

# Occupational and non-occupational intoxications in Primavera do Leste, Mato Grosso

*Intoxicações ocupacionais e não ocupacionais em Primavera do Leste, Mato Grosso*

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## ABSTRACT

**Objective:** The cases of exogenous intoxications and their relationship with the occupational activity of the victims were evaluated using data recorded at SINAN, between 2007 and 2014 of Primavera do Leste, Mato Grosso, Brazil. **Methods:** Information about the victims' profile, intoxications and the association with occupational activity were analyzed. **Results:** 231 cases were registered, of which 54.5% affected are male victims and 45.5% female. The majority (n=109; 47.2%) were between 20 and 39 years old and had primary education only (30.7%). The main agents involved were: pesticides (35.1%), medicines (22.5%), food and beverages (15.2%) and household products (5.6%). The most reported circumstances were: accidental (39%), suicide attempt (26%), food intake (13.4%) and habitual use (13.4%). The majority (85.7%; n = 198) of the exposures were acute and unique. There was a relationship with occupational activity in 32.9% (n = 76) of the cases, being 69.7% (n = 53) of pesticides. In those not related to occupational activity (n=155), medicines were the most involved agents (33.1%). The 78% of the cases evolved to cure without sequelae and two deaths were registered. **Conclusion:** In summary, this data indicate that there is a need for orientative, preventive and educational actions easy for the population understand, especially regarding the use of pesticides and medicines.

## RESUMO

**Objetivo:** Avaliaram-se os casos de intoxicações exógenas e a relação destas com a atividade ocupacional das vítimas, por meio de dados registrados no SINAN, de 2007 a 2014 para o município de Primavera do Leste, Mato Grosso, Brasil. **Métodos:** Analisaram-se informações quanto ao perfil das vítimas, das intoxicações e a relação com a atividade ocupacional. **Resultados:** Registraram-se 231 casos; destes, 54,5% acometeram vítimas do sexo masculino e 45,5%, do feminino. A maioria (n=109; 47,2%) possuía de 20 a 39 anos e apenas o ensino fundamental (30,7%). Os principais agentes envolvidos foram: agrotóxicos (35,1%), medicamentos (22,5%), alimentos e bebidas (15,2%) e produtos de uso domiciliar (5,6%). As circunstâncias mais notificadas foram: acidentais (39%), tentativa de suicídio (26%), ingestão de alimentos (13,4%) e uso habitual (13,4%). A maioria (85,7%; n=198) das exposições foram agudas e únicas. Registrou-se relação com atividade ocupacional em 32,9% (n=76) dos casos, sendo 69,7% (n=53) por agrotóxicos. Nas não relacionadas à atividade ocupacional (n=155), os medicamentos foram os agentes mais envolvidos (33,1%); 78% dos casos evoluíram para cura sem sequelas e registram-se dois óbitos. **Conclusões:** Todos esses dados indicam que há uma necessidade de ações orientativas, preventivas e educativas de fácil entendimento à população, principalmente, quanto ao uso de agrotóxicos e medicamentos.

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## Introduction

Exogenous intoxications are important health problems<sup>1</sup> and are frequent causes of demand for medical care in urgent and emergency services worldwide<sup>2</sup>. The occurrence of intoxication is characterized by the clinical manifestation of harmful effects produced by the interaction of some chemical substance with a living organism<sup>3</sup>, which can result in the manifestation of toxic effects leading to a pathological process. Such manifestations can evolve into serious conditions and, consequently, death<sup>4</sup>.

In Brazil, information on registered poisoning cases is made available through annual publications of the National System of Toxic-Pharmacological Information (SINITOX). According to the Ministry of Health, all cases of intoxication must be compulsorily notified and registered through the Notifiable Diseases Information System – SINAN<sup>5</sup>.

SINAN is an official system of the Ministry of Health of Brazil, which aims to record and process data on notifiable diseases throughout the national territory<sup>6</sup>. It is mainly fed by the notification and investigation of cases of all diseases and conditions that appear on the national list of diseases of compulsory notification (Consolidation Ordinance No. 4, September 28, 2017, Annex V - Chapter I)<sup>5</sup>. The notification requirement is established for the entire health network, both public and private, and, when characterized as an occupational accident, it must be issued to the CAW (Communication of Accident at Work)<sup>5</sup>.

SINAN report that the main toxic agents involved in cases of exogenous intoxication are drugs and pesticides<sup>7,8</sup>. Cases of accidental intoxication related to work activity also stand out among the problems related to intoxication, mainly due to the use of pesticides<sup>9</sup>.

