

Spatial distribution of mortality from landtraffic accidents before and after the law against drinking and driving in Santa Catarina, Brazil

Distribuição espacial da mortalidade por acidentes de trânsito terrestre antes e após a Lei Seca em Santa Catarina, Brasil

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ABSTRACT | OBJECTIVE: To evaluate the impact of the law against drinking and driving on mortality from land traffic accidents in Santa Catarina, Brazil. **METHODS:** This is an ecological study of mortality from land traffic accidents from 2000 to 2016 in the municipalities of Santa Catarina. The mortality rate in the periods 2000 to 2007 and 2009 to 2016 and the difference between them was calculated. Spatial autocorrelation analysis of the product of the deviations in relation to the mean was performed according to the place of residence of the victim. **RESULTS:** Deaths resulting from land traffic accidents in the state of Santa Catarina totaled 28,528 cases, 50.36% in the second period, equivalent to 1.45% increase. For the death rate, there were 31.1 cases/100,000 inhabitants in the first period and 27.5 in the second, representing a reduction of 11%. **CONCLUSION:** Despite the overall reduction in the mortality rate from land traffic accidents in Santa Catarina after the law against drinking and driving, the increase in rates in some municipalities in the state demonstrates that there is still a need to strengthen inspections and implement other public and education policies.

KEYWORDS: Information Systems. Accidents, Traffic. Alcohol Drinking. Spatial Analysis.

RESUMO | OBJETIVO: Avaliar o impacto da Lei Seca na mortalidade por acidentes de trânsito terrestre em Santa Catarina, Brasil. **MÉTODOS:** Trata-se de um estudo ecológico da mortalidade por acidentes de trânsito, de 2000 a 2016, nos municípios de Santa Catarina. Calculou-se a taxa de mortalidade nos períodos 2000 a 2007 e de 2009 a 2016, bem como a diferença entre eles. Foi realizada análise de autocorrelação espacial do produto dos desvios em relação à média de acordo com o local de residência da vítima. **RESULTADOS:** Os óbitos decorrentes de acidentes de trânsito terrestres no estado de Santa Catarina totalizaram 28.528 casos, sendo 50,36% no segundo período, equivalente a 1,45% de aumento. Para taxa de óbitos foram 31,1 casos/100.000 habitantes no primeiro período e 27,5 no segundo, com redução de 11%. **CONCLUSÃO:** Apesar da redução global da taxa de mortalidade por acidentes de trânsito terrestre em Santa Catarina após a lei seca, o aumento das taxas em alguns municípios do estado demonstra que ainda há necessidade de reforço das fiscalizações e implantação de outras políticas públicas e de educação.

PALAVRAS-CHAVE: Sistema de Informação. Acidentes de Trânsito. Consumo de Bebidas Alcoólicas. Análise Espacial.



Introduction

The World Health Organization (WHO) recognizes traffic accidents as a serious public health problem, being a major cause of morbidity and mortality worldwide. This event causes an increase in the cost of health services, compromising the country's economy, which can affect 1% to 3% of the Gross Domestic Product (GDP), in addition to leading to early loss of life.¹

About 1.2 million deaths per year worldwide are caused by traffic accidents, of which 90% occur in low- and middle-income countries. Brazil is one of the countries that lead the mortality due to urban traffic accidents, with males, black skin color, young adult, low education and motorcyclist as the profile with the highest rate of deaths and hospitalizations resulting from these accidents.²

In the period from 1996 to 2015, 12.6% of deaths in Brazil were due to external causes. Among the causes of external deaths, Land Transport Accident (LTA) appears as the second most recurrent cause affecting 27.6% of deaths in this group.³

It is observed that the consumption of alcohol and/or other drugs among drivers is associated with the severity of injuries and also fatal accidents, being a consensus in the literature that the effect of alcohol interferes and impairs the skills of the drivers, which can thus endanger their own lives and those of other people.⁴

The United Nations (UN) recognizes the seriousness of this problem, which is why it aimed to halve deaths and injuries in road accidents by the year 2020, including this proposal in the Sustainable Development Goals (SDGs) and in the Agenda 2030.⁵

