

Prevalence and factors associated with work accidents in a metal-mechanic company

Prevalência e fatores associados aos acidentes de trabalho em uma indústria metalmeccânica

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ABSTRACT | **Background:** Work accidents affect more than 700,000 workers in Brazil each year. Among the three economic sectors, industry is the one that contributes with most work accidents in the country. Metallurgical and metal-mechanic companies stand out within this sector as a function of the frequency of leaves resulting from work-related accidents and illnesses. **Objective:** To analyze the occupational profile and hazards associated with work accidents at a metal-mechanic company for the period from 2007 to 2015. **Methods:** Cross-sectional study that analyzed data available in work accident report forms issued by the employer. **Results:** The socio-demographic and occupational profile predominantly associated with work accidents at the investigated company included: male gender, age 18 to 29 years old, white people, married or in stable union, with incomplete higher education, welders/assemblers and less than 5 years of work at the company. The most frequent types of injuries caused by accidents were fractures, dislocations, strains, contusions, excoriations, cuts and amputations. The most common causative agents were metal parts. The highest accident rates corresponded to 2008 and 2012, in which years economic recession hit the metal-mechanic segment. **Conclusion:** In addition to pointing to an economic sector with a high-risk work accident profile, the analyzed work accidents — the predominant consequence of which was leave for more than 15 days — might express a selective strategy from the company, which chose not to record less serious accidents. **Keywords** | occupational medicine; occupational injuries; occupational health.

RESUMO | **Introdução:** Os acidentes de trabalho vitimam mais de 700 mil trabalhadores anualmente no Brasil. Dos três setores econômicos o maior responsável pelos acidentes de trabalho no país é o industrial. Dentro desse setor, a indústria metalúrgica e a metalmeccânica se destacam pela proporção de afastamentos decorrentes de acidentes e agravos relacionados ao trabalho. **Objetivo:** Analisar os riscos ocupacionais existentes e o perfil associado aos acidentes de trabalho ocorridos em uma indústria do setor metalmeccânico no período 2007 a 2015. **Métodos:** Estudo transversal, realizado em indústria a partir das análises dos dados das comunicações de acidentes de trabalho (CAT) emitidas pela empresa. **Resultados:** O perfil sociodemográfico e ocupacional predominante dos acidentados na indústria estudada foi o trabalhador do sexo masculino, entre 18 e 29 anos, caucasiano, casado ou em união estável, com nível superior incompleto, soldador/montador e com menos de 5 anos de serviço. As lesões mais frequentes produzidas pelos acidentes ocorridos no período estudado foram: fraturas, luxações, distensões, contusões, escoriações, cortes e amputações; e os agentes causadores mais comuns foram peças de metal. As maiores taxas de acidentes de trabalho ocorreram nos anos de 2008 e 2012, anos associados a períodos de recessão econômica que atingiram o setor metalmeccânico. **Conclusão:** Os registros de acidentes estudados, no qual predominaram os afastamentos por mais de 15 dias, para além da indicação de um setor com perfil de riscos de acidentes graves, podem expressar uma estratégia seletiva patronal, que optou pela omissão do registro dos acidentes de menor gravidade.

Palavras-chave | medicina do trabalho; traumatismos ocupacionais; saúde do trabalhador.

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INTRODUCTION

Work accidents (WA) and the diseases derived from them make countless victims every year. In addition to impairing work activities, they have significant economic, social and environmental impact¹. Yet, lack of global data and discussions, especially in Brazil, deprive subject workers' health and safety of its due priority².

According to International Labor Organization estimates, 317 million WA occur each year worldwide. WA and work-related diseases make 6.300 fatal victims daily, i.e., 2.3 million people die every year as result of work³. Since workplace accidents and death can be avoided through preventive measures and greater safety, these numbers convey an idea of the social inequity that characterizes labor relations in the global scale⁴.

