7% (95%CI 19.7 – 26.1). This prevalence is also strongly altered when comparing male (20.0%; 95%CI 15.5 – 25.5) and female adolescents (6.3%; 95%CI 4.4 – 9.1) (Table 1). Therefore, if we consider only 17 year-old male students, the prevalence of driving at least four times in the past 30 days reaches 32.0% (95%CI 25.6 – 39.2) of all of the interviewees (data not shown).

Tables 2 and 3 present the results of the analysis of associated factors and behaviors with 91,444 students aged less than 18 years old, and compare the ones who mentioned not having driven (85.02%) with those who mentioned having driven often (14.98%) in the past 30 days.

As to demographic characteristics of the student, it is observed, as mentioned earlier, that this practice is strongly associated with age, so the younger the age, the higher the chances of mentioning this practice ($p < 0.001$, Table 2). Boys have four times more chances of reporting that practice (OR = 4.395) than girls. Besides, mulatto ($p < 0.001$) or indigenous students ($p = 0.022$) also mentioned this practice more often than white students; these differences, however, were discreet. It is interesting to notice that, in the non-adjusted analysis, characteristics like "living with mother"

Table 2. Association between the selected variables and history of frequent driving (four times or more) within the last 30 days by students under the age of 18. Brazil, 2012.

Variable	Crude OR	95%CI	p-value	Adjusted OR*	95%CI	p-value
Age (years)						
< 15 (ref.)	1.000	–	–	1.000	–	–
15	1.989	1.676 – 2.359	< 0.001	1.985	1.697 – 2.321	< 0.001
16	2.381	1.884 – 3.010	< 0.001	2.242	1.891 – 2.660	< 0.001
17	2.826	2.254 – 3.544	< 0.001	2.572	2.155 – 3.070	< 0.001
Male	4.275	3.627 – 5.039	< 0.001	4.395	3.700 – 5.220	< 0.001
Race/color						
White (ref.)	1.000	–	–	1.000	–	–
Black	1.056	0.912 – 1.224	0.453	1.074	0.923 – 1.250	0.345
Yellow	0.962	0.806 – 1.148	0.659	0.994	0.813 – 1.214	0.949
Mulatto	1.033	0.936 – 1.140	0.509	1.070	1.038 – 1.104	< 0.001
Indigenous	1.197	1.069 – 1.340	0.003	1.180	1.026 – 1.358	0.022
Not living with the mother	1.198	1.037 – 1.383	0.016	–	–	–
Not living with the father	0.847	0.756 – 0.950	0.006	–	–	–

Table 2. Continuation.

Variable	Crude OR	95%CI	p-value	Adjusted OR*	95%CI	p-value
Region*						
Southeast (ref.)	1.000	–	–	1.000	–	–
Center-West	1.419	1.117 – 1.801	0.005	1.214	1.060 – 1.389	0.006
South	1.619	1.387 – 1.890	< 0.001	1.276	1.115 – 1.461	0.001
Northeast	1.934	1.557 – 2.403	< 0.001	1.669	1.489 – 1.872	< 0.001
North	2.208	1.404 – 3.474	0.001	1.926	1.482 – 2.502	< 0.001
Mothers' schooling						
< Elementary school (ref.)	1.000	–	–	1.000	–	–
Complete elementary school or more (no higher education)	1.062	0.959 – 1.177	0.238	1.144	1.027 – 1.274	0.016
Higher education or more	1.167	0.953 – 1.428	0.13	1.233	1.063 – 1.429	0.007
Fathers' schooling						
< Elementary school (ref.)	1.000	–	–	–	–	–
Complete elementary school or more (no higher education)	0.986	0.946 – 1.028	0.49	–	–	–
Higher education or more	0.915	0.713 – 1.172	0.469	–	–	–
Number of people in the household						
Living alone (ref.)	1.000	–	–	1.000	–	–
2 – 4 people	0.488	0.120 – 1.982	0.304	0.670	0.259 – 1.733	0.396
5 – 7 people	0.467	0.115 – 1.888	0.275	0.567	0.210 – 1.529	0.252
8 – 10 people	0.425	0.125 – 1.438	0.162	0.448	0.203 – 0.986	0.046
11 and more (up to 30)	0.642	0.243 – 1.694	0.359	0.586	0.208 – 1.651	0.301
Someone in the house owns a car	1.453	1.245 – 1.695	< 0.001	1.693	1.535 – 1.866	< 0.001
Someone in the house owns a motorcycle	3.842	3.459 – 4.267	< 0.001	3.508	2.985 – 4.124	< 0.001
Someone in the house owns a car or a motorcycle†	2.732	2.195 – 3.399	< 0.001	†	–	–
School in a non-capital city	1.543	1.024 – 2.325	0.039	1.497	1.267 – 1.769	< 0.001
Public school	1.180	0.971 – 1.433	0.093	1.136	1.007 – 1.282	0.039

*Model adjusted by all other variables kept in the model; †Variable not included in the adjusted model since it results from the combination of variables "Does someone in the household have a car?" and "Does someone in the household have a motorbike?", which would result in perfect collinearity.

and "not living with father" presented associations that are apparently protective in relation to the behavior of driving often before the age of 18. These associations lost statistical significance after the adjustment in the multivariate analysis (Table 2).