Death in traffic is often predictable and preventable. To combat this public problem, stricter legislation and harsher punishments have proven effective in reducing the number of traffic accidents and their mortality. Examples such as Japan, Iran and England demonstrate that speed control measures, alcohol consumption, promotion of seatbelt and helmet use have shown a reduction in traffic accident and mortality rates.⁶

The Código de Trânsito Brasileiro – CTB (Brazilian Traffic Code) of 1998 establishes attributions for agencies related to traffic, thus defining conduct, rules, penalties and infractions for users. In 2008, Brazil sanctioned Law 11,705, the law against drinking and driving, which amended part of the CTB, instituting a zero blood alcohol rate, as well as penalties such as a fine, suspension of the right to drive for 12 months and seizure of the vehicle in the identification of any concentration of alcohol per liter of blood, and may also be characterized as a crime with a penalty of imprisonment when the driver presents a concentration equal to or greater than 0.6g of alcohol per liter of blood or equal to or greater than 0.3mg of alcohol per liter of alveolar air.⁷

It is known that there is an expansion of the vehicular fleet in the cities over time, and, proportionally to this, the number of accidents involving the means of transport also showed growth.⁸ According to the report of Traffic Accidents on Brazilian Federal Highways, LTA are currently responsible for about 43,000 deaths per year, thus demonstrating the importance of dealing with this issue.⁹

Given this scenario, there is an urgent need for discussions and reflections on LTA in order to strengthen local policies to reduce morbidity and mortality from these causes, thus supporting the implementation of actions that can, in addition to identifying an existing problem in a given region, serve as a tool to propose improvements that directly impact people's quality of life.¹⁰

From this perspective, the study seeks to evaluate the impact of the Law against drinking and driving on mortality from land traffic accidents in Santa Catarina, Brazil.

Methods

This is an ecological study on the impact of Law against drinking and driving on mortality from land traffic accidents in the state of Santa Catarina, in the period from 2000 to 2016.

The data used are available for online public consultation in the Sistema de Informação sobre Mortalidade – SIM (Mortality Information System) of the Sistema Único de Saúde – SUS (Unified Health System). For collection and analysis, deaths by municipality of residence classified in categories V01 to V89 of ICD-10 were selected, which represent all transport accidents with land vehicles.

As proposed by Nunes and Nascimento¹¹, mortality rates per 100,000 inhabitants were categorized as low (up to 20 deaths), moderate (21 to 40 deaths), high (41 to 60 deaths) and very high (over 60 deaths). Data from the years 2000 to 2016 were collected, totaling 17 years; the longer period favors the reliability of the data in small municipalities that are frequent in the studied state.

Population data were obtained through the Departamento de Informática do SUS – DATASUS (Department of Informatics of SUS), using data from censuses and projections of the Instituto Brasileiro de Geografia e Estatística – IBGE (Brazilian Institute of Geography and Statistics) for the period from 2000 to 2012 and the population estimate per year of the Tribunal de Contas da União – TCU (Federal Court of Auditors) for the period from 2013 to 2016. The population mean of each municipality was obtained, evaluating the estimated population in each period. In all, 295 municipalities belonging to the states of Santa Catarina were studied, which were divided into 20 microregions and had a population of about 6.2 million inhabitants in 2010.

For the calculation of the mortality rate, 2008 was considered as the year of the event analyzed and two periods were defined based on that: from 2000 to 2007, before the Law against drinking and driving, and from 2009 to 2016, after the Law against drinking and driving. This is, therefore, a comparative analysis of two periods.

After obtaining the death rate, the variation between the rate of the first period and that of the second period was calculated. Thus, it was possible to observe the municipalities that had improvement and those that had worsening in the death rate. These data were categorized similarly to that proposed by Nunes and Nascimento¹¹, according

to the variation of accident percentages: great improvement (reduction above 20% in death rates), moderate improvement (between 10% and 20% reduction in death rates), slight improvement (up to 10% in reduction in death rates), slight worsening (up to 10% in increase in rates), moderate worsening (increase from 10 to 20%) and great worsening (increase greater than 20% in death rates).