Drug intoxications are commonly related to the unnecessary use and use of drugs in contraindicated situations, which can cause serious damage to health<sup>8</sup>, in addition to cases of attempted suicide<sup>10</sup>, making drugs the main toxic agent that causes poisoning in Brazil. exogenous<sup>8</sup>.

The incidence of pesticide poisoning in Brazil follows an increasing trend, with the Midwest being among the regions with the highest rates and greatest increase in notifications<sup>11</sup>. Pointing to an important problem related to the use and dissemination of these products, which is commonly associated with employment in occupational activities related to the handling of these agents<sup>11</sup>. Some cases can occur during activities carried out in the workplace, on the way, or in displacements and, therefore, are considered work accidents<sup>9</sup> and public health problems<sup>12</sup>, subject to health monitoring and surveillance.

Occupational and/or environmental exposure to pesticides can trigger acute or chronic intoxication, with different effects on human health, from subclinical manifestations to fatal cases. Thus, human exposure to pesticides represents an important public health problem, for which health surveillance has sought to propose and implement prevention and health promotion initiatives<sup>13</sup>.

Therefore, the epidemiological data recorded in SINAN provide useful elements for conducting research, which makes it possible to use them in epidemiological studies and the surveillance of diseases and health problems<sup>14</sup>. They can also provide information for analyzing the profile of morbidities and, contribute to decision-making at the municipal, state, and federal levels<sup>6</sup>.

Given the above, the present study aims to evaluate the profile of exogenous intoxication cases and their relationship with the occupational activity of the victims, through data recorded in SINAN, from 2007 to 2014, for the municipality of Primavera do Leste, Mato Grosso, Brazil. Therefore, this evidence can help in the development of measures to prevent and combat cases of intoxication in the locality under study, as well as the most commonly exposed population.

## Methods

The identification of the profile of poisoning cases was constructed using a secondary database, with the guarantee of confidentiality and anonymity of the reported cases, and is presented following Resolution 196/96 of the National Health Council<sup>15</sup>. This is a cross-sectional, non-probabilistic epidemiological study of cases of intoxication recorded, from 2007 to 2014, in the municipality of Primavera do Leste, Mato Grosso, Brazil. Information was extracted from all available cases and registered with the database of the Information System of Notifiable Diseases (SINAN), from July to December 2017, with public access through the website: <[http://portalsinan.saude.gov.br/dados-](http://portalsinan.saude.gov.br/dados-epidemiologicos-sinan)

[epidemiologicos-sinan](http://portalsinan.saude.gov.br/dados-epidemiologicos-sinan)>.

The data available on the Platform of SINAN are presented at the national level. However, to meet the objective of this research, a filter was carried out in search of cases that occurred only in Primavera do Leste, Brazil. The following information was then selected for the analysis: age group (classification used by the Brazilian Institute of Geography and Statistics (IBGE)), sex, race, schooling, area of residence of victims, type of exposure, circumstances of intoxication, toxic agents involved, evolution and final classification of intoxications, in addition to the relationship with work activity and issuance of the CAW.

The data obtained after filtering were organized using computer programs (Microsoft Office Excel 2008) and later submitted to statistical analysis using the specific program BioEstat 5.3. To verify the existence of significant statistical variation between the data, they were submitted to the following analyses: t-test and Kolmogorov-Smirnov to evaluate the differences between the months of occurrence, between the sexes, between the brown and white races, and between the sexes with the toxic agent involved; and the Chi-square test to analyze the relationship between genders by age group, between races over the years, between the toxic agent over the years and between the circumstances of intoxication. Poisoning incidence rates were obtained per 100,000 inhabitants, taking into account the number of cases each year and the estimated population according to the IBGE. This study is part of a research project approved by the Ethics Committee of the Federal University of Mato Grosso, under the number CAAE 34892914.3.0000.5587.

## Results

Over the seven years evaluated, 231 cases of poisoning were reported in the municipality of Primavera do Leste; where, in the years 2008 (19.9%; n=46) and 2009 (20.2%; n=49), they registered the highest incidence coefficients (Table 1). Most occurrences were recorded in April (n=35), May (n=30), and November (n=30), and the number of cases varied significantly over the months evaluated ( $p < 0.0001$ ). As for the profile of victims for cases of intoxication in general, these occurred more frequently in males (54.5%; n=126), in the age groups from 20 to 39 years (Table 2). Regarding race, 48.9% (n=113) of the cases involved brown individuals and 32.5% (n=75) white individuals. Statistical analyzes determined a significant variation between the sexes by age group involved ( $p = 0.0170$ ) and between the number of cases of the two races, over the years evaluated ( $p = 0.0390$ ). The most frequent level of education among the victims was an elementary school (30.7%; n=71), followed by high school (12.1%; n=28), basic (11.7%; n=27), and higher education levels in a smaller proportion (3.1%; n=7). However, the number of notifications, in which education was not informed, was quite high (42.5%; n=98).

