

Emergency room visits for work-related injuries: characteristics and associated factors – Capitals and the Federal District, Brazil, 2011

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Abstract *Work-related injuries, often classified as occupational injuries (OI), stand out among visits due to external causes (accidents and violence) in health services. To describe the characteristics and factors associated with emergency room visits for OI, a cross-sectional study was conducted using data from the Survey of Violence and Injuries in Emergency Services (VIVA Inquérito 2011) in 24 state capitals and the Federal District. The prevalence of treatment for OI and prevalence ratios (PR) with confidence intervals of 95% (95%CI) were calculated. There were 29,463 emergency room visits due to accidental injuries in the population above 18 years of age. The prevalence of OI was 33.4% and was positively and significantly associated with the male gender, age 30-59 years old, industrial workers, agricultural sector or repair and maintenance services. The occurrence of OI was significantly higher in attendance for objects falling on people (PR = 3.37, 95% CI 2.80 to 4.05) and injuries due to perforating object (PR = 3.01, 95% CI 2.50-3.65). The results support the surveillance of external causes and direct public policies to promote occupational health.*

Key words *Occupational health, Work-related accidents, External causes, Emergency medical services*

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Introduction

External causes (e.g., accidents and violence) of morbidity and mortality are of substantial importance in public health, given their magnitude and impact on people's lives, particularly in developing countries¹⁻³. According to the Pan American Health Organization (PAHO), external factors constitute the leading cause of lost years of life in two-thirds of the American nations, and transport-related accidents, homicides and suicides are among the five main causes of premature death⁴.

In Brazil, the mortality rates of these events are high and have been increasing since the 1980s⁵, which demonstrates the relevance of this problem for the country⁶. The mortality rate for external causes in Brazil has varied from 69.3 deaths per 100,000 inhabitants in 2001 to 75.1 deaths per 100,000 inhabitants in 2010 (i.e., an increase of 8.4 %). In 2010, external causes were the third-leading cause of death among the total population and the leading cause of death among adolescents (10 to 19 years old) and young adults (20 to 39 years old). Deaths from aggression and road traffic accidents were responsible for approximately 70 % of all deaths from external causes. In 2011, external causes of death accounted for 8.6 % of all hospitalizations in the Brazilian Public Health System (Sistema Único de Saúde – SUS), occupying the fifth rank in Brazil. The highest hospitalization rates were found among men aged between 20 and 39 years old (89.7 per 10,000 men) and women aged 60 years and older (74.3 per 10,000 women). In the period from 2002 to 2011, the hospitalization by intentional injury rate increased by 19.3 %⁷.

Among the external causes treated at health-care services, work-related accidents, or occupational accidents (OAs), are important. However, in this area, knowledge is limited because only injuries to formally hired workers (approximately one-fourth of the total active work force) are reported to the National Social Security data system. Thus, employees without registered jobs and statutory employees are excluded⁸.

Brazilian OAs are most likely underreported for two main reasons: 1) they are not recognized as work-related and therefore appear in official statistics under common homicides and general accidents and 2) a single system that centralizes all available information on OAs in the country is lacking^{9,10}. The most comprehensive database is managed by the Ministry of Social Security (Ministério da Previdência e Assistência Social –

MPAS). However, MPAS does not collect information on accidents that occur in the informal labor market of the Brazilian economy¹⁰.

According to Santana *et al.*¹¹, the OA mortality rate is 13.2 per 100,000 formal workers, and the annual cumulative incidence of non-fatal accidents is approximately 3 % to 6 %. These conditions result in high health-care costs in the country, in addition to social security expenses. It is estimated that the expenses of the National Social Security Institute (Instituto Nacional de Seguridade Social – INSS) for sick leave and occupational conditions represent more than half the benefits paid by INSS (62.8 %) ^{11,12}.

In Brazil, surveillance and monitoring of accidents and violence are performed through a systematic stream of primary and secondary data for which the major sources are the mortality and hospitalization information systems, police reports, communication of OAs (comunicação de acidente de trabalho – CAT), toxico-pharmacological information and periodic health surveys^{13,14}.