Geoprocessing techniques were used to georeference the data of the municipalities according to the municipality of residence of the victim. In the study, the Global Moran Index (I) was used, performing a first-order autocorrelation, using the GeoDa software for the calculation. This index makes a spatial autocorrelation from the product of the deviations in relation to the mean.¹²

After analyzing the database, the information was used in the preparation of choropleth maps in the free software QGIS, allowing specialized observation of the results graphically.

The present study only used secondary data aggregated in a system open to the public, and for this reason it was exempt from consideration by the Ethics Committee, in accordance with Resolution No. 466, of December 12, 2012, of the Conselho Nacional de Saúde (National Council of Health).¹³

Results

Deaths due to traffic accidents in the state of Santa Catarina totaled 28,528 cases. A total of 14,161 (49.64%) occurred in the first period from 2000 to 2007, ranging from 0 to 961. In the second period, from 2009 to 2016, there were 14,367 (50.36%), again ranging between 0 and 961. The mean number of deaths per municipality was equivalent to 48.33 in the period from 2000 to 2007, rising to 48.70 between 2009 and 2016. These values represent an increase in the number of deaths per municipality of 0.72 percentage points, equivalent to 1.45% increase. However, when considering the population increase and evaluating the mortality rate in both periods, we see that it went from 31.12 deaths per 100,000 inhabitants in the first period to 27.54 in the second period, which represents a reduction of 11%.

The maximum value in the reduction of deaths was 100% (Cunhataí - SC) and the maximum value of the increase in death rates was 1,016% (Irati - SC), taking into account that the large number of municipalities with a small population favors these large variations in periods. The Moran coefficients (global) for the death rates of the variables studied are shown in Box 1, which shows a positive spatial correlation presented in the first period, in the second period and in the difference between the rates of the periods although there is also a positive spatial correlation, the index is lower.

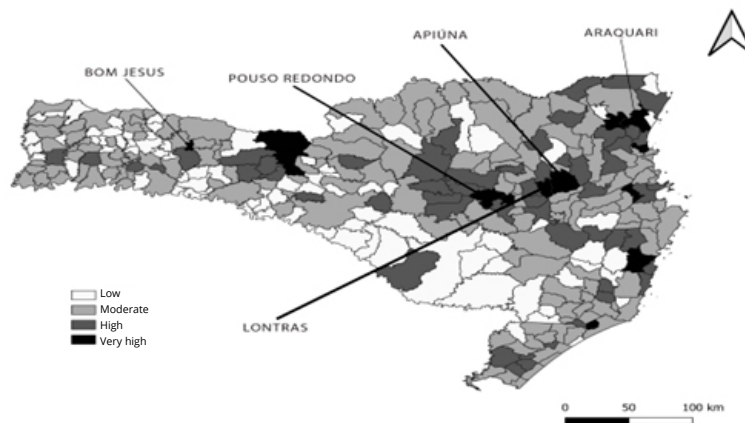
Box 1. Distribution of the Global Moran Index attributed to the variables studied on mortality in traffic accidents, from 2000 to 2016 in Santa Catarina, Brazil

Variables	Moran's index
Death rate 2000 to 2007	0.28
Death rate 2009 to 2016	0.14
Difference between the rates of the two periods	0.13

Source: The authors (2023).

Figure 1 shows the spatial distribution of the death rate per 100,000 inhabitants of the first period. Highlighted are the five municipalities that have the highest death rates, namely: Bom Jesus, Apiúna, Pouso Redondo, Araquari and Lontras. In this first period, from 2000 to 2007, 82 municipalities were observed with a low mortality rate, 145 municipalities with a moderate rate, 56 municipalities with a high rate and 12 municipalities with a very high rate.

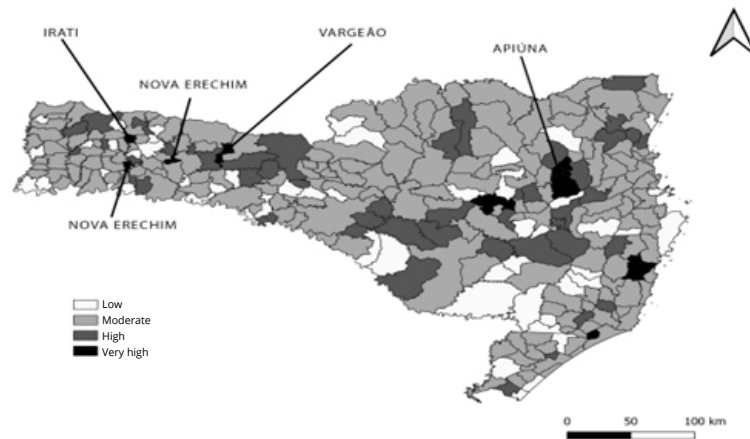
Figure 1. Mortality rate per 100,000 inhabitants due to land traffic accidents, according to place of residence, from 2000 to 2007 in Santa Catarina, Brazil



Source: The authors (2023).