**Table 1.** The number of notifications for intoxications and the relation with the work activity registered in Primavera do Leste, Mato Grosso, Brazil, from 2007 to 2014.

Year	Relationship with work activity						Population <sup>c</sup> (thousand)	IC <sup>d</sup>
	YES		NO		Total			
	N <sup>a</sup>	% <sup>b</sup>	N	%	N	%		
2007	3	3.9	0	0.0	3	1.3	44.729	6.7
2008	16	21.1	31	13.4	47	20.3	46.311	101.5
2009	5	6.6	44	19.0	49	21.2	46.931	104.4
2010	12	15.8	20	8.7	32	13.9	52.066	61.5
2011	5	6.6	1	0.4	6	2.6	53.004	11.3
2012	12	15.8	27	11.7	39	16.9	53.910	72.3
2013	10	13.2	14	6.1	24	10.4	55.451	43.3
2014	12	15.8	20	8.7	32	13.0	56.450	56.7
Total	76	100	155	100	231	100		

<sup>a</sup>: Number of cases; <sup>b</sup>: Percentage; <sup>c</sup>: Brazilian Institute of Geography and Statistics; <sup>d</sup>: Incidence coefficient per 100,000.

The circumstances of poisoning were mainly accidental, followed by a suicide attempt, habitual use and ingestion of food, and environmental, among others (Table 3). And these showed significant variation over the years ( $p=0.0052$ ). Accidental cases occurred more frequently with male victims (66.7%;  $n=60$ ), aged between 20 and 39 years (45.6%;  $n=41$ ), and involved pesticides for agricultural use (36.7%;  $n=33$ ), household pesticides (18.9%;  $n=17$ ), medicines (8.9%;  $n=8$ ), household products (8.9%;  $n=8$ ) and chemical products (7.8%;  $n=7$ ), among others. Suicide attempts were more frequent in female victims (70%;  $n=42$ ), aged 20 to 59 years (68.3%;  $n=41$ ) and 10 to 19 (30%;  $n=18$ ). In greater proportion, medicines were used (63.3%;  $n=38$ ), followed by products for household use (8.3%,  $n=5$ ), pesticides for agricultural use (6.7%;  $n=4$ ), pesticides for home use (3.3%;  $n=2$ ) and veterinary product (1.7%;  $n=1$ ). Poisoning by habitual use affected mainly male individuals (81.2%;  $n=26$ ) and occurred more frequently with victims aged between 20 and 59 years (78.1%;  $n=25$ ), most of them with pesticides. of agricultural use (54.8%;  $n=17$ ).

The toxic agents most frequently involved in cases of intoxication in the municipality were pesticides (for agricultural use, domestic use, public health use, and

rodenticides) and medicines (Table 3), and these data varied significantly ( $p=0.0004$ ) over the years evaluated. It was found that, in cases involving pesticides for agricultural use, most victims were male (96.6%;  $n=57$ ), however, in cases involving pesticides for domestic use (70%;  $n=14$ ), the majority were female. There was a significant variation between the number of cases and sexes ( $p<0.0001$ ), concerning all the toxic agents involved. Victims of poisoning by agricultural pesticides belonged mostly to the age group from 20 to 59 years old (61.4%;  $n=35$ ). For household pesticides, the most affected age group was 10 to 14 ( $n=13$ ). Adolescents aged 15 to 19 years old were more frequently intoxicated with medication ( $n=9$ ).

**Table 3.** Classification of intoxications according to circumstances, toxic agents and the relationship with work activity in Primavera do Leste, Mato Grosso, Brazil, from 2007 to 2014.