The Brazilian economically active population comprised about 100 million individuals in August 2015. About 58% of the workforce corresponded to males and 42% to females, distributed across the various economic sectors⁵. According to estimates, the working population includes 18.7 million informal workers, who do not enjoy any social or labor protection whatsoever⁶. Underreporting of WA is a confirmed fact in Brazil and affects a significant proportion of formal workers⁷. A recent study by the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística — IBGE) based on occurrences for 2013 showed that seven accidents were not reported per case notified or recognized by the Brazilian Social Security⁸.

One should notice that while the absolute number of registered WA increased in Brazil in the past decade, the incidence of work-related accidents and diseases actually decreased⁹. Nevertheless, the Brazilian situation is still alarming by comparison to other countries and points to the precariousness of the working conditions, low effectiveness of inspections, and impunity resulting from the fact that employers are scarcely made responsible for workplace safety¹⁰.

Among the three economic sectors, industry accounts for the largest proportion of WA. Within this sector, the metal-mechanic industry significantly contributes to WA indicators⁹. Data for 2013 described in the Statistical Yearbook, published in January 2015 by the Ministry of Social Welfare and Assistance, indicate that 717,000 WA were registered by

the National Institute of Social Security (Instituto Nacional do Seguro Social — INSS)¹¹. Almost half such WA (45.1%) corresponded to the secondary economic sector. The incidence of WA for the industry sector (28.8/1,000 workers) was twice higher than the overall rate for all sectors together (14.8/1,000 workers)⁹.

The metal-mechanic industry underwent considerable expansion in recent years, especially in the Southern and Southeastern regions of Brazil¹². It represents one third of the industry sector and contributes with 35.2% of the Brazilian industrial gross domestic product¹³. Although the 2008 global economic crisis had negative impact on this segment, resulting in reduction of the number of jobs and of exports in 2009, it still contributed with 24.4% of the exports from the state of Santa Catarina. Also the latest crisis, in 2015, had negative repercussions for the industry dynamics, the impact of which has not yet been precisely established¹⁴.

Hazards threatening the safety and health of metal-mechanic workers are strongly related to the various modalities of work and production management. The physical, cognitive and mental demands at work might translate as disease when they exceed the workers' capacity for recovery¹². As a rule, the lack of standardized organization of work meeting the productive capacity and available resources — usually influenced by the market demands — alter the rhythm of production, causing changes in the organization of work, with consequent increase of the work-related environmental and psychosocial hazards¹⁵.

Based on the aforementioned considerations — which point to the relevance of the industry sector for the development of Santa Catarina and Brazil as a whole, as well as to the magnitude of the risks inherent to productive processes and that pose a threat to the health and safety of workers — the aim of the present study was to analyze the main risk factors for WA at a large metal-mechanic company and their impact on the employees' health.

METHODS

The present cross-sectional observational study analyzed secondary data extracted from WA reports issued by the investigated company, which were collected from the company's archives and documents. The study was conducted at

a metal-mechanic company in the southern macro-region of the state of Santa Catarina, Brazil, which is one among the 1,000 largest Brazilian organizations, according to magazine *Exame*, and the third largest within its segment in the country.

We considered the data for all the workers with formal employment relationship from 2007 to 2015 who suffered WA recognized by the company along this period. Mean accident rates were calculated according to the average number of employees each year ($n_{MAX}=2,052$ and $n_{MIN}=560$). We included all the employees who suffered WA by any reason that were recorded on a work accident reporting form (WARF) along the analyzed period.

We analyzed all the WARFs issued by the company from 2007 through 2015. The data were collected from the company's databases after having been granted the due authorization. The relevant data were entered in an electronic spreadsheet designed by the author on software Microsoft® Excel for later export and statistical analysis.

Once data collection was complete, the data were entered in a EpiInfo® version 3.5.4. spreadsheet and analyzed using software Statistical Package for the Social Sciences (SPSS)® version 20.0. The significance level was set to 5% ($p<0.05$). Numerical variables were described in terms of mean and standard deviation (SD) and categorical variables as frequencies. The association of categorical variables was analyzed by means of the chi-square test. Analysis of variance (ANOVA) was used for comparison of means.