Figure 2 shows the spatial distribution of the mortality rate from 2009 to 2016. We observed 53 municipalities with low mortality rate, 184 municipalities with moderate rate, 47 municipalities with high rate and 11 municipalities with very high rate. Highlighted in the figure are the five municipalities that had the highest mortality rates of the period, namely: Nova Erechim, Lajeado Grande, Irati, Vargeão and Apiúna.

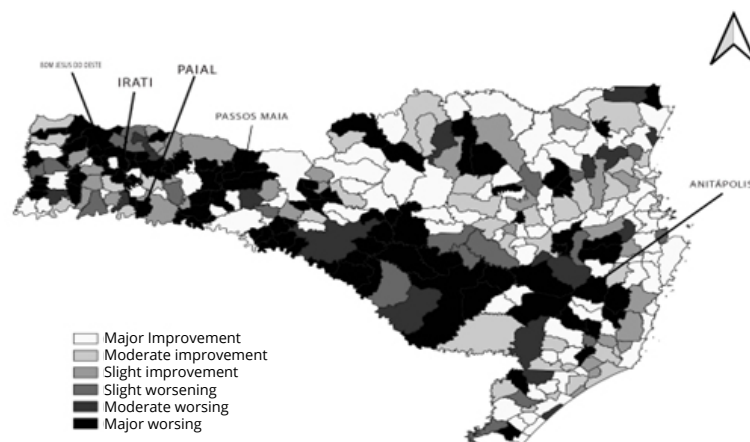
Figura 2. Mortality rate per 100,000 inhabitants due to land traffic accidents, according to place of residence, from 2009 to 2016 in Santa Catarina, Brazil



Source: The authors (2023).

Figure 3 shows the variation in mortality of the two periods, thus it is possible to observe the municipalities that had improvement and those that had worsening. In all, 94 municipalities were classified as Very high Improvement, 39 as Moderate Improvement, 32 as Mild Improvement, 19 as Mild Worsening, 17 as Moderate Worsening and 94 as Very high Worsening.

Figure 3. Difference in the mortality rate per 100,000 inhabitants due to land traffic accidents in Santa Catarina, according to place of residence, in the two periods studied (2000 to 2007) and (2009 to 2016)



Source: The authors (2023).

Discussion

The present study presents a geospatial analysis of the mortality rates of LTA in the state of Santa Catarina, presenting findings little explored in the literature, which contribute to the prevention of deaths from this cause, as well as can subsidize the construction of new more efficient policies, as well as the improvement of those that are currently in force.

In this sense, the creation of Law against drinking and driving in 2008 was seen as an important time frame, which served to analyze the period before and after its implementation, seeking to verify whether such a milestone was really able to reduce mortality from traffic accidents.¹¹

According to data from the Brazilian Institute of Geography and Statistics¹⁴, the fleet of vehicles in the country grew by about 89.1% in the period between 2007 and 2016. In Santa Catarina, the growth was 78.7% in the same time interval, and, despite a great growth in the vehicle fleet, the increase in the number of traffic accidents observed does not seem to be proportional to this increase in the fleet.

It is noted that there was a slight increase in the number of deaths due to accidents after the Law against drinking and driving. Even if there is a positive growth in accidents, it is possible to notice that this expansion does not follow in proportion the increase in relation to the number of vehicle fleets and population increase in the state of Santa Catarina. Despite the increase in the number of accidents, the fact that there has not been a sharp increase may be related to the rigor of the Law against drinking and driving, which has been less flexible with offenders, as well as the increase in the number of actions both in terms of inspection. as educational campaigns to guide vehicle drivers.