Variables	Labor Activity		No labor relationship		Ignored / Blank		Total	
	N <sup>a</sup>	% <sup>b</sup>	N	%	N	%	N	%
<b>CIRCUMSTANCE</b>								
Habitual use	22	28.9	10	6.8	0	0.0	32	13.9
Accidental	46	60.5	43	29.1	1	14.3	90	39.0
Environmental	4	5.3	3	2.0	0	0.0	7	3.0
Food intake	4	5.3	27	18.2	0	0.0	31	13.4
Admin error	1	1.3	0	0.0	0	0.0	1	0.4
Self-medication	0	0.0	1	0.7	0	0.0	1	0.4
Abuse	0	0.0	3	2.0	0	0.0	3	1.3
Suicide attempt	0	0.0	59	39.9	1	14.3	60	26.0
Violence/homicide	0	0.0	1	0.7	0	0.0	1	0.4
Ignored/Blank	0	0.0	1	0.7	5	71.4	6	2.6
Total Circumstance	76	32.9	148	64.1	7	3.0	231	100.0
<b>TOXIC AGENT</b>								
Medication	1	1.3	49	33.1	2	28.6	52	22.5
Agricultural pesticide	50	65.8	10	6.8	0	0.0	60	26.0
Household pesticide	2	2.6	18	12.2	0	0.0	20	8.7
Pesticides of Public Health	1	1.3	1	0.7	0	0.0	2	0.9
Rodenticide	1	1.3	11	7.4	0	0.0	12	5.2
Veterinary product	1	1.3	1	0.7	0	0.0	2	0.9
Home use product	0	0.0	12	8.1	1	14.3	13	5.6
Cosmetic	1	1.3	1	0.7	0	0.0	2	0.9
Product chemical	5	6.6	2	1.4	0	0.0	7	3.0
Drugs of abuse	0	0.0	3	2.0	0	0.0	3	1.3
Toxic plant	4	5.3	0	0.0	0	0.0	4	1.7
Food and drink	0	0.0	35	23.6	0	0.0	35	15.2
Ignored/Blank	1	1.3	4	2.7	4	57.1	9	3.9
Others	10	13.2	1	0.7	0	0.0	11	4.8
Total Toxic Agent	76	32.9	148	64.1	7	3.0	231	100.0

Data extracted from the SINAN Platform. <sup>a</sup> Number; <sup>b</sup> Percentage.

Regarding the type of exposure, in general, acute and single exposure was the most frequent (n=198), followed by acute repeated exposure (n=21). There were only two cases of chronic exposure, one by contact with rodenticide and the other by recreational drug abuse. As for the final classification of cases, 124 (53.7%) were confirmed as intoxications and 86 (37.2%) as exposure only, that is, in these cases, biochemical and functional alterations and/or signs and symptoms compatible with a picture of intoxication. Most victims evolved to a cure without sequelae (78%; n=180) and, in two cases, death was recorded, one of a male victim, due to a suicide attempt involving the use of agricultural pesticides and the other of a female victim, also due to suicide attempt, however, due to medication use.

In this study, 76 cases of exogenous intoxications

related to the victims' work were recorded, representing 32.9% of the total intoxications that occurred in the evaluated period. Of this total, only one case was issued the CAW, and this intoxication occurred accidentally with a chemical product that was not identified in the notification form. Pesticides (72.4%; n=55) for agricultural, domestic, public health use, rodenticides, and veterinary products were the main toxic agents involved in cases that occurred during work activities. As for the profile of victims related to work, 89.5% (n=68) were male, 93.4% (n=71) were aged between 20 and 59 years and 31.6% had only the incomplete elementary school. Most of these occupational intoxications were classified as acute-single exposure (59.2%) and acute-repeated (14.5%).

## Discussion

The Midwest region has shown a marked increase in the incidence of intoxications<sup>16</sup>, along with the South region<sup>11</sup>, which demonstrates the need for studies like this one, aiming to characterize the individual situations of the municipalities. As an example, Primavera do Leste, which is a municipality of great economic importance for the state of Mato Grosso, Brazil, stands out with a high Municipal Human Development Index (IBGE) and has particularities related to exogenous intoxications. It was observed that, in the region where the municipality is located, the period of cultivation of most crops occurs in the months in which the highest rates of intoxication were recorded, this may also be related to the increase in the frequency of use of pesticides<sup>17</sup> and the expressive agricultural production of this locality. The main activities carried out in a geographic region can influence the occurrence of poisoning cases. Thus, based on knowledge, it is possible to adopt more effective prevention measures to reduce the population's exposure and consequently the number of cases<sup>16</sup>.