In compliance with the National Health Council Resolution no. 466/2012 relative to research with human beings, data collection started only after the study was approved by the research ethics committee of University of Southern Santa Catarina, CAAE (Certificate of Presentation for Ethical Appraisal) no. 55655016.4.0000.5369, ruling no. 1,553,563.

We obtained from the investigated company — which is legal depositary of its employees' data — authorization to access its archives and relevant documents.

Along the process of collection and storage, the information was not linked to any identification data to protect its confidentiality and the employees' anonymity. Instead, identification was performed by means of codes, with consequent reduction of the odds to identify the study subjects.

The data exclusively serve for academic and scientific purposes, and we ensured the investigated company we would keep its name and location confidential.

RESULTS

The number of employees at the investigated company varied along the considered interval of time, with an average of 1,277 per year in the analyzed period. The sample for the present study comprised 437 employees who suffered WA along the period from 2007 to 2015.

The absolute and proportional distribution of WA according to the considered sociodemographic variables is described in Table 1.

Table 1 describes the absolute and proportional distribution of sociodemographic variables relative to the employees who suffered WA. The most affected age range was 18 to 29 years old, corresponding to 62.5% of WA. As expected, most of the affected employees were male (94.7%). Most WA victims were white (88.8%) and had incomplete higher education (33.6%). Relative to the marital status, the group with the highest frequency of WA was the one of married employees/in stable union (57.7%). The job position with highest prevalence of WA was the one of welders/assemblers (46.9%). WA were most frequent among the group who had worked 1 to 5 years at the company (51.0%) and least frequent among the ones who had worked more than 10 years (0.7%).

Table 2 describes the total number of employees per year and the distribution of WA along the analyzed period.

Table 2 shows that the largest rate of WA corresponded to 2012 affecting 55.7‰ of the employees; in 2008 WA involved 53.0‰ of the employees. Considering the frequency of WA according to the total number of employees per year, the risk of WA decreased in the last three analyzed years.

Table 3 describes the absolute and proportional distribution of the characteristics of the WA that occurred at the investigated company.

As concerns type/motive, typical accidents were the most common, with a rate of 301.48‰ relative to the total number of employees. The most frequent consequence of WA was leave longer than 15 days, 59.5% ($n=259$). Two cases resulted in permanent leave (0.5%).

Table 1. Absolute and proportional distribution of work accidents at a metal-mechanic company according to sociodemographic and occupational variables, southern Santa Catarina, 2007-2015 (N=437).

Variables	Frequency (n=437)	Distribution (%)	Accident rate (x1,000)
Sex			
Male	414	94.70	324.10
Female	23	5.30	18.00
Ethnicity			
White	388	88.80	303.80
Non-white	49	11.20	38.30
Age (years)			
18 to 28	273	62.50	213.70
29 to 49	157	35.90	122.90
Over 50	7	1.60	5.40
Marital status			
Single	176	40.30	137.80
Married/stable union	252	57.70	197.20
Widowed/divorced	9	2.10	6.90
Educational level			
Illiterate or incomplete elementary school	42	9.60	32.80
Complete elementary school	87	19.90	68.10
Incomplete secondary school	67	15.30	52.40
Complete secondary school	86	19.70	67.30
Incomplete higher education	147	33.60	115.10
Complete higher education	8	1.80	6.20
Area or position			
Storage	51	11.70	39.90
Administrative assistant	12	2.70	9.39
Production assistant	39	9.00	30.50
Mechanic	8	1.80	6.26
Assembler/welder	205	46.90	160.50
Machine operator	73	16.70	57.10
Painter	37	8.46	28.90
Other	12	2.74	9.39
Length of work			
Less than 1 year	205	46.90	160.50
1 to 5 years	223	51.00	174.60
6 to 10 years	6	1.40	4.69
More than 10 years	3	0.70	2.34

Table 2. Distribution of employees exposed to risk of accidents, absolute number of accidents and prevalence of recorded work accidents per year. Southern Santa Catarina, 2007-2015 (N=437).