Thus, the control of the consumption of alcoholic beverages is an important prevention factor not only to avoid accidents, but also as the adoption of health measures, which are related to social and economic aspects, directly interfering in the daily life of society, as is the case of estimated expenses associated with alcohol, which exceed 1% of the Gross Domestic Product (GDP) in countries that have high and medium income.¹⁵

In addition, alcohol consumption has significant importance in cases of traffic accidents, being an influencing factor in the rates of violence, but it cannot be considered the only one. Factors such as the use of other licit or illicit drugs, poor conservation of vehicles, lack or even poor signaling of roads, highways with structural impairment or even poor conservation, end up being complications that can contribute to accidents.

In general, what is expected from the application of Law against drinking and driving is the reduction of morbidity and mortality due to traffic accidents. According to the study conducted by Mello and Adura¹⁶, there was a decrease in the number of hospitalizations caused by traffic accidents, as well

as in government spending on care provided to injured people.

In an investigation on the trend of mortality due to LTA, from 2000 to 2010, spatial analysis was carried out to identify risk clusters in Brazilian municipalities, and the results showed growths in risk clusters for LTA and for occupants of motorcycles and vehicles, with a reduction in the risk of death for pedestrians in general. Santa Catarina went from the 4th place, in the mortality rate due to LTA, in the year 2000 to the 11th in 2010, in fact registering the reduction in mortality, and the cluster of greatest risk was constituted by a large number of municipalities of Santa Catarina, in addition to cities of Paraná and São Paulo.¹⁷

Aquino *et al.*¹⁸ estimated trends in LTA mortality in Goiânia (GO), from 2006 to 2014, in which time series of standardized LTA mortality were analyzed. The results showed 3,347 deaths, with a reduction in mortality for pedestrians, but an increase for car occupants, with variations between the city's health districts. In addition, it is noteworthy that the use of alcohol and excessive speed influence both the frequency of accidents and the severity of injuries, which may have been decisive for the result of the reduction in deaths, after there is legislation relevant to the case presented.¹⁹

In a temporal trend of mortality due to traffic accidents in the state of Piauí,²⁰ there was a significant increase in mortality rates in a period similar to the present study, with a mortality rate per 100,000 inhabitants ranging from 13.9 in 2000 to 30.6 in 2017. The difference of these data with the findings in Santa Catarina demonstrates not only the heterogeneity of the Brazilian regions, but also the complexity of the factors that influence mortality from traffic accidents.

In this context, education actions are important factors to promote health and prevent health problems. Such measures should count on the performance of health professionals, since they deal with the consequences of the event.

It is known that accidents represent a serious public health problem and that the work of professionals takes place in the care of complications, largely due to the work of nurses. For this reason and the experience that this professional has with unfavorable and

disabling outcomes is that nurses can contribute to good practice campaigns in traffic safety.²¹

The present study presented a limitation on the impossibility of locating deaths according to the place of occurrence. Such action would allow the identification of the risk area where the accidents occurred, indicating areas in need of intervention, whether on highways, urban perimeters, or other locations.

As it is a potentially preventable event, it is important to consider the need to create legislation for the measures taken to be effective, and it is important to invest in strategies to raise awareness of the risks of drunk driving, as well as in the expansion of inspection with the intention of ensuring the full application of the measures instituted, especially in the municipalities identified as priority areas for preventing this event.

As a result, there was a reduction in mortality rates in the period after the creation of the new legislation, which restricts the consumption of alcohol associated with driving vehicles, such observations are compatible with that found in the state of Santa Catarina.^{22,23}

Conclusion

It was possible to demonstrate the spatial distribution of deaths related to Land Transport Accidents in the state of Santa Catarina. Likewise, it was possible to identify that, even with the overall reduction in the mortality rate in Santa Catarina, from the entry into force of the Law against drinking and driving, there was an increase in land traffic accident rates in several municipalities in the state. This is a factor that demonstrates the need to strengthen and increase the areas of supervision, as well as other public education and health policies, to ensure a more homogeneous result.

Thus, the results of this research pointed out local characteristics related to the problem of Land Transport Accidents in the state of Santa Catarina, contributing both to health promotion and health management, as all information generated includes important items to be considered by health

professionals who work at all levels of complexity of the Health Care Network.

