

# ANALYSIS OF THE EPIDEMIOLOGICAL PROFILE AND TEMPORAL TREND OF SERIOUS OCCUPATIONAL ACCIDENTS

## ANÁLISE DO PERFIL EPIDEMIOLÓGICO E TENDÊNCIA TEMPORAL DOS ACIDENTES GRAVES DE TRABALHO

## ANÁLISIS DEL PERFIL EPIDEMIOLÓGICO Y LA TENDENCIA TEMPORAL DE ACCIDENTES DE TRABAJO GRAVES

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**Objective:** to analyze the epidemiological profile and the temporal trend of serious occupational accidents in Sergipe, in the period from 2009 to 2015. **Method:** ecological, descriptive, time-series study, based on secondary data reported on the Information System for Disease Notification. **Results:** there were 1,271 reports of serious occupational accidents with workers aged between 16 and 65 years; the years 2011 (19.5%) and 2009 (15.6%) presented the highest number of records; 2011 (23.6%) and 2010 (19.9%) had the highest incidence; 2014 and 2015 recorded the lowest rates. Profile of injured workers: males (88.8%), between 25 and 29 years (17.1%), *pardos* (61.5%), incomplete education from 5<sup>th</sup> to 8<sup>th</sup> grade (20.2%). **Conclusion:** the analysis of the epidemiological profile and the temporal trend of serious occupational accidents in the state of Sergipe showed decreasing trend in the analyzed period, although the number of accidents recorded was high.

**Descriptors:** Epidemiology, Descriptive. Information Systems. Occupational Health. Accidents, Occupational.

*Objetivo:* analisar o perfil epidemiológico e a tendência temporal dos acidentes graves de trabalho no estado de Sergipe, no período de 2009 a 2015. *Método:* estudo ecológico, descritivo, de série temporal, com base em dados secundários informados no Sistema de Informação de Agravos de Notificação. *Resultados:* foram notificados 1.271 acidentes graves de trabalho com trabalhadores entre 16 e 65 anos de idade; os anos de 2011 (19,5%) e 2009 (15,6%) foram os de maior número de registros; 2011 (23,6%) e 2010 (19,9%) apresentaram maior incidência;

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2014 e 2015 registraram as menores taxas. Perfil dos trabalhadores acidentados: sexo masculino (88,8%), entre 25 e 29 anos (17,1%), pardos (61,5%), ensino incompleto da 5ª a 8ª série (20,2%). Conclusão: a análise do perfil epidemiológico e a tendência temporal dos acidentes graves de trabalho no estado de Sergipe revelou tendência geral decrescente no período analisado, ainda que fosse elevado o número de acidentes registrados.

*Descritores: Epidemiologia Descritiva. Sistemas de Informação. Saúde do Trabalhador. Acidentes de Trabalho.*

*Objetivo: analizar el perfil epidemiológico y la tendencia temporal de los accidentes de trabajo graves en el estado de Sergipe, en el período comprendido entre 2009 y 2015. Método: estudio ecológico, descriptivo, de series de tiempo, basado en datos secundarios reportados en el Sistema de Información de Agravios de Notificación. Resultados: se reportaron 1.271 accidentes de trabajo graves con los trabajadores con edad entre 16 y 65 años; los años 2011 (19,5%) y 2009 (15,6%) fueron el mayor número de registros; 2011 (23,6%) y 2010 (19,9%) tuvieron una mayor incidencia; 2014 y 2015 registraron las tasas más bajas. El perfil de los trabajadores lesionados: varones (88,8%), entre 25 y 29 años (17,1%), pardos (61,5%), enseñanza incompleta del 5º a 8º grado (20,2%). Conclusión: el análisis del perfil epidemiológico y la tendencia temporal de accidentes de trabajo graves en el estado de Sergipe mostró una tendencia decreciente en el período analizado, aunque el número de accidentes registrados fue elevado.*

*Descritores: Epidemiología Descriptiva. Sistemas de Información. Salud Laboral. Accidentes de Trabajo.*

## Introduction

The work represents a fundamental dimension in the structuring of the individual, family and society, in relation to the development of working capacity and to the guarantee of material conditions for living. However, throughout time, it has become a process that causes suffering, diseases and death. The occupational diseases/health problems arising from the execution of the work can result from the professionals' exposure to biological, physical, chemical, psychosocial and ergonomic hazards<sup>(1-2)</sup>.