Regarding the profile of intoxicated individuals, the predominance of exogenous intoxications of male victims was also observed in other studies<sup>18-22</sup>, as well as the greater number in the age group of young adults<sup>6,23</sup>. In general, men are more commonly involved in rural activities and, consequently, come into contact with pesticides in the development of rural activities<sup>24,25</sup>. This increases the possibility of intoxication by these agents, especially when not handled properly. And considering that Primavera do Leste has a broad rural activity, this relationship is evident. The higher frequency in brown and white individuals can be attributed to the predominance of these races in the region, according to data recorded by the Brazilian Institute of Geography and Statistics<sup>26</sup>. As for the low level of education observed, in line with the literature<sup>9,27</sup>, this may have a direct influence on the occurrence of intoxications, because the lower this level, the greater the possibility of lack of user information<sup>23</sup>. In addition to greater difficulty in understanding technical information, the need to use personal protective equipment during application<sup>15,16,24</sup> and, consequently, the risks of contact and handling of toxic agents.

The circumstance of intoxication by accidental causes was also recorded among the most frequent in national studies<sup>11,30</sup>. And the involvement of young adults (19-39 years old) in a greater proportion of accidental cases, may be related to these victims being of age production and exposure to toxic agents are commonly related to occupational use<sup>25,29,31</sup>. Accidental cases involving pesticides may have as contributing factors the reuse of packaging for these products, storage in easily accessible places, in addition to situations of greater risk, which are mainly linked to the handling for the use of these products. Such as the preparation of the grouts, in the application, in the harvest, and even in the act of weeding<sup>32</sup>. In addition to cases in which workers do not

use personal protective equipment and or do not receive adequate training for the preparation and use of these products<sup>32</sup>, allowing the occurrence of accidents<sup>35</sup>.

It is common to observe that cases of attempted suicide by poisoning mainly involve the use of pesticides and medications as the main agents of self-extermination<sup>34,35,36</sup>. The occurrences of attempts at self-extermination with the use of medication by women in the adult age group are frequently observed<sup>37,38,39</sup>, which may be because, in this age group, they have easier access to medicines, justifying the choice of this agent<sup>37</sup>. On the other hand, cases of intoxication by self-extermination, involving adolescents, may be more related to an emotional and cognitive evolution, which becomes a possible escape for problems in adolescents, due to the maturation of the concept of death<sup>40</sup>. In general, reducing and or improving the control of access to methods can be an important prevention strategy for suicidal acts<sup>41</sup>. Thus, knowing the different methods used for suicide attempts is an important tool for defining the most appropriate prevention interventions for the characteristics of each location<sup>37</sup>.

Cases of intoxication due to circumstances of habitual use can be attributed to the lack of technical knowledge for handling and application of toxic agents and non-use of protective equipment by the applicators<sup>14,25</sup>.

Poisoning related to occupational circumstances, the male gender, and the use of agricultural pesticides is also observed in other studies<sup>6,30</sup>. The higher frequency of cases involving male victims is possibly due to the use of pesticides related to rural work being carried out, in general, by men, who in many situations do not use protective equipment during work activity and or do not have technical training adequate<sup>24,25</sup>.

In general, the occurrence of exogenous intoxications involves the ingestion of contaminated food, use of medicines, pesticides, domestic cleaning products, veterinary products, and other chemical substances<sup>27</sup>. Pesticides prevailed among the toxic agents, similar to the national trend and the greater magnitude of the average annual increase in the Midwest Region<sup>11</sup>. However, it should be considered that the mandatory notification in the work environment and other associated activities in the country have influenced the registration of cases of poisoning by pesticides<sup>11</sup>.

Intoxication by pesticides is a serious public health problem<sup>6</sup> and, in general, exposure to these toxic agents is commonly related to occupational use<sup>22,25,31</sup>. The use of pesticides is increasing in agriculture, representing a risk to animal and environmental health. Its toxic effects depend on the chemical characteristics, exposure time, the victim's health conditions, and the amount that can be absorbed dermally, by inspiration, direct ingestion, or through contaminated food<sup>42,43,44</sup>. In addition to the acute condition, pesticide poisoning can affect health in the medium and long term and produce late consequences, not always measurable through commonly used tests<sup>29</sup>. By not knowing or not identifying certain risk situations, the victim can perform activities

without adequate protection or safety, which consequently can trigger work accidents or even occupational diseases<sup>45</sup>.

Confirmation of most cases as intoxication and evolution to cure without sequelae is also found in scientific reports<sup>6,46,47</sup>. Such clinical evolutions may be related to better preparation of hospital units to provide adequate care to these patients<sup>21</sup>. However, annually, around 70,000 fatal acute and chronic poisonings by pesticides victimize workers<sup>48</sup> and for each case of pesticide poisoning reported, there are another 50 that were not<sup>32</sup>. There is a tendency to register notifications only of the most acute cases, with more severe clinical signs, therefore, not all cases of intoxication that occur may be duly reported<sup>49</sup>. Therefore, it is very important to raise awareness and continuous training of health professionals and awareness of the exposed population, so that, increasingly, we can have the notifications regarding this condition closer to reality<sup>50</sup>.