Year	Number of employees	Number of accidents	Rate (x1000)
2007	560	11	19.6
2008	675	36	53.0
2009	780	23	29.4
2010	1,160	34	29.3
2011	1,530	44	28.7
2012	1,740	97	55.7
2013	2,052	87	42.3
2014	1,830	70	38.2
2015	1,170	35	29.9

Analysis of association between variables of interest showed that job position had statistically significant relationship with WA type. Length of work at the company had statistically significant correlation with consequences of WA indicating that the less experienced employees had higher odds of suffering more serious accidents.

As Table 4 shows, analysis of prevalence ratio (PR) and 95% confidence interval (95%CI) indicates that the employees who had worked at the company for less than 1 year had 30% higher risk for leave longer than 15 days compared to the employees who had worked more 1 year (PR=1.29; 95%CI 1.11–1.50; p=0.0015). The prevalence of leave longer than 15 days was 50% higher for the male employees (PR=1.53; 95%CI 0.93–2.56; p=0.048).

Table 3. Absolute and proportional distribution of the characteristics of recorded work accidents. Southern Santa Catarina, 2007-2015 (N=437).

Variable	Frequency (n=437)	Distribution (%)	Rate (x1000)
Type of accident			
Typical	385	88.10	301.48
Disease	3	0.69	2.34
On the way to work	49	11.21	38.34
Injury nature			
Fractures, dislocations and strains	185	42.70	144.70
Contusions, excoriations, cuts and amputations	188	43.10	147.20
Immediate injury	45	10.00	35.20
Other	53	4.30	41.50
Body part			
Head, face and neck	34	7.80	26.60
Upper limbs	52	12.00	40.70
Hands and fingers	186	43.00	145.60
Lower limbs	129	30.00	101.00
Other	36	8.20	28.10
Generating situation			
Caught in or between	133	30.00	104.10
Rubbed or abraded	28	6.40	21.90
Struck	200	46.00	156.60
Fall to	53	12.00	41.50
Contact, exposure or excessive effort	23	5.30	18.00

Continue...

Table 3. Continuation.

Variable	Frequency (n=437)	Distribution (%)	Rate (x1000)
Causative agent			
Metal/iron	147	33.60	115.10
Equipment and machines	72	16.50	56.30
Floor/surface	32	7.30	25.00
Manual equipment	67	15.30	52.40
Wood	6	1.40	4.60
Vehicles and forklifts	60	13.70	46.90
Stairs	7	1.60	5.40
Other	50	11.40	39.10
Day of the week			
Monday	72	16.50	56.30
Tuesday	90	20.60	70.40
Wednesday	76	17.40	59.50
Thursday	97	22.20	75.90
Friday	83	19.00	64.90
Saturday or Sunday	19	4.30	14.80
Consequences			
No leave	59	13.60	46.20
Leave shorter than 15 days	115	26.40	90.00
Leave longer than 15 days	259	59.50	202.80
Permanent leave	2	0.50	1.10

DISCUSSION

The results of the present study show that WA involved more men than women (94.70% vs. 5.30%). One reason for this finding is that the vast majority of employees at the investigated metal-mechanic company were male. One study that analyzed WA within the metallurgical and metal-mechanic industry in Rio Grande do Sul from 1996 to 1997 found that men represented 90.30% and women to 9.38% of the occurrences. Similar findings were reported by the Metallurgical Union of Osasco following analysis of WARFs, according to which 90.45% of WA corresponded to men¹⁶.

Table 4. Results of statistical analysis (chi-square test) of work accidents. Southern Santa Catarina, 2007-2015 (N=437).

Association	χ^2	p value
Job position vs. type of accident	93.662	0.000*
Injury nature vs. consequence	42.789	0.249
Generating situation vs. consequence	20.746	0.475
Length of work vs. consequence	24.294	0.004*
Sex vs. consequence	4.575	0.206

*Statistically significant

In the present study, WA were more frequent among whites compared to non-whites (88.8% vs. 11.2%). This finding is due to the fact that the investigated company is located in a region that underwent significant European colonization, especially by Italians and Germans. Similar studies conducted in other Brazilian states, such as Bahia, reported opposite results, the proportions of WA being 12.1% and 87.9% for whites and non-whites, respectively¹⁷.