The workers fall ill and die from causes related to work as a direct consequence of professional activities they execute or executed, or from adverse conditions in which their work is or was performed<sup>(3)</sup>.

In this way, the work directly affects workers' morbidity and mortality profile, either directly – with occupational accidents and diseases –, or indirectly – work-related illnesses. The professional activities workers execute or executed at their work environment or the adverse conditions in which the work is or was performed favor the process of illness and death<sup>(4)</sup>.

Occupational accident can be defined as an event that occurred while executing labor activity, regardless of the worker's employment or social

security situation, which leads to potential damage to health, temporarily or permanently, causing bodily injury and, as a consequence, loss or reduction of the ability to work<sup>(5)</sup>.

Legally, occupational accidents can be classified into: those that occur in the work environment, and those that occur during the journey between home and workplace<sup>(6)</sup>. The first is defined as the one that occurs within the working environment and in its execution; the second represents the accident suffered outside the workplace and working hours, which occurs while returning home or vice-versa, by any means of locomotion<sup>(7)</sup>. Moreover, occupational accidents can also be classified as serious, which imply physical and functional impairments, or even fatal results, such as mutilation<sup>(8)</sup>.

For public health, occupational accidents are serious health problems that significantly impair the living and health conditions of the population in the provision for the families and the movement of the economy of a country<sup>(9)</sup>.

The present study is justified due to the aspects such as: the significant number of workers victims of serious accidents in the state of Sergipe, with 1,271 cases reported in the period from 2009 to 2015; the need for guiding health workers' actions using the epidemiological

profile; the studies addressing temporal trend allow for the knowledge of the distribution and characteristics of the accidents that occurred in a certain period; few studies in the state of Sergipe address the topic.

In the world, annually, over 2 million deaths due to work occur, with representativeness of 318 thousand deaths from accidents and 2 million at the expense of work-related diseases<sup>(10)</sup>. Work-related accidents are responsible for 18% of deaths in low- and mid-income countries; in high-income countries, this percentage is only 5%.

The scenario demonstrates the large cost in relation to morbidity and mortality caused by work, with greatest impact in low – and mid – income countries, where a large part of the population is involved in dangerous activities such as mining. In Brazil, the costs with occupational accidents and diseases exceed R\$ 70 billion by year, which corresponds to approximately 9% of the payroll of the country. For families, the costs and the damage to workers are estimated at R\$ 16 billion. However, this cost is underestimated, because it refers only to the formal sector of the labor market<sup>(11)</sup>.

Workers' health problems are a theme with social dimension of paramount importance to public health, and have increasingly challenging the actions of the State, in order to carry out more interventions more frequently, to reduce the costs of social security in the country<sup>(12-13)</sup>.

Regarding the aforementioned considerations, the objective of this study is to analyze the epidemiological profile and the temporal trend of serious occupational accidents in the state of Sergipe, in the period from 2009 to 2015.

## Method

This is an ecological, descriptive, time-series study based on secondary data reported on the Information System for Disease Notification (SINAN) powered by DATASUS of the State Health Department of the state of Sergipe. The study analyzed the historic series (2009 to 2015) of the incidence of Serious Occupational

Accidents occurred in the municipalities of the state of Sergipe. This period was chosen due to the availability of the data at the system. The state of Sergipe is located on the coast of Northeastern Brazil, with a population of 2,068,017 inhabitants/km<sup>2</sup>, and an area of 21,910.354 km<sup>2</sup>, equivalent to 0.26% of the entire national territory<sup>(14)</sup>.