Author contributions

Friestino JKO, Nakalski LR and Baldissera VG contributed to the conception, design, execution of the work, interpretation of the data and writing. Barbato PR, Luzardo AR and Batista JDL contributed with the interpretation of the data and writing. All authors approved the final version of the manuscript

Conflicts of interest

No financial, legal or political conflict involving third parties (government, private companies and foundations, etc.) has been declared for any aspect of the submitted work (including but not limited to grants and funding, participation in advisory board, study design, manuscript preparation, statistical analysis, etc.).

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References

1. Ministério da Infraestrutura (Brasil). Plano Nacional de Redução de Mortes e Lesões no Trânsito [Internet]. Secretaria Nacional de Trânsito; 2021. Available from: https://www.gov.br/infraestrutura/pt-br/assuntos/transito/arquivos-senatran/Anexo_I_pnatrans.pdf
2. Mendonça MFS, Silva APSC, Castro CCL. A spatial analysis of urban transit accidents assisted by Emergency Mobile Care Services: an analysis of space and time. *Rev. bras. epidemiol.* 2017;20(4):727-741. <https://doi.org/10.1590/1980-5497201700040014>
3. Moreira MR, Ribeiro JM, Motta CT, Motta JJJ. Mortality by road traffic accidents in adolescents and young people, Brazil, 1996-2015: will we achieve SDG 3.6? *Ciênc. saúde coletiva.* 2018;23(9):2785-2796. <https://doi.org/10.1590/1413-81232018239.17082018>
4. Conceição AEC, Pinho CM, Andrade MS, Vasconcelos RT, Monteiro RF, Andrade EA, et al. Perfil epidemiológico, comportamental e clínico de pacientes vítimas de acidentes motociclísticos. *Revista Brasileira de Ciências da Saúde* [Internet]. 2022;26(3):321-332. Available from: <https://periodicos.ufpb.br/index.php/rbcs/article/view/61269>