As to the region of residency (school location), it is observed that in the Southeast region there was less reference to the behavior of driving often among students aged less than 18 years old. These students from the Center-West and South regions presented discreet increment (however, statistically significant) concerning the chances of having this behavior when compared to the ones in the Southeast region; on the other hand, students in the Northeast and North regions had about 1.5 (OR) more chances of mentioning this behavior in comparison to those who lived in the region of comparison, which was the Southeast (Table 2).

The proxy variables of socioeconomic level that were analyzed apparently presented the same direction as to this association: better socioeconomic situation (higher maternal schooling and fewer people in the household) associated with the higher chances of the student reporting history of driving often in the past 30 days (Table 2). Besides, the availability of a car and/or motorcycle in the household is associated with the practice of students aged less than 18 years old driving often in the past 30 days. Especially, the chances of a student reporting driving often before the age of 18 is three times higher (OR = 2.98; $p < 0.001$) when someone in the household owns a motorcycle (Table 2).

With regard to type and location of the school, it is observed that students aged less than 18 years old attending schools in the countryside (not in capitals) had higher chances (OR = 1.77; $p < 0.001$) of reporting having driven often (four times or more) in the past 30 days (Table 2). The increment of this practice was also observed for students attending public schools, however, with a very discreet magnitude (OR = 1.007; $p = 0.039$).

A directly proportional relationship was observed between the prevalence of driving often (in the past 30 days) before the age of 18 and practices of drinking alcohol and not using a seatbelt (Table 3). There is a gradient between the prevalence of driving often and the increasing intake of alcohol in the past 30 days among the analyzed students. For instance, students who reported having consumed alcohol every day in the past 30 days had 8.6 times more chances (OR = 8.627; $p < 0.001$) of mentioning having driven a motorized vehicle at least four times in the past 30 days, even after the age and sex adjustment. Besides, the practice of not using a seatbelt (never, rarely or sometimes) while being in a car driven by other people is higher among students who report having driven often in the past 30 days (OR = 1.16; $p = 0.008$) (Table 3), regardless of age and sex. On the other hand, the low adherence of using a helmet while riding a motorcycle did not present statistically significant association ($p = 0.45$) with the history of driving a motorized vehicle (car or motorcycle) in the past 30 days among the analyzed students.

Table 3. Association between other risk behaviors and history of frequent driving (four times or more) within the last 30 days by students aged less than 18 years old. Brazil, 2012.

Variable	Crude OR	95%CI	p-value	Adjusted OR*	95%CI	p-value
Have you ever drunk alcohol†						
No (ref.)	1.000	–	–			
Yes	2.617	2.346 – 2.919	< 0.001	†		
Frequency of alcohol consumption (past 30 days)						
Never (ref.)	1.000	–	–	1.000	–	–
1 – 2 days	2.342	2.178 – 2.519	< 0.001	2.099	1.905 – 2.311	< 0.001
3 – 9 days	3.953	3.660 – 4.269	< 0.001	3.311	3.014 – 3.638	< 0.001
10 or more (< 30 days)	4.549	3.664 – 5.649	< 0.001	3.477	2.781 – 4.348	< 0.001
Every day	8.943	5.560 – 14.385	< 0.001	8.627	4.995 – 14.899	< 0.001
How often did you use a seatbelt in a car driven by somone else (past 30 days)?						
Always or most of the time	1.000	–	–	1.000	–	–
Never, rarely or sometimes	1.277	1.171 – 1.393	< 0.001	1.088	1.024 – 1.157	0.008
Was not in a car	0.489	0.439 – 0.545	< 0.001	0.650	0.559 – 0.757	< 0.001
How often did you use a helmet when riding a motorcycle (past 30 days)?						
Always or most of the time	1.000	–	–	1.000	–	–
Never, rarely or sometimes	1.002	0.902 – 1.112	0.974	0.965	0.876 – 1.062	0.451
Was not in a motorcycle	0.119	0.106 – 0.134	< 0.001	0.133	–	< 0.001

*Model adjusted by age and sex; †Variable not included in the adjusted model.