However, because of the difficulty of obtaining data on morbidity with respect to injuries with lower severity that do not imply death or hospitalization but that have a high impact on the demand for urgent care services, the Ministry of Health introduced the Surveillance System for Violence and Accidents (Sistema de Serviços Sentinelas de Vigilância de Violências e Acidentes – VIVA) in 2006. This surveillance system has two components: 1) surveillance of violence and accidents in hospital emergencies, which aims to characterize urgent care services required for injuries with external causes (VIVA Survey), and 2) surveillance of sexual, domestic and/or other interpersonal violence, which considers the legal requirement to report violence against children, adolescents, women and the elderly¹⁵.

In the 2011 VIVA Survey, a variable was added to identify whether the injury is work-related, and the type of occupation practiced, regardless whether the work was performed in the formal, informal or autonomous labor sector. This modification was useful because it rendered nugatory the reductionist views that regarded these occurrences as simple events caused by worker error and thus enabled research to focus on OA prevention¹⁶.

The objective of this study was to characterize the emergency assistance provided to individuals whose injuries had work-related external causes using data from the 2011 VIVA survey in 24 state capitals and the Federal District of Brazil. The

results can support the surveillance of violence and accidents and can help in the development of public policies aimed at the promotion of worker health, including the health of the working population not typically included in the official MPAS reports.

Methods

This cross-sectional study is based on data from the VIVA Survey performed between September and November 2011 in 71 urgent and emergency care services of the SUS located in the Federal District and 24 state capitals of Brazil. Manaus (Amazonas State – AM) and São Paulo (São Paulo State – SP) did not administer the survey because of operational factors. The inclusion of the selected service units was validated by the local teams according to the following criteria: 1) the health facility was recorded as qualified to provide urgent and emergency care assistance in the National Registry of Health Facilities (Cadastro Nacional de Estabelecimentos de Saúde – CNES); 2) records were available on the requirement of hospitalization for external causes in the Hospital Information System of the SUS (Sistema de Informações Hospitalares do SUS – SIH/SUS); 3) the number of treatments identified in the 2006, 2007 and 2009 VIVA Survey¹⁷⁻¹⁹.

Data were collected during a period of 30 consecutive days that were divided into 12-hour shifts, totaling 60 shifts: 30 day shifts (7:00 am to 6:59 pm) and 30 night shifts (7:00 pm to 6:59 am). Shifts were drawn by means of single-stage cluster sampling, with the shift as the primary sampling unit. The number of shifts drawn for each establishment was obtained according to the minimum sample size (i.e., 2,000 per state capital), and the mean of treatments for external causes performed at the health-care service was obtained assuming a coefficient of variation below 30 % and a standard error below 3¹⁷⁻¹⁹.

All victims of injuries with external causes who sought urgent and emergency care assistance for the first time in the selected units and during the drawn shifts and who agreed to participate in the survey were considered eligible for the interview. Data were collected using a standardized form, which was administered by trained teams. Assistance was classified into two groups according to intentionality: 1) the accident was defined as “an unintentional and avoidable event causing physical injuries and/or emotional distress within the domestic setting or in other social envi-

ronments, such as work, school, sports or leisure activities”²⁰ (e.g., accidents caused by road traffic, falls, burns, cuts, falling objects, poisoning, suffocation and drowning); 2) violence was considered as “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation”³ (e.g., self-inflicted injuries, mistreatments and aggression).

The reported event (i.e., the accident/violence) was considered to be work-related when the victim (or the legal guardian/next of kin if the patient was unconscious or under 18 years of age) declared that the event occurred during work or on the way to or from work by positively answering the question *Did the occurrence occur while at work or commuting to work?* This approach enabled the identification of typical OAs (which occur at the workplace) and commuting OAs (which occur while traveling to or from work, provided that the commuting is ordinary commuting with no stops or detours during the home-to-work or work-to-home route).

The patient was also asked about his/her occupation during most of the day up to the occurrence of the reported event, either in the formal, informal or autonomous labor sector. Occupations were coded according to the Brazilian Classification of Occupations, 2002 edition (Classificação Brasileira de Ocupações, edição 2002 – CBO-2002) and combined into large groups according to level of competence and the similarity of the performed activities²¹.