WA were more frequent among employees aged 18 to 29 years old (62.5%). A study conducted at metallurgical companies in Presidente Médici, Rondônia, reported similar findings: most accidents involved young adults aged 23 to 30 years old¹⁸. The average age of employees who suffered WA was 26 to 30 years old in a study conducted at metal-mechanic companies in Rio Grande do Sul¹⁶. Some among the factors that might contribute to the higher incidence of WA among younger workers is their lack of professional experience and the relative fearlessness of youths in the face of high-risk situations.

WA more often involved married employees/in stable union (57.70%) which agrees with the results found for metal-mechanic workers in Rio Grande do Sul, as 63.32% of the registered WA involved married workers¹⁶. As to the educational level, WA prevailed among employees with incomplete higher education (33.60%). Differently, other studies reported predominance of WA (50.00%) among employees with low educational level (incomplete elementary school)¹⁷. This discrepancy might be due to the fact that the company investigated in the present study implemented a nationally recognized program for literacy promotion, which includes teaching at the organization's premises and scholarships for employees interested in pursuing higher education, in addition to the situation proper to the later stage of data collection, which reflected the overall increase in formal schooling attendance that took place in Brazil in the past decade.

WA were more frequent among the employees who had worked for 1 to 5 years (51.0%). Also other studies reported similar results. An analysis conducted in São José do Rio Preto, São Paulo, for the period from 2008 to 2013 found that employees having worked 1 to 5 years were the group with the highest prevalence of WA (25.9%)¹⁹. Similarly, a study conducted in Fortaleza, Ceará, found that employees having worked 2 to 7 years were involved

in 24.0% of accidents²⁰. As to variable job position, the group with the highest number of WA, 46.9% of the total, was the one of welders/assemblers. Welding is a highly relevant activity in the metal-mechanic industry, while it is highly hazardous for workers, since they often perform their work under conditions of physical and emotional stress, in addition to pressure derived from exposure to other hazards, including physical, chemical, biological and ergonomic agents²¹.

WA were more frequent on Thursdays (88.0%), which might be explained as a function of its closeness to the weekend, as well as of the accumulated effect of the emotional and physical stress associated with the acceleration of the work rhythm along the week. This hypothesis is reinforced by the high frequency of WA on Fridays, despite the reduction of the working time by 1 hour by comparison to the rest of the week at the investigated company.

Typical accidents were the most frequent type of WA (88.0%). These are the accidents that occur during actual performance of work activities. A study conducted in São José do Rio Preto, São Paulo, found that a large number of WA were typical accidents (65.8%)¹⁹. One study that analyzed the official records of Reference Center for Workers' Health (Centro de Referência em Saúde do Trabalhador — CEREST) of Botucatu, São Paulo, for the period from 2009 to 2011 found similar results; 98.3% of the WA recorded in WARFs were classified as typical accidents²². In the present study, the most frequent types of injuries were contusions, excoriations, cuts and amputations, which accounted for 43.1% of the recorded WA along the analyzed period, followed by fractures, dislocations and sprains, 42.7%. Also cuts and contusions, 23.6%, were the most frequent types of WA-related injuries among metal-mechanic workers in Rio Grande do Sul as revealed by analysis of WARFs, followed by fractures, 9%²¹. In turn, burns stood out (45.0%) at metallurgical companies in Presidente Médici, Rondônia, followed by cuts (32.0%)¹⁸.

In the present study, hands and fingers were the most affected body parts (43.0%). In one study conducted in Fortaleza, Ceará, for the period from 2008 to 2012 the hands were the most frequently involved, 63.2%²⁰. Also the hands (22.7%) were the most frequently injured body part, followed by the upper limbs (20%) in a study on WA performed in São José do Rio Preto, São Paulo,

for the period from 2008 to 2013. A study conducted in Curitiba, Paraná, on return to work of employees who suffered finger injuries found that most were able to reassume their older job position, albeit with difficulty to perform their activities²³. Almost half the occurrences analyzed in the present study were due to struck-by accidents (46.0%). Also in a study on the occurrence of WA within the metal-mechanic industry of Rio Grande do Sul the most frequent generating situation were struck-by incidents (46.0%)¹⁹.