The totality of occupational accidents considered serious, recorded on the Sinan, between the years 2007 and 2010, with workers of age over 16 years and under 65 years, was included in the study, since, for calculation of the incidence, the Economically Active Population (EAP) was used, defined as the potential workforce available to act in the productive sector, that is, the occupied population and unoccupied population, aged up to 65 years<sup>(15)</sup>.

Data were collected through a structured instrument, developed by the researcher, according to the variables of interest for the study, as well as in relation to the SINAN platform, composed of two parts:

a) demographic data: sex (male/female); skin color/race (white, black, *pardo*, Asians, indigenous and ignored/blank); schooling (illiterate, 1<sup>st</sup> through incomplete 4<sup>th</sup> grade, complete 4<sup>th</sup> grade, 5<sup>th</sup> through incomplete 8<sup>th</sup> grade, complete basic education, incomplete secondary education, complete secondary education, incomplete higher education, complete higher education) and age (16-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-65);

b) data for characterization of the accident: type of accident (at-work, outside work, ignored), if a Communication of Occupational Accidents (COA) was issued, treatment regimen (inpatient, outpatient, both, ignored) and evolution of the cases (cure, temporary incapacity, partial incapacity, total permanent incapacity, death from serious occupational accident, death from other causes, other, ignored).

The data were stored on electronic spreadsheets and analyzed using Microsoft Excel 2010. A descriptive analysis of the sample was performed. The categorical variables

were expressed through absolute and relative frequency, and the numeric, such as age, were stratified to be expressed in the same way as the categorical variables.

The annual incidence rates of serious occupational accidents were calculated by dividing the absolute number of accidents in the year by the EAP of the respective year, obtained from the Superintendency of Studies and Researches (SUPES) of the Planning and Management Department (SEPLAG).

The trend for each health region (HR) was analyzed through linear regression, and the trends were considered significant with  $p < 0.05$ , in addition to the value of coefficient of determination ( $R^2$ ) and the analysis of residues. In the simple linear model, those with some set of data with two variables measured as  $x$  and  $y$ , the correlation between them indicated a linear behavior and was adjusted to a straight line that best adapted to the pairs of values, using the least squares method.

In the linear model, those with some set of data with two variables measured as  $x$  and  $y$ , the correlation between them indicated a linear behavior and was adjusted to a straight line that best adapted to the pairs of values, using the least squares method.

The study was performed only with data from secondary source of free access, and the ethical precepts were treated according to Resolution n. 466, of 12 December 2012, of the National Health Council (NHC).

## Results

There were 1,271 cases of serious occupational accidents reported in the state of Sergipe in the period from 2009 to 2015. Regarding the number of accidents, the two years of prominence were 2011 (19.5%) and 2009 (15.6%); in relation to the incidence calculated by the EAP, the years 2011 and 2010 stood out with their respective incidence rates of 23.6% and 19.9%; the years 2014 and 2015 were those with the lowest rates (Table 1).

**Table 1** – Frequency and incidence of serious occupational accidents occurred and recorded by year. Sergipe, Brazil – 2009-2015 (N=1,271)

Year	n	%	Incidence (by 100 mil among the EAP)
2009	198	15.6	18.6
2010	185	14.6	19.9
2011	248	19.5	23.6
2012	160	12.6	14.9
2013	187	14.7	17.5
2014	132	10.4	11.5
2015	161	12.7	14.0
<b>Total</b>	<b>1,271</b>	<b>100</b>	

Source: Created by the authors.

The analysis of the sociodemographic characteristics of the cases of serious occupational accidents that occurred between the years 2009 and 2015 revealed the following profile of

victims: male workers (88.8%), *pardo* race/skin color (61.5%), between 25 and 29 years (17.1%), with incomplete education from 5<sup>th</sup> to 8<sup>th</sup> grade (20.2%) (Table 2).