In this analysis, medical records from emergency care assistance provided to accident injury patients aged 18 years and older were included considering the following characteristics:

- 1) sociodemographic: gender (male, female), age range (18-29, 30-39, 40-59, 60 years and older), race/skin color (white, black/brown, yellow/Amerindian), educational level (0-8, 9 years and above), disability of any type and occupational group; 2) event-related: place of occurrence (home, street, school, recreational area, store/service establishment/bar, factory/construction site, other), type of injury (no physical injury, bruises, cuts/lacerations/amputations, sprains/dislocations, fractures, traumas, other), afflicted body part (head/neck, thorax/abdomen/pelvis, limbs, multiple organs/sites), declaration regarding the consumption of alcoholic beverages, type of occurrence (traffic accident, fall, puncture wound, being struck by an object/person, sprains, foreign

bodies, being struck by a falling object, animal accidents, burns); 3) assistance-related: means of traveling to the hospital (on foot, private vehicle, mobile emergency care service (MECS)/ambulance/rescue vehicle, bus/van, police car, other), time (night, day), day (Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday), evolution (discharge, hospitalization, referral to outpatient treatment, discharge against medical advice, death).

The analyses were processed by groups of treatments performed in the selected services while comparing accident victim characteristics according to the relationship of the event to the occupation. The null hypothesis of independence between qualitative variables was determined using the chi-square test at a significance level of 5 %. The prevalence ratio and the respective 95 % confidence intervals were estimated with Poisson regression. The *svy* command of Stata software, version 11 (Stata Corp., College Station, TX, USA) was used to obtain unbiased estimates with data derived from complex sampling plans.

The 2011 VIVA Survey project was evaluated and approved by the National Committee for Ethics in Research (Comissão Nacional de Ética

em Pesquisa – CONEP). Further information on study sample design, research organization and implementation can be found in other publications¹⁵⁻¹⁸.

Results

In the 2011 VIVA Survey, a total of 29,463 emergency treatments for injuries with accidental causes were identified in the adult population (18 years and older). The mean prevalence of work-related events in this population was 33.4 % for all state capitals and the Federal District. The state capitals of the North and Northeast, such as Macapá, Fortaleza, Boa Vista and São Luís, exhibited the lowest prevalence, whereas the highest prevalence was observed in the capitals of Brazil's more developed states, such as Curitiba, Florianópolis, Vitória, Campo Grande and the Federal District (Figure 1).

Table 1 summarizes demographic characteristics of emergency treatments according to accident, prevalence and factors associated with the occurrence of work-related events. Among all of the interviewees, male (65.0 %), young patients

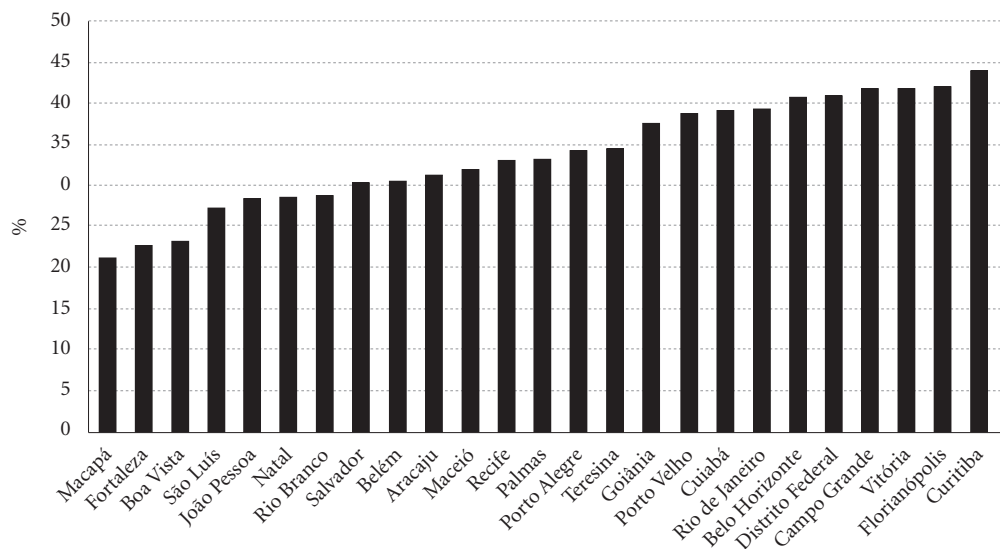


Figure 1. Ratio of emergency treatments by work-related injury – State capitals^a and Federal District, Brazil, 2011.