The issuance of the CAW is a legal requirement for cases of intoxication related to work activity, as it characterizes an accident at work, but there is also underreporting, which makes it difficult to know the real situation of these accidents and the adoption of preventive measures. The challenges and difficulties for reporting may be related to the health service and the intoxicated individual<sup>11</sup>.

Underreporting and the high percentage of records where the field is ignored or left blank are limitations found in the actual analysis of this study. However, strengths can also be identified, for example, the relationship between pesticide poisoning and work activity was evidenced and; identification of the main toxic agents; the significant period used for the study; guidance for training professionals to feed the exogenous poisoning notification form, among others. Considering the number of cases found in Primavera do Leste and

defining the profile of those intoxicated and intoxicated, it is possible to direct preventive and surveillance actions, aimed at the general population and the professionals involved, so that they are more effective, reducing the number of poisoning cases. These actions can result in reduced spending of public money, care that could be avoided, and a better quality of life for citizens. In this way, the present study brings contributions to regional knowledge and for more specific actions to be carried out, since the local reality of a municipality has its specific characteristics, which may go unnoticed in a broader study.

## Conclusion

The profile of the cases registered for the municipality was more frequently in male victims, economically active age group, of brown and white ethnicities, and basic education level. The most common toxic agents in poisoning were agricultural pesticides and medicines, mainly involving accidental circumstances, suicide attempts, and habitual use. The predominance of cases of occupational intoxication was in the male gender and by pesticides.

Knowledge of the profile of intoxications in the municipality is important to assist in the development of educational, preventive policies and actions, focusing on victims' situations, toxic agents, and the most frequent circumstances. Thus, actions aimed at this specific population are necessary for the short term and this study supports the possible strategies that can be carried out by the health surveillance department, to have a future with better security and quality of life for the population, as the higher levels of occurrence, represents an important public health problem.

## Conflict of interests

The authors declare that there is no potential conflict of interest.