**Table 2** – Frequency of serious occupational accidents, according to sex, skin color, schooling and age. Sergipe, Brazil – 2009-2015 (N=1,271)

<b>Variables</b>	<b>n</b>	<b>%</b>
<b>Sex</b>		
Female	126	9.8
Male	1,145	88.8
<b>Skin Color</b>		
White	249	19.3
Black	62	4.8
Asian	3	0.2
<i>Pardo</i>	793	61.5
Indigenous	3	0.2
Ignored	161	12.5
<b>Schooling</b>		
Illiterate	25	1.9
Incomplete 1 <sup>st</sup> - 4 <sup>th</sup> grade	233	18.1
Complete 4 <sup>th</sup> grade	74	5.7
Incomplete 5 <sup>th</sup> - 8 <sup>th</sup> grade	261	20.2
Complete basic education	59	4.6
Incomplete secondary education	88	6.8
Complete secondary education	247	19.2
Incomplete higher education	29	2.2
Complete higher education	27	2.1
Ignored	228	17.7
<b>Age</b>		
16-19	80	6.3
20-24	178	14.0
25-29	217	17.1
30-34	206	16.2
35-39	184	14.5
40-44	143	11.3
45-49	130	10.2
50-54	81	6.4
55-59	34	2.7
60-65	18	1.4

Source: Created by the authors.

In relation to the characteristics of the accident, 59.8% of the accidents were at-work and 35.8%, outside work. The COA was only issued in 9.6% of cases. The treatment regimen adopted was mainly the hospital (57.9%), followed by

outpatient, applied in 20.4% of cases. Most cases (62.6%) evolved to temporary incapacity, whereas, in 12.2%, there was the death of the worker directly from the accident suffered. Only 14.3% of the cases evolved to cure (Table 3).

**Table 3** – Frequency of serious occupational accidents, according to type of accident, issuance of Communication of Occupational Accidents, treatment regimen and evolution of the case. Sergipe, Brazil – 2009-2015

Variables	2009	2010	2011	2012	2013	2014	2015	Total	
	n	n	n	n	n	n	n	n	%
<b>Type of Accident</b>									
At-work	113	108	155	104	93	88	99	760	59.8
Outside work	75	74	86	51	91	34	44	455	35.8
Ignored	10	3	7	5	3	10	18	56	4.4
<b>Issuance of Communication of Occupational Accidents</b>	<b>198</b>	<b>185</b>	<b>248</b>	<b>160</b>	<b>187</b>	<b>132</b>	<b>161</b>	<b>1,271</b>	100.0
Yes	42	11	17	14	11	19	8	122	9.6
No	54	12	72	37	38	34	61	308	24.2
Not applicable	70	51	112	43	43	42	23	384	30.2
Ignored	32	111	47	66	95	37	69	457	36.0
<b>Treatment Regimen</b>	<b>198</b>	<b>185</b>	<b>248</b>	<b>160</b>	<b>187</b>	<b>132</b>	<b>161</b>	<b>1,271</b>	100.0
Hospital	101	87	202	100	78	82	86	736	57.9
Outpatient	83	41	17	12	74	18	14	259	20.4
Both	2	47	23	16	19	5	6	118	9.3
Ignored	12	10	6	32	16	27	55	158	12.4
<b>Case Evolution</b>	<b>198</b>	<b>185</b>	<b>248</b>	<b>160</b>	<b>187</b>	<b>132</b>	<b>161</b>	<b>1,271</b>	100.0
Cure	6	17	49	38	17	25	30	182	14.3
Temporary Incapacity	164	136	179	73	121	76	47	796	62.6
Partial Incapacity	6	7	4	6	22	2	13	60	4.7
Permanent Total Incapacity	-	2	1	-	2	4	3	12	0.9
Death from Serious Occupational Accident	15	12	8	29	25	15	51	155	12.2
Death from Other Causes	-	-	1	1	-	-	-	2	0.2
Other	1	-	-	1	-	-	2	4	0.3
Ignored	6	11	6	12	-	10	15	60	4.7

Source: Created by the authors.