Source: Health Ministry, Health Surveillance Secretariat, Surveillance System for Violence and Accidents (Sistema de Vigilância de Violências e Acidentes – VIVA), 2011 Survey. ^a Except Manaus – Amazonas State (AM) and São Paulo – São Paulo State (SP).

between 18 and 29 years of age (38.2 %) who declared having black/brown skin (65.2 %) with more than 8 years of education (51.1 %) were predominant. Only 4.1 % declared a disability. More than half the patients reported that their occupation belonged to the industrial goods and services sector (34.0 %) or that they were service workers and salespersons (33.5 %). The occurrence of work-related events was significantly higher among adult males between 30 and 39 years of age. Workers from the industrial goods and services sector, managers, repair/maintenance service workers, salespersons, medium-level technicians and farmers exhibited a higher OA rate than science and art professionals. Elderly and disabled

persons exhibited a significantly lower OA ratio (Table 1).

Table 2 shows the proportional distribution of the characteristics of the accidents that required emergency treatment. Events that occurred on public streets (41.5 %) with injuries that involved cuts/lacerations/amputations (27.8 %) that primarily affected the limbs (62.6 %) were predominant. The most frequent types of occurrence were traffic accidents (33.9 %) and falls (29.4 %). The prevalence of work-related events was significantly higher among accidents in factories/plants, construction sites, stores, service establishments and bars. Fractures and traumas were 20 % to 30 % less

Table 1. Sociodemographic characteristics of patients treated at emergency care services as a result of accidents according to work-related event – State capitals^a and Federal District, Brazil, 2011.

Characteristics	Total (n = 29,463) ^b % ^c	Work-related event		PR	95%CI	p value
		Yes (n = 9,754) ^b % ^c	No (n = 19,709) ^b % ^c			
Gender						
Female	35.0	22.3	77.7	1.00	-	-
Male	65.0	39.4	60.6	1.77	1.68-1.86	0.000
Age range (years)						
18 to 29	38.2	34.3	65.8	1.00	-	-
30 to 39	23.4	40.1	59.9	1.17	1.12-1.23	0.000
40 to 59	26.5	36.3	63.7	1.06	1.01-1.12	0.023
60 and older	11.9	11.4	88.6	0.33	0.30-0.37	0.000
Race/skin color						
White	32.6	32.1	67.9	1.00	-	-
Black/brown	65.2	34.1	65.9	1.06	1.00-1.13	0.063
Yellow/Amerindian	2.2	34.1	65.9	1.06	0.95-1.20	0.302
Educational level (years of education)						
9 and above	51.1	33.3	66.7	1.00	-	-
0 to 8	48.9	34.4	65.6	1.03	0.99-1.08	0.136
Disability						
No	95.9	34.2	65.8	1.00	-	-
Yes	4.1	17.3	82.7	0.50	0.42-0.60	0.000
Occupational group						
Science and arts professionals	5.5	30.0	70.0	1.00	-	-
Industrial goods production and services	34.0	55.4	44.7	1.85	1.63-2.09	0.000
Service providers and salespersons	33.5	44.1	55.9	1.47	1.29-1.68	0.000
Administrative service providers	7.2	40.8	59.2	1.36	1.17-1.59	0.000
Medium-level technicians	6.4	39.0	61.0	1.30	1.13-1.50	0.000
Agricultural laborers	4.7	45.7	54.3	1.52	1.33-1.75	0.000
Repair and maintenance services	4.5	51.6	48.4	1.72	1.48-2.00	0.000
Public and business managers	3.4	33.2	66.8	1.11	0.91-1.34	0.298
Armed and police forces, and fire service	0.8	34.8	65.2	1.16	0.89-1.52	0.279

Source: Health Ministry, Health Surveillance Secretariat, Surveillance System for Violence and Accidents (Sistema de Vigilância de Violências e Acidentes – VIVA), 2011 Survey. ^a Except Manaus – Amazonas State (AM) and São Paulo – São Paulo State (SP); ^b Absolute number of observations; ^c Weighted percentage. PR: prevalence ratio; 95%CI: 95% confidence interval.

Table 2. Characteristics of accidental events that required assistance at emergency care services according to work-related event – State capitals^a and Federal District, Brazil, 2011.