## References

1. Brasil. Boletim Epidemiológico. Suicídio: tentativas e óbitos por intoxicação exógena no Brasil, 2007 a 2016. Secretaria de Vigilância em Saúde. Brasília: Ministério da Saúde; jul. 2019. v. 50; n.15; 1-12.
2. Andrade Filho A, Campolina D, Dias MB. Toxicologia na prática clínica. Belo Horizonte: Folium; 2001. p. 53-60.
3. Zambolim CM, Oliveira TP, Hoffmann AN, et al. Perfil das intoxicações exógenas em um hospital universitário. Revista Médica Minas Gerais. 2008; v. 18; n. 1; 5-10.
4. Schwartsman C, Schwartsman S. Intoxicações exógenas agudas. Jornal de Pediatria. Sociedade Brasileira de Pediatria. 1999, v. 75, Supl. 2.
5. Brasil. Portaria nº 104 de 26 de janeiro de 2011. Diário Oficial da União. Brasília, DF: Ministério da Saúde; 26 de janeiro de 2011. Nº 18, seção I, 37 e 38.
6. Malaspina FG, Lise MLZ, Bueno PC. Perfil epidemiológico das intoxicações por agrotóxicos no Brasil, no período de 1995 a 2010. Caderno Saúde Coletiva. 2011; v. 19; n. 4; 425-34, 2011.
7. Corrêa AD, Caminha JR, Souza CAM, Alves LA. Uma abordagem sobre o uso de medica-mentos nos livros didáticos de biologia como estratégia de promoção de saúde. Ciências e Saúde Coletiva. 2013; v.18; 3071-81.
8. Bertoldi AD, Barros AJD, Hallal PC, et al. Utilização de medicamentos em adultos: prevalência e determinantes individuais. Revista Saúde Pública. 2004; v. 38; n. 2; 228-38.
9. Santana CM, Costa Ar, Nunes RMP, et al. Exposição ocupacional de trabalhadores rurais a agrotóxicos. Cadernos Saúde Coletiva. 2016; v. 24; n. 3; 301-307.
10. Klinger EI, Schmidt DC, Lemos DB, et al. Intoxicação exógena por medicamentos na população jovem do Rio Grande do Sul. Revista de Epidemiologia e Controle de Infecção, v. 1, n. 1, p.1-8, 2016.
11. Queiroz PR, Lima KC, Oliveira TC, et al. Sistema de Informação de Agravos de Notificação e as intoxicações humanas por agrotóxicos no Brasil. Revista Brasileira de Epidemiologia. 2019; v. 22; e190033.
12. Konradsen F. Acute pesticide poisoning: a global public health. Dan Med Bull. 2007; v. 54; n. 1; 58-9.
13. Secretaria de Estado da Saúde. Nota informativa: notificação de intoxicação exógena por agrotóxicos no SINAN. Porto Alegre, RS: Centro Estadual de Vigilância em Saúde; 2015; 1-5.
14. Coeli CM, Camargo Jr KR. Avaliação de diferentes estratégias de blocagem no relacionamento probabilístico de registros. Revista Brasileira de Epidemiologia [online]. 2002; v. 5; n. 2: 185-196.
15. Brasil. Ministério da Saúde. Resolução 196, de 10 de outubro de 1996: diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos. Brasília (DF): Conselho Nacional de Saúde; 1996.
16. Brasil. Ministério da Saúde. Agrotóxicos na ótica do Sistema Único de Saúde. Brasília: Ministério da Saúde; 2016; v. 1; 1-19.
17. CONAB. Acompanhamento da Safra Brasileira - Grãos: safra 2017/18. Monitoramento agrícola. Brasília: Observatório Agrícola; 2018. v. 5.
18. Moreira CS, Barbosa NR, Vieira RCPA, et al. Análise retrospectiva das intoxicações admitidas no hospital universitário da UFJF no período 2000-2004. Ciência & Saúde Coletiva. 2010; n.15; v.3; 879-888.
19. Martins CBG. Acidentes na infância e adolescência: uma revisão bibliográfica. Revista Brasileira Enfermagem. 2006; v. 59; n. 3; p. 344-8.
20. Presgrave RF, Camacho LAB, Villas Boas MHS. Análise dos dados dos Centros de Controle de Intoxicação do Rio de Janeiro, Brasil, como subsídio às ações de saúde pública. Caderno de Saúde Pública, Rio de Janeiro. 2009; v. 25; n.2; p. 401-8.
21. Lebrão ML, Jorge MHPM, Laurenti R. II – Morbidade hospitalar por lesões e envenenamentos. Revista de Saúde Pública. 1997; v. 31; n. 4; 26-37.
22. Ramos TO, Colli VC, Sanches, ACS. Indicadores epidemiológicos das intoxicações exógenas em crianças menores de 5 anos na região de Araçatuba-SP. REVINTER. 2017; v. 10; 86-100.
23. Oliveira FFS, Suchara EA. Perfil epidemiológico das intoxicações exógenas em crianças e adolescentes em município do Mato Grosso. Revista Paulista Pediatria, São Paulo. 2014; v. 32; n. 4; 299-305.
24. Moreira JC, Jacob SC, Peres F, et al. Avaliação integrada do impacto do uso de agrotóxicos sobre a saúde humana em uma comunidade agrícola de Nova Friburgo, RJ. Ciências Saúde Coletiva. 2002; v. 7; n. 2; 299-311.
25. Delgado IF, Paumgartten FJR. Intoxicações e uso de pesticidas por agricultores do Município de Paty do Alferes, Rio de Janeiro, Brasil. Cadernos de Saúde Pública. 2004; v. 20; n. 1; 180-186.
26. IBGE. População total e respectiva distribuição percentual, por cor ou raça, segundo as grandes regiões, unidades da federação e Regiões Metropolitanas: síntese dos indicadores sociais 2008. São Paulo: Instituto Brasileiro de Geografia e Estatística, 2008.
27. Melo CM, Silva LF. Fatores associados à intoxicação por agrotóxicos: estudo transversal com trabalhadores da cafeicultura no sul de Minas Gerais. Epidemiologia e Serviços de Saúde. 2013; v. 22; n. 4; 609-620.
28. Castro MGGM, Ferreira AP, Mattos IE. Uso de agrotóxicos em assentamentos de reforma agrária no município de Russas (Ceará, Brasil): um estudo de caso. Epidemiologia Serviços de Saúde. 2011; v. 20; n. 2, 245-54.
29. Faria NMX, Facchini LA, Fassa ACG, et al. Trabalho rural e intoxicações por agrotóxicos. Caderno de Saúde Pública. 2004. v. 20 n. 5, 1298-308.
30. Mendonça RT, Marinho JL. Discussão sobre intoxicações por medicamentos e agrotóxicos no Brasil de 1999 a 2002. Revista Eletrônica de Farmácia. 2005; v. 2; n. 2; 45-63.
31. Castro JSM, Confalonieri U. Uso de agrotóxicos no