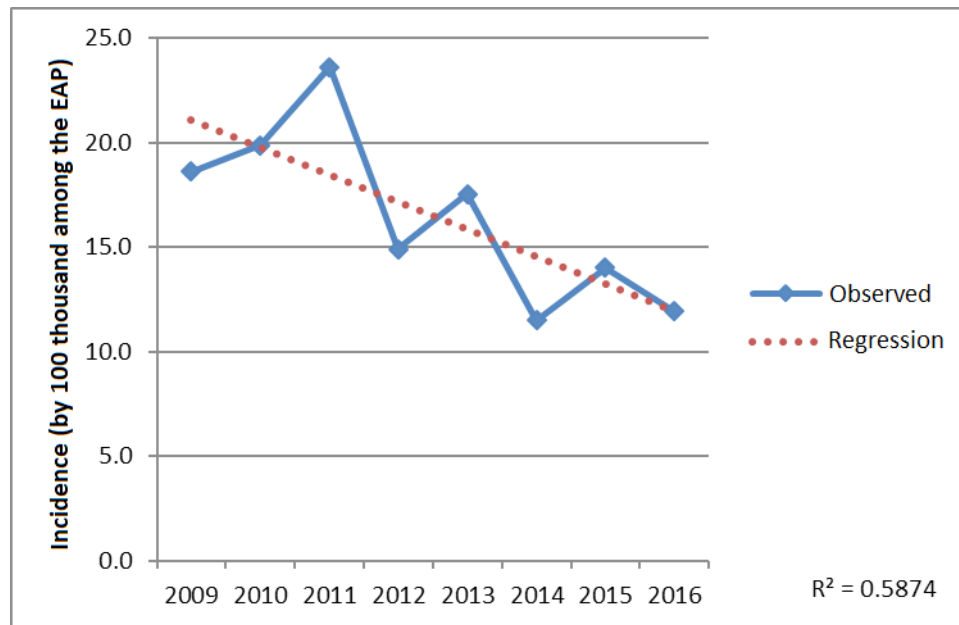
Note: Conventional sign used:

- Numeric datum equal to zero not resulting from rounding.

As seen in Figure 1, the state presented significant decreasing trend in the occurrence of cases of serious occupational accidents. Models of simple linear regression were made for the

incidence rate of accidents, as shown in Table 1. Although the coefficient of determination ( $R^2 = 0.58$ ) was not high, its p-value (0.03) proved to be significant.

**Figure 1** – Frequency and incidence of serious occupational accidents occurred and recorded by year. Sergipe, Brazil – 2009-2015



Source: Created by the authors.

## Discussion

In Sergipe, in the period between 2009 and 2015, 1,271 serious occupational accidents were recorded, which provides an average of 158.87 serious accidents by year. Relatively high average, which reinforces the need to reduce the number of accidents, through specific strategies, such as the National Strategy for Reduction of Occupational Accidents 2015-2016, proposed by the Ministry of Labor and Employment<sup>(16)</sup>.

Analyzing each year, there is a substantial variability in the incidence rate of these accidents (based on the EAP), demonstrating increasing involvement in Sergipe in the years 2009 through 2011, with the year 2011 with the highest rate. After this increase, there occurred fluctuations, which are common in the literature on the topic. Most studies also feature variable rates, as in a study conducted in the state of Paraná<sup>(17)</sup> and another in Rio Grande do Norte<sup>(18)</sup>.

In addition to these, in daily practice, whether in the health sector or in other sectors, it is possible to view the non uniformity of rates of

accidents, since these are influenced by several factors which differ over the months and years.

Of the cases of serious occupational accident analyzed, the majority were male (88.8%) and belonging to the age group of young adults between 25 and 29 years (17.1%), which was also observed in several other studies related to the theme<sup>(19-21)</sup>. This fact is explained by the fact that younger men perform tasks of greater degree of risk of accidents<sup>(22)</sup>.

Although this work excluded accidents with workers aged under 16 years, there was the occurrence of serious occupational accidents in children and adolescents – situation also evidenced in a study in Rio Grande do Norte<sup>(18)</sup>. Furthermore, the accident rate in the age range from 25 to 29 years was not significant (17.1%), once this age range was grouped into ten categories, with a predominance of accidents between 16 and 39 years, representing 68% of the sample, which corroborates the predominance of accidents among adults in productive age.