Characteristics	Total (n = 29,463) ^b % ^c	Work-related event		PR	95%IC	p value
		Yes (n = 9,754) ^b % ^c	No (n = 19,709) ^b % ^c			
Place of occurrence						
Home	32.4	10.5	89.5	1.00	-	-
Public street	41.5	30.2	69.8	2.88	2.66-3.13	0.000
Store/service establishment/bar	13.4	85.8	14.2	8.18	7.49-8.92	0.000
Recreational area	5.0	4.5	95.5	0.43	0.32-0.59	0.000
Factory/plant/construction site	4.7	95.6	4.5	9.11	8.33-9.97	0.000
School	0.7	30.4	69.7	2.89	2.26-3.71	0.000
Other	2.3	44.9	55.1	4.28	3.81-4.80	0.000
Type of injury						
No injury	5.9	35.4	64.6	1.00	-	-
Cut/laceration/amputation	27.8	36.0	64.0	1.02	0.92-1.12	0.739
Sprain/dislocation	20.7	32.2	67.8	0.91	0.83-1.00	0.056
Bruise	19.3	34.5	65.5	0.97	0.89-1.07	0.581
Fracture	11.9	29.0	71.0	0.82	0.74-0.91	0.000
Trauma	8.3	25.4	74.6	0.72	0.63-0.82	0.000
Other	6.2	40.8	59.3	1.15	1.03-1.29	0.014
Afflicted body part						
Head/neck	17.6	29.6	70.4	1.00	-	-
Thorax/abdomen/pelvis	9.2	34.6	65.4	1.17	1.07-1.27	0.000
Limbs	62.6	35.1	64.9	1.18	1.11-1.26	0.000
Multiple organs/sites	10.6	28.4	71.6	0.96	0.88-1.05	0.374
Alcohol use						
No	88.8	36.6	63.5	1.00	-	-
Yes	11.2	9.0	91.0	0.25	0.21-0.28	0.000
Type of occurrence						
Accident with animals	3.2	18.1	82.0	1.00	-	-
Traffic accident	33.9	31.3	68.7	1.73	1.44-2.09	0.000
Fall	29.4	23.1	76.9	1.28	1.08-1.52	0.005
Puncture wound	6.9	54.4	45.6	3.01	2.50-3.64	0.000
Struck by an object/person	5.7	28.2	71.9	1.56	1.30-1.87	0.000
Sprain	5.7	38.2	61.8	2.12	1.72-2.60	0.000
Foreign body	4.8	49.7	50.3	2.75	2.26-3.34	0.000
Struck by falling object	4.4	60.8	39.2	3.37	2.80-4.05	0.000
Burn	2.0	38.9	61.2	2.15	1.74-2.66	0.000
Other accidents ^d	4.0	52.6	47.4	2.92	2.41-3.53	0.000

Source: Ministry of Health, Health Surveillance Secretariat, Surveillance System for Violence and Accidents (Sistema de Vigilância de Violências e Acidentes – VIVA), 2011 Survey. ^a Except Manaus – Amazonas State (AM) and São Paulo – São Paulo State (SP);

^b Absolute number of observations; ^c Weighted percentage; ^d Includes suffocation, drowning, poisoning, intoxication, injury due to firearms, crushing and other non-classified injuries. PR: prevalence ratio; 95%CI: 95% confidence interval.

associated with OAs than events that caused no physical injuries. Regarding body parts, the limbs and the thorax/abdomen/pelvis were associated with the occurrence of OAs. Patient consumption of alcoholic beverages exhibited a significant association with OAs but at a 75 % lower ratio than that of patients who had not consumed alcohol. The prevalence of work-related events was higher among treatments for the following oc-

currences: being struck by a falling object, puncture wounds, foreign bodies, burns and sprains. The prevalence of OAs was significantly higher in treatments because of being struck by a falling object (PR = 3.37; 95 %CI 2.80-4.05) and puncture wounds (PR = 3.01; 95 %CI 2.50-3.65).

The characteristics of the treatments provided for accident injuries in the emergency units are listed in Table 3. Treatments that in-

involved traveling to the hospital by private vehicle (52.0 %) during the daytime (63.4 %) from Monday to Friday were predominant. Most of the patients were discharged (77.7 %) within the first 24 h after emergency care. The prevalence of work-related events was higher among patients who traveled to the hospital on foot or via public transportation and were treated during the daytime from Monday to Friday. Work-related accidents were significantly less frequent among treatments that required hospitalization or among patients who discharged themselves against medical advice relative to the majority of patients who were discharged within the first 24 h after emergency assistance.