DISCUSSION

This is the first study to approach factors that are associated with the practice of driving before the age of 18, with national representativeness, among students in Brazil. In this analysis, it was possible to identify the high prevalence of driving a motorized transport vehicle (car, motorcycle, bass boat, boat etc.), considering the 30 days prior to the interview, among students aged less than 18 years old (minimum age to obtain a driver's license in Brazil). The act of driving at least once in the past 30 days was reported by 27.0% of the students; having driven often (at least four times in the past 30 days) was mentioned by 12.9% of the students, by 20.0% of male students, by 22.7% of students aged 17 years old, and by 32.0% of male students aged 17 years old.

Besides the strong associations with age and the male gender, there were other factors associated with the behavior of driving often in the past 30 days: students (< 18 years old) who lived in the Northeast and the North regions, with better socioeconomic status (estimated by maternal schooling and fewer people in the household), those who had a car and/or motorcycle available in the household and the ones attending schools outside capitals. As to socioeconomic status, there was one exception concerning the type of school (public or private). A great number of students referring this practice was observed in public schools. This fact requires further analyses, however, it is worth to remember that the practice of driving before the age of 18 was mostly reported in the North and the Northeast regions and in schools outside of capitals, where it is possible to observe higher proportions of public schools[14]. For example, the network of elementary public schools in the Southeast region represents 75% of the total of schools, while in the North region this proportion increases to 95%[14]. It is important to mention that even though the practice of driving at this early age is associated with better individual socioeconomic indicators, higher numbers were observed in areas outside of capitals and in regions that are economically less favored.

To sum up, it is possible to speculate about an individual effect connected to certain economic status that can enable the access to a motorized vehicle, and about an ecological effect, connected to areas with precarious transportation, longer distances to travel and less surveillance when it comes to traffic legislation, in places where public schools are also more present.

The fact that the practice of driving often without a license is also associated with other risk practices in traffic stands out, such as the consumption of alcohol and the non-use of a seatbelt. However, it has not been associated with the non-use of helmets.

The behavior of driving a motorized vehicle before the age of 18 has several meanings in a society. Regardless of age, the car, the motorcycle or the boat are important means of transportation which reduce the dependency on public transport; the latter can be dramatically precarious or absent in some regions of Brazil. However, for the adolescent, the act of driving can represent more than that: it can be, for instance, a symbol of independence from the surveillance of the country, and/or a mean of social interaction and acceptance. It can also provide a social status that is not allowed

for children. While driving, adolescents can possibly find another way to state they are no longer children.

The act of questioning (and, sometimes, the violation) rules imposed by the country and by society, the adoption of unconventional behaviors and the demonstration of comfort when adopting risk behaviors are part of this process of conquest and establishment of autonomy, which are strongly associated with adolescence. In this context, driving without a license is also in this process of growing up, which, unfortunately, can expose the adolescent and the society to important risks[15].

In this study, in 2012, 22.2% of students aged less than 18 years old who attend schools in the capitals reported having driven a motorized vehicle at least once in the 30 days prior to the study. In the first edition of PeNSE, in 2009, this proportion was of 18.5%[11], which is equivalent to an increment of more than 20%. This increment can be related to the inaccuracy and methodological differences of estimates, as well as to the consequences of the increasing fleet of vehicles in Brazil, as well as to the increasing access of students to these vehicles.

The highest prevalence of driving a motorized vehicle among male students, which was observed in this study, is in accordance with previous studies[4,16]. This result is also consistent with the higher exposure of men to risk behaviors, including fatal land transport accidents.

The fact that students aged less than 18 years old living in countryside cities, as well as in the Northeast and North regions, were more prevalent in relation to driving a motorized vehicle can be related to several explanations, such as the lower offer of public transportation in these locations and the large distances to go to school, work and leisure activities. Additionally, there may be more cultural acceptance and tolerance, and/or less chances of surveillance by controlling parties with regard to driving before the age of 18 in these places, especially motorcycles in rural areas, and boats or bass boats in regions with no accessible land transport routes.

The higher prevalence of driving a motorized vehicle before the age of 18 among students whose mothers had higher schooling, who lived in households with fewer inhabitants and with the presence of someone who owned a car or a motorcycle in the household seems to be related to better socioeconomic condition of these families. This fact can be partly explained because such a socioeconomic status can amplify the access of students to the vehicle (car, motorcycle, boat). Besides, other explanations can be explored, such as the higher acceptance of this behavior and/or the need to demonstrate this socioeconomic status, which may be associated to richer families.