- Município de Cachoeiras de Macacu (RJ). Ciências e Saúde Coletiva. 2005; v. 10; n. 2, 473-82.
32. Bochner R. Perfil das intoxicações em adolescentes no Brasil no período de 1999 a 2001. Caderno de Saúde Pública. 2006; v. 22; n. 3; 587-95.
  33. Carneiro FF, Rigotto RM, Augusto LGS, et al. Dossiê Abrasco: um alerta sobre os impactos dos agrotóxicos na saúde. Rio de Janeiro: Abrasco; 2015; Parte I; 624.
  34. Botega NJ. Comportamento suicida: epidemiologia. Psicologia. USP. 2014; v. 25; n. 3; 231-236.
  35. Lovisi GM, Santos Sa, Legay L. et al. Análise epidemiológica do suicídio no Brasil entre 1980 e 2006. Revista Brasileira Psiquiatria. 2009; v. 31, Supl. 2, p. 86-94.
  36. Marín-León L, Barros MBA. Mortes por suicídio: diferenças de gênero e nível socioeconômico. Revista de Saúde Pública. 2003; v. 37; n. 3; 357-63.
  37. Vieira LP, Santana VTP, Suchara EA. Caracterização de tentativas de suicídios por substâncias exógenas. Caderno de Saúde Coletiva, Rio de Janeiro. 2015; v. 23; n. 2; 118-123.
  38. Santos AS, Legay LF, Lovisi GM. Substâncias tóxicas e tentativas e suicídios: considerações sobre acesso e medidas restritivas. Caderno de Saúde Coletiva. 2013; v. 21; n. 1; 53-61.
  39. Coslop S; Quinte GC; Antunes Mn. Tentativas de suicídio por intoxicação exógena no estado Espírito Santo, Brasil. Revista Brasileira de Pesquisa em Saúde. Vitória, 2019; jan-mar; v. 21; n. 1, 46-54.
  40. Fonseca CA, Pardal PP. Intoxicações por agentes químicos em adolescentes. Rev para med. 2010; v. 24; n. 3-4, 23-27.
  41. Bmeier KP, Donaghey C, Steele DJ. Recent developments and current controversies in depression. Lancet. 2006; v. 367; n. 9505; 153-67.
  42. Brasil. Ministério da Saúde. Departamento de Ações Programáticas Estratégicas. Diretrizes para atenção integral à saúde do trabalhador de complexidade diferenciada: protocolo de atenção à saúde dos trabalhadores expostos a agrotóxicos. Brasília; Ministério da Saúde; 2006.
  43. Lira SVG, Silva JG, Abreu RND, et al. Intoxicações por pesticidas em crianças, adolescentes e jovens no município de Fortaleza - CE. Ciência, Cuidado e Saúde. 2009; n. 8; v. 1; 48-55.
  44. Pignati WA, Machado JMH, Cabral JF. Acidente rural ampliado: o caso das “chuvas” de agrotóxicos sobre a cidade de Lucas do Rio Verde - MT. Ciências Saúde Coletiva. 2007; v. 12; n. 1; 105-14.
  45. Sfredo TC, Ramos AI, Conceição VM, et al. Vulnerabilidade do trabalhador na agroindústria. Revista Brasileira de Pesquisa em Ciências da Saúde PBeCS. 2019; v.6; n.12:14-21.
  46. Silva Filho J. Intoxicações exógenas no município de Sobral-Ceará. Fortaleza - CE. Especialização em Vigilância Sanitária. Escola de Saúde Pública do Ceará, 2009.
  47. Da Silva VM, Noronha TR, Marques WS, et al. Intoxicações exógenas notificadas no Sinan Net em 2010: Perfil Epidemiológico dos casos confirmados no Maranhão. Revista ABEN, Seção Maranhão, Imperatriz. 2010; v. 1; n 84; 84-85.
  48. International Labor Organization (ILO). World Day for Safety and Health at Work: A Background Paper. In: Focus Programme on SafeWork. Geneva: International Labour Office, The World Health Organization; 2005.
  49. Matos GC, Rozenfeld S, Bortoletto ME. Intoxicações medicamentosas em crianças menores de cinco anos. Revista Brasileira de Saúde Materno Infantil. 2002. v.2, n.2, p. 167-176.
  50. SES-PR. Secretaria do Estado de Saúde do Paraná. Material técnico intoxicações agudas por agrotóxicos atendimento inicial do paciente intoxicado. Saúde da População Exposta à agrotóxicos. PEVASPEA; 2018. 120 p.