Metal/iron was the most frequent causative agent of the recorded WA (33.6%), followed by manual equipment (15.3%). Differently, studies conducted at metal-mechanic companies in Rio Grande do Sul found higher frequency of noise and repetitive strain injury/work-related musculoskeletal diseases (RSI/WMSDs), followed by injuries by iron bars, machines and tools (29.82%)¹⁶. In both studies, the number of causative agents present at the workplace was quite large, which shows that the work environment within the metal-mechanic industry poses high risk. In turn, these studies differed, as the one conducted in Rio Grande do Sul was based on independent observation, while ours was limited to analysis of the employer's records, resulting in overestimation of accidents and trauma at the expense of occupational diseases, this being a regressive characteristic associated with the prevailing pattern of underreporting, whereby only the most severe accidents are recorded.

The most frequent consequence of the analyzed WA was leave longer than 15 days, 59.5%, followed by leave shorter than 15 days (26.4%). The frequency of permanent leave was 0.5%. An analysis of WA in Botucatu, São Paulo, for the period from 2009 to 2001 found that leaves were necessary for 73.1% of the cases, but only 1.9% of the workers had to be admitted to hospital²². One study targeting metal-mechanic companies in Rio Grande do Sul reported similar results, being leaves necessary for 74.31% of the cases¹⁹. One study conducted with meatpacking workers participating in a professional rehabilitation program from 2007 to 2008 found that the duration of leaves was longer than 15 days. The results of this study showed that the length of leaves was coherent with the degree of disability exhibited by the employees, i.e., the longer the leave, the lesser their ability to return to work²⁴. The predominance of longer leaves in our study somehow corroborates the selective

nature of the WA records, because were the accidents to have been reliably recorded, a higher prevalence of accidents resulting in no need for or shorter leaves would have been reasonably expected.

Economic crises cause countless problems that impair not only the economy, but also the quality of life of the overall population. Even if not involving an unequivocal association, the hypothesis of an inverse relationship between macroeconomic conditions and health is reasonable²⁵. The financial crisis triggered by the bursting of the housing bubble in the United States in 2007 became rapidly global. Yet differently from our results, a study conducted in Spain found that the number of WA decreased along a period of economic slowdown from 2000 to 2009²⁶. This phenomenon might be explained by elevation of the unemployment rates and decrease of the number of paid employees in Europe, with consequent reduction of the exposure to hazards. However, increase of informal work possibly led to underreporting of WA, while the certainty of efficacious social protection somehow reduces the stress of employees facing layoffs. We found that the WA rate increased in 2012 and 2008, being both years characterized by economic crisis with significant impact on the metal-mechanic industry in Brazil. This situation, and the attending job instability, might have increased the levels of stress among workers. One study performed in Uruguay found correlation of WA, reduced quality of life and burnout syndrome with stress caused by fear of losing the job, among other aspects of an ongoing economic crisis.

The main limitation of the present study derive from the quality of the analyzed databases; some forms were incomplete and data of interest for the present study were missing, which led to the exclusion of several participants. This fact reinforces the need to raise the awareness of professionals charged of reporting WA of the need to fill WARFs correctly, given the indisputable relevance of these records for accurately mapping the true situation of health and safety at work.

CONCLUSION

The results of the present study showed that the predominant profile of WA at the investigated company was composed

of typical accidents, causing fractures, sprains, contusions, excoriations or sprain, most frequently involving the hands and fingers or the lower limbs, mainly for being struck by metal and iron parts, on Tuesday or Thursday and resulting in leaves longer than 15 days.

Length of work shorter than one year was associated with risk of more severe WA. Job position was correlated with accident type in a statistically significant manner.

Male workers exhibited 50% higher odds for WA compare to the women.

The present study also found that predominance of more severe WA resulting in leaves longer than 15 days might be related to the employer's choice to underreport milder WA. This situation is not exclusive to the investigated company and might be quickly corrected through more effective inspection of work environments.