As identified in other countries[8,17,18], this study also identified that the fact that Brazilian students often drive without a license is strongly associated with the use of alcohol and the low adherence to the use of the seatbelt, even if controlling the effects of age and sex. The fact that students who reported the daily intake of alcohol in the past 30 days have 8.6 times more chances of having driven often in comparison to those who reported not having consumed alcohol in this period stands out. This result enables to speculate that driving under the influence of alcohol would not be an unlikely practice among these young unlicensed drivers. However,

in this study it was not possible to confirm this hypothesis. Similar results were described in studies conducted in Spain and in the USA[8,17,18]. Driving under the influence of alcohol or drugs among students can be more common among adolescents of wealthier families in Spain[18], and more common among American students who drive without a license than in the other groups[8]. This suggests that driving without a license forms part of a more complete profile of these adolescents, in the sense of adopting behaviors that provide risk to health[8]. The use of alcohol, cigarettes, and marijuana was an important predictor of severe infractions and accidents among men and women at the age of 15, among students attending public schools in Michigan, in the United States[19], and the intake of alcohol among individuals aged 15 to 34 years old was a predictive factor of traffic accidents, as well as accidents at work and while practicing sports in Canada[20]. Among adolescents living in the United States, the early alcohol consumption was associated with higher risks of traffic infractions before the age of 21, and excessive speed and dangerous driving were the most common ones[5].

The association between alcohol consumption and driving among students aged less than 18 years old is even more relevant when we observe its relationship with the non-use of safety equipment. In this study, the association between driving without a license often and low adherence to of using seatbelts was observed. A study conducted in the USA describes that one third of the newly licensed adolescents reported not using a seatbelt in the week prior to the study[21].

Therefore, the triad involving the frequent alcohol consumption, the lower adherence to the use of a seatbelt and the frequent practice of driving among Brazilian students aged less than 18 years old is worrisome and deserves the attention of health, education and traffic safety administrators.

The results of this study should be analyzed considering its limitations. The outcomes and exposures were determined based on self-reported and cross-sectional information. The measurement of the outcome was based on a single question, which did not allow differentiating the type of vehicle (car, motorcycle, bass boat, boat etc.). The discrimination of vehicle categories could characterized the problem better and guide administrators towards action. The self-report of illegal risk behaviors is susceptible to error, which is originated from social acceptance, and it can be a potential source of gauging bias[8]. The report of driving a motorized vehicle among adolescents, on the one hand, can be underestimated since it is an illegal activity. On the other hand, this behavior can be valued by the student, once it indicates the desire to demonstrate maturity and economic status. A similar line of thought can be followed with regard to alcohol consumption. The report of students can underestimate the real condemnable social behavior, especially among heavy users[5]. However, alcohol consumption can also be overestimated, in case the student considers it to be an indication of maturity and social status. In both cases, the use of an anonymous and self-applicable questionnaire can be a protective factor against these distortions. Besides, it was chosen to consider driving a motorized vehicle at least four times in the 30 days prior to this study as an outcome. This strategy aimed at preventing the influence of occasional/sporadic practices that are overrated by the student. On the other hand,

consciously and intentionally, the contrasts between groups were amplified: not driving *versus* driving at least four times in the past 30 days.

Due to the cross-sectional design, it is important to be careful regarding the debate about the causality of this study[8]. For instance, it is not possible to establish if the presence of a motorcycle / car in the household increased the chances for adolescents to drive before the age of 18 or, on the contrary, if the fact that the adolescent was driving led to the acquisition of a motorcycle / car. Temporality problems between the analyzed events are characteristics of this type of study.

Relevant factors that can interfere in the behavior of adolescents aged less than 18 years old driving motorized vehicles and that provide better information to the action of administrations could not be analyzed. For example, the purpose for using the vehicle (leisure, work, study) and the characteristics of the community where the students live, including local traffic safety, the social acceptance of this practice among controlling parties, among others. For children and adolescents, the neighborhood is a place where several development and socialization processes occur[22]. It is important to understand this context in order to properly characterize the problem and act effectively.

CONCLUSIONS

The findings in this study stand out the prevalence and factors associated with the behavior of students aged less than 18 years old who drive without a license in Brazil, and indicate the need to understand this phenomenon better. The high prevalence and demographic and socioeconomic characteristics of students associated with this practice can provide administrators with information in order to prioritize policies and reinforce the application of the traffic laws focused on specific groups. However, the solution for this problem is certainly not only in the imposition of the current law. More efforts addressed to health promotion among students should be prioritized. It is also necessary to understand the relationships of the adolescent and the practice of driving in different contexts and needs (work, leisure, study), especially in the countryside of some states in Brazil. In this sense, it is essential to reach out to these adolescents and their responsible parties by means of educational processes, such as increasing the access to qualified transport alternatives, thus ensuring the right to safely come and go to all Brazilian citizens.

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