This fact is quite worrying, since a good part of accidents leads to temporary incapacity (62.3%), moving the worker away at the beginning of his/



her career, many times generating significant sequelae that directly interfere in his/her future performance or even leading to premature death.

The skin color/race was also analyzed and demonstrated that the serious occupational accidents, in Sergipe, occurred predominantly in the *pardo* population (61.5%), a fact that is contrary to the findings of another study<sup>(17)</sup>, in which most victims were white (70.3%). This contradiction can be explained by the variation of the distribution of this characteristic in the Brazilian population, considering that the high number of white people victims of accidents took place in the Southern Region of the country, where many communities are descendants of European peoples.

With regard to schooling, the accidents occurred primarily among the least qualified. The largest part did not reach the secondary education, with emphasis to the study range from 5<sup>th</sup> to incomplete 8<sup>th</sup> grade. Some studies also highlighted the lack of schooling among the victims<sup>(22)</sup>. A study developed in Paraná<sup>(17)</sup> revealed that 21% of the victims have completed secondary education, which shows a higher degree of schooling in Paraná when compared to other regions of the country.

As for the characteristics of the accident, 59.8% of accidents were at-work and 35.8% outside work, corroborating similar results found in another study<sup>(23)</sup>. It is important to highlight the growth of outside-work accidents, which, although fewer in number, reaches similar percentages of at-work accidents. The increasing violence on the streets and, particularly, in the traffic, justifies this growth<sup>(24)</sup>.

The COA assists in the calculation of the labor charges generated for the employer, i.e., the more the institution issues the COA, the greater the tax burden, constituting one of the reasons for its non-issuance<sup>(25)</sup>. The COA is a tool of great importance for the epidemiology of occupational accidents and its issuance is mandatory. In this study, however, it was issued only in 9.6% of cases, being ignored in most of them (36%), not identifying the possible causes that led to this fact.

Moreover, the COA does not record the accidents with informal workers; in this way, the SINAN becomes an important database of epidemiological information on accidents, since it encompasses all workers: the formal and the informal ones. Although the data provided by the Social Security base on the situation of the Brazilian worker, this record is not always done.

The treatment regimen used in the care with the victims was mainly the hospital (57.9%), justified by the serious accidents, which are normally sent to mid- and high-complexity large hospitals.

The assessment of the trend was decreasing over the years analyzed and predicted an incidence of 11.9 for the year 2016. The trend was significant for the occurrence of cases of serious occupational accidents in the time series analyzed, with p-value (0.03). Similar results were seen by the Ministry of Labor and Employment<sup>(14)</sup>, in a study of trend conducted between the years 2003 and 2013, in which, although still present as significant numbers, there is a decrease in the number of accidents.

## Conclusion

The results of this study reveal an overall decreasing trend of serious occupational accidents in the state of Sergipe during the studied period. Although this decrease has shown significance, the number of serious accidents in the state is still high and presents the following profile: male workers at productive age, *pardos* and low schooling, who suffered, mainly, at-work accidents, requiring hospital regimen and mostly resulting in temporary disabilities.

The knowledge of the trend is of great importance for the formulation and structuring of prevention programs and for the elaboration of more specific and efficient strategies. The occupational accident theme demands the attention of professionals from several areas, in particular, those from occupational medicine and nursing, who can deal with the risks and possibilities of prevention, by means of an interdisciplinary approach.



Further studies should be carried out in the region to identify the occurrence of factors intrinsically related to serious occupational accidents, and to make a more rigorous analysis of the structure of the operation of the healthcare network. To ensure there is a significant reduction in these serious incidents, it is important that further studies can assist with early identification and establish effective interventions to reduce these rates.

### Collaborations:

1 – conception, design, analysis and interpretation of data: Ana Caroline Rodrigues Lima, Damião da Conceição Araújo and Julianne Souza Bezerra;

2 – writing of the article and relevant critical review of the intellectual content: Jádriel Fellipe Santana Santos and Jéssica Oliveira da Cunha;

3 – final approval of the version to be published: Ana Caroline Rodrigues Lima and Allan Dantas dos Santos.

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