REFERENCES

- Gonçalves CGO, Dias A. Three years of work-related accidents in a metallurgic plant: ways to its understanding. Faculdade de Ciências Biológicas e da Saúde, Universidade Tuiuti do Paraná. Faculdade de Medicina de Botucatu, Universidade Estadual Paulista. *Ciênc Saúde Colet.* 2011;16(2):635-46. <http://dx.doi.org/10.1590/S1413-81232011000200027>
- Galdino A, Santana VS, Ferrite S. Workers' health referral centers and reporting of work-related injuries in Brasil. *Cad Saúde Pública.* 2012;28(1):145-59. <http://dx.doi.org/10.1590/S0102-311X2012000100015>
- Organizacion Internacional del Trabajo. Seguridad y salud en el trabajo [Internet]. [Cited on Apr 28, 2015]. Available at: <http://www.ilo.org/global/topics/safety-and-health-at-work/lang-es/index.htm>
- Mascarenhas DE, Freitas MG, Monteiro RA, Da Silva MMA, Malta DC, Gómez CM. Emergency room visits for work-related injuries: characteristics and associated factors - Capitals and the Federal District, Brazil, 2011. *Ciênc Saúde Colet.* 2015;20(3):667-78. <http://dx.doi.org/10.1590/1413-8123201520316842014>
- Instituto Brasileiro de Geografia e Estatística. Diretoria de Pesquisas. Coordenação de Trabalho e Rendimento. Pesquisa Mensal de Emprego [Internet]. [Cited on Oct 24, 2015]. Available at: https://ww2.ibge.gov.br/home/estatistica/indicadores/trabalhoerendimento/pme_nova/default.shtm
- Mesquita EC. Mapa da ilegalidade: as relações de trabalho sem carteira assinada. Fortaleza: IDT; 2015. 81 p.
- Brasil. Ministério da Saúde. Trabalhar, sim! Adoecer, não! Relatório da III Conferência Nacional em Saúde do Trabalhador [Internet]. Brasília: Ministério da Saúde, 2011 [cited on Oct 26, 2015]. Available at: http://conselho.saude.gov.br/biblioteca/Relatorios/trabalhar_sim_adoecer_nao.pdf
- Lorenzi RL, Maia ALS, Saito CA, Oliveira JA, Bussacos MA, Maeno M, et al. Accidents at work in Brazil in 2013 - comparison between selected data within two data sources: IBGE National Household Health Survey and Statistical Yearbook of the Social Security (by Ministry of Social Welfare). Brasília, 2015. DOI: 10.13140/RG.2.1.2333.4886
- Serviço Social da Indústria. Panorama em Segurança e Saúde no Trabalho na Indústria: Brasil e Unidades da Federação 2004: setor de metalurgia básica e metalmeccânica [Internet]. Brasília, 2011 [cited on Nov 1, 2015]. Available at: [http://www.sesipr.org.br/uploadAddress/Serie%20panorama%20da%20seguranca%20e%20saude%20no%20trabalho%20no%20brasil_setor_de_metalurgia_metal_arquivo\[33366\].pdf](http://www.sesipr.org.br/uploadAddress/Serie%20panorama%20da%20seguranca%20e%20saude%20no%20trabalho%20no%20brasil_setor_de_metalurgia_metal_arquivo[33366].pdf)
- Almeida FS, Morrone LC, Ribeiro KB. Trends in incidence and mortality due to occupational accidents in Brazil, 1998-2008. *Cad Saúde Pública.* 2014;30(9):1957-64. <http://dx.doi.org/10.1590/0102-311X00009213>
- Brasil. Ministério da Previdência Social. Anuário estatístico de acidentes de trabalho [Internet]. 2013 [cited on Oct 26, 2016]. Available at: <http://www.previdencia.gov.br/?p=63362>
- Veiga RAR, Xavier EA, Lenzi FC. Uma análise do processo produtivo e das condições ergonômicas do trabalho na Mefaro Indústria Metalmeccânica. *Rev Ciênc Exatas Tecnol.* 2012;7(7):97-106.
- Federação das Indústrias do Rio Grande do Sul. Indicadores industriais Rio Grande do Sul [Internet]. 2013 [cited on Oct 17, 2016]. Available at: http://www.fiergs.org.br/sites/default/files/O8_boletim_dos_indicadores_industriais_do_rs_agosto_2013.pdf
- Grapeggia M, Ferreira C, Douglas L. Santa Catarina em Números: metalmeccânico / Sebrae/SC. Florianópolis: Sebrae/SC; 2010.
- Fernandes RCP, Assunção AA, Carvalho FM. Mudanças nas formas de produção na indústria e a saúde dos trabalhadores. *Ciênc Saúde Colet.* 2010;15(suppl. 1). <http://dx.doi.org/10.1590/S1413-81232010000700068>
- CF Goldman. Análise de acidentes de trabalho ocorridos na atividade da indústria metalúrgica e metalmeccânica no estado do Rio Grande do Sul em 1996 e 1997. Breve interligação sobre o trabalho do Soldador. Porto Alegre: UFRGS; 2002.
- Santana VS, Xavier C, Moura MCP, Oliveira R, Espírito-Santo JS, Araújo G. Severity of occupational injuries treated in emergency services. *Rev Saúde Pública.* 2009;43(5):750-60. <http://dx.doi.org/10.1590/S0034-89102009005000061>
- Nascimento JKM. Riscos ambientais causadores de acidentes de trabalho no setor produtivo de metalúrgicas em Presidente Médici [course conclusion paper] [Internet]. Cacoal: Universidade Federal de Rondônia; 2016 [cited on Apr 17, 2017]. Available at: <http://www.ri.unir.br/jspui/handle/123456789/1471>
- Cardoso MG, Romero LO, Bacchi ZC, Eid VRT, Beretta D, Jericó MC. Caracterização das ocorrências de acidentes de trabalho graves. *Arq Ciênc Saúde.* 2016;23(4):83-8.
- Monteiro PP. Perfil clínico-epidemiológico dos trabalhadores que sofreram acidentes de trabalho graves notificados no município de Fortaleza [dissertation]. Fortaleza: Universidade de Fortaleza; 2013.