5. United Nations (UN). Transformando Nosso Mundo: A Agenda 2030 para o Desenvolvimento Sustentável [Internet]; 2015. Available from: https://www.mds.gov.br/webarquivos/publicacao/Brasil_Amigo_Pesso_Idosa/Agenda2030.pdf
6. Abreu DROM, Souza EM, Mathias TAF. Impact of the Brazilian Traffic Code and the Law Against Drinking and Driving on mortality from motor vehicle accidents. *Cad. Saúde Pública*. 2018;34(8):e00122117. <https://doi.org/10.1590/0102-311X00122117>
7. Presidência da República (Brasil). Lei Nº 11.705, de 19 de junho de 2008. Altera a Lei no 9.503, de 23 de setembro de 1997, que institui o Código de Trânsito Brasileiro, e a Lei no 9.294, de 15 de julho de 1996, que dispõe sobre as restrições ao uso e à propaganda de produtos fumíferos, bebidas alcoólicas, medicamentos, terapias e defensivos agrícolas, nos termos do § 4º do art. 220 da Constituição Federal, para inibir o consumo de bebida alcoólica por condutor de veículo automotor, e dá outras providências [Internet]. 16 Jul 2008. Available from: https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2008/lei/11705.htm
8. Cavalcante AK, Holanda VM, Rocha CF, Cavalcante SW, Sousa JP, Sousa FH. Perfil dos Acidentes de Trânsito atendidos por Serviço Pré-Hospitalar Móvel. *Rev Baiana Enferm*. 2015;29(2):135-45. <https://doi.org/10.18471/rbe.v29i2.12656>
9. Instituto de Pesquisa Econômica Aplicada (Ipea). Relatório de Pesquisa: Rodovias Federais Brasileiras: caracterização, tendências e custos para a sociedade [Internet]. Brasília: Instituto de Pesquisa Econômica Aplicada; 2015. Available from: http://www.ipea.gov.br/portal/images/stories/PDFs/relatoriopesquisa/150922_relatorio_acidentes_transito.pdf
10. Longuiniere ACF, Silva ACB, Araújo DR, Silva GC, Ferraz MOA. Perfil dos acidentes de trânsito atendidos por Serviço de Atendimento Móvel de Urgência. *Enfermagem em Foco*. 2021;12(4):801-5. <https://doi.org/10.21675/2357-707X.2021.v12.n4.4625>
11. Nunes MN, Nascimento LFC. Spatial analysis of deaths due to traffic accidents, before and after the Brazilian Drinking and Driving Law, in micro-regions of the state of São Paulo, Brazil. *Rev. Assoc. Med. Bras*. 2012;58(6):685-690. <https://doi.org/10.1590/S0104-42302012000600013>
12. Anselin L. Local Indicators of Spatial Association-LISA. *Geographical Analysis*, 2010;27(2):93-115. <https://doi.org/10.1111/j.1538-4632.1995.tb00338.x>
13. Ministério da Saúde (Brasil). Conselho Nacional de Saúde. Resolução n. 466, de 12 de dezembro de 2012. Aprova diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos [Internet]. Brasília, Diário Oficial da União, 12 dez. 2012. Available from: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/resolucao-cns-466-12.pdf>
14. Instituto Brasileiro de Geografia e Estatística – IBGE. Frota de veículos [Internet]; 2018. Available from: <https://cidades.ibge.gov.br/brasil/sc/pesquisa/22/28120>
15. Silva LES, Helman B, Silva DCL, Aquino EC, Freitas PC, Santos RO, et al. Prevalence of heavy episodic drinking in the Brazilian adult population: National Health Survey 2013 and 2019. *Epidemiol. Serv. Saúde*. 2022;31(n. spe1):e2021379. <https://doi.org/10.1590/SS2237-9622202200003.especial>
16. Mello JMHP, Adura FE. Álcool e direção. *Revista USP* [Internet]. 2013;96:23-36. Available from: https://www.abramet.com.br/files/revista_usp.pdf
17. Morais Neto OL, Montenegro MMS, Monteiro RA, Siqueira Júnior JB, Silva MMA, Lima CM, et al. Mortality due to road traffic accidents in Brazil in the last decade: trends and risk clusters. *Ciênc. saúde coletiva*. 2012;17(9):2223-2236. <https://doi.org/10.1590/S1413-81232012000900002>
18. Aquino EC, Neves CM, Morais Neto OL. Trends in mortality due to road traffic accidents in the municipality of Goiânia, Brazil, 2006-2014. *Epidemiol. Serv. Saúde*. 2018;27(4):e2017268. <https://doi.org/10.5123/S1679-49742018000400015>
19. Silva DO, Oliveira MA, Fernandes FECV, Mola R. Accidents and their association with the consumption of alcoholic beverages. *Enfermería Global* [Internet]. 2018;52:377-388. Available from: https://scielo.isciii.es/pdf/eg/v17n52/pt_1695-6141-eg-17-52-365.pdf
20. Sousa RA, Sousa, CMS Silva FRS, Rodrigues MTP, Cardoso OO, Mascarenhas MDM. Transport accident mortality time trend and spatial distribution in Piauí, Brazil, 2000-2017. *Epidemiol. Serv. Saúde*. 2019;29(5):e2019558. <http://dx.doi.org/10.1590/s1679-49742020000500005>
21. Maia RCB, Santos RAS, Pereira RA, Souza RAAR. Acidente de trânsito e enfermagem: uma parceria necessária no contexto da promoção de saúde. *Revista Científica da Faculdade de Educação e Meio Ambiente*. 2017;8(2):103-123. <https://doi.org/10.31072/rcf.v8i2.503>
22. Coutinho TP, Carvalho AGC, Araújo MGR, Oliveira CC, Santos WL, Pereira Júnior AG, et al. Perfil das lesões das vítimas de acidentes de motocicletas atendidas em hospital público. *Revista Brasileira de Ciências da Saúde*. 2019;23(3):309-320. <https://doi.org/10.22478/ufpb.2317-6032.2019v23n3.40941>
23. Ribeiro LS, Damacena GN, Souza Junior PRB, Szwarcwald CL. The habit of drinking and driving in Brazil: National Survey of Health 2013 and 2019. *Rev. Saúde Pública*. 2022;56:115. <https://doi.org/10.11606/s1518-8787.2022056004472>