21. Dias TMA, Araújo GV. Percepção dos trabalhadores de soldagem em relação à exposição aos riscos de acidentes no local de trabalho. *Rev Enferm Contempor*. 2015;4(1):49-55. <http://dx.doi.org/10.17267/2317-3378rec.v4i1.468>
22. Molina AC, Lima MAF, Fressatti WL, Pilan Neto CA, Caldas Junior AL, Lima SAM. Notificações de Acidentes de Trabalho em CEREST de Botucatu-SP. *R. Laborativa*. 2016;5(1):64-79.
23. Simonelli AP, Jackson Filho JM, Schneider BRL, Machado DE. Retorno ao trabalho de trabalhadores com amputação de dedos. *Rev Ter Ocup Univ São Paulo*. 2016;27(2):138-45. <http://dx.doi.org/10.11606/issn.2238-6149.v27i2p138-145>
24. Sardá Junior JJ, Kupek E, Cruz RM. Preditores biopsicossociais de incapacidade física e depressão em trabalhadores do setor de frigoríficos atendidos em um programa de reabilitação profissional. *Acta Fisiatr*. 2009;16(2):76-80. <http://dx.doi.org/10.5935/0104-7795.20090002>
25. Ruhm CJ. Are recessions good for your health? *Quart J Econ*. 2000;115:617-50. DOI: 10.3386/w5570
26. Fuente VS, López MA, González IF, Alcántara OJ, Ritzel DO. The impact of the economic crisis on occupational injuries. *J Safety Res*. 2014;48:77-85. <https://doi.org/10.1016/j.jsr.2013.12.007>
27. Tomasina F. Los problemas en el mundo del trabajo y su impacto en salud. Crisis financiera actual. *Rev Salud Pública*. 2012;14:56-67. <https://doi.org/10.1590/S0124-00642012000700006>

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