Table 4 specifies the prevalence of OAs among the different types of event and identifies factors associated with their occurrence. The OA ratio was significantly higher among men for all types

of occurrence, except being struck by an object/person. OAs were positively associated with age between 30 and 39 years in treatments for injuries caused by traffic accidents, falls, being struck by an object/person and sprains. The OA ratio was significantly higher among black/brown individuals treated for falls, puncture wounds, being struck by falling objects and burns. A low educational level was positively associated with the occurrence of work-related events among treatments for accidents with animals, puncture wounds, being struck by a falling object, sprains and other accidents. A negative association between OAs and disability was found in treatments for falls, puncture wounds, sprains and other accidents. The OA ratio among alcohol consumers treated for accidental events was also significantly lower, except for accidents with animals and burns.

Table 3. Characteristics of emergency treatments as a result of accidents according to work-related event – State capitals^a and Federal District, Brazil, 2011.

Characteristics	Total (n = 29,463) ^b % ^c	Work-related event		PR	95% IC	p value
		Yes (n = 9,754) ^b % ^c	No (n = 19,709) ^b % ^c			
Means of travel to the hospital						
MECS/ambulance/rescue	26.8	30.0	70.0	1.00	-	-
Private vehicle	52.0	32.6	67.4	1.09	1.02-1.15	0.007
Bus/van (public)	15.0	39.3	60.7	1.31	1.22-1.41	0.000
On foot	3.4	42.2	57.8	1.41	1.24-1.60	0.000
Police car	0.8	30.2	69.8	1.01	0.81-1.26	0.946
Other	2.0	43.2	56.8	1.44	1.27-1.63	0.000
Time of treatment						
Nighttime	36.6	21.1	78.9	1.00	-	-
Daytime	63.4	40.5	59.5	1.92	1.80-2.05	0.000
Weekday of treatment						
Sunday	14.9	13.3	86.7	1.00	-	-
Monday	14.7	34.7	65.3	2.61	2.31-2.96	0.000
Tuesday	15.3	41.0	59.0	3.09	2.72-3.50	0.000
Wednesday	13.1	35.9	64.1	2.70	2.35-3.11	0.000
Thursday	13.6	41.5	58.5	3.12	2.74-3.56	0.000
Friday	14.8	41.3	58.7	3.11	2.77-3.49	0.000
Saturday	13.6	26.5	73.5	1.99	1.76-2.26	0.000
Evolution						
Discharge	77.7	34.2	65.8	1.00	-	-
Hospitalization	15.3	29.2	70.8	0.85	0.79-0.92	0.000
Referral to outpatient treatment	5.8	34.6	65.4	1.01	0.92-1.11	0.801
Discharge against medical advice	1.0	23.5	76.5	0.69	0.53-0.89	0.004
Death	0.1	33.6	66.4	0.98	0.62-1.56	0.934

Source: Ministry of Health, Health Surveillance Secretariat, Surveillance System for Violence and Accidents (Sistema de Vigilância de Violências e Acidentes – VIVA), 2011 Survey. ^aExcept Manaus – Amazonas State (AM) and São Paulo – São Paulo State (SP);

^b Absolute number of observations; ^c Weighted percentage. PR: prevalence ratio; 95%CI: 95% confidence interval.

Table 4. Prevalence (%) and prevalence ratio (PR) of work-related events among emergency treatments by type of occurrence according to victim characteristics – State capitals^a and Federal District, Brazil, 2011

Characteristics	Type of occurrence					
	Traffic accident (n = 10,463)		Fall (n = 8,317)		Puncture wound (n = 2,302)	
	%	PR (95%CI)	%	PR (95%CI)	%	PR (95%CI)
Total	31.3	-	23.1	-	54.4	-
Gender						
Female	25.8	1.00	16.9	1.00	33.5	1.00
Male	33.2	1.28 (1.17-1.41)	29.3	1.74 (1.55-1.95)	61.4	1.83 (1.56-2.15)
Age range (years)						
18 to 29	28.8	1.00	26.5	1.00	54.9	1.00
30 to 39	35.0	1.21 (1.13-1.31)	32.4	1.22 (1.08-1.38)	59.3	1.08 (0.96-1.21)
40 to 59	36.4	1.26 (1.17-1.37)	27.5	1.04 (0.91-1.18)	54.9	1.00 (0.89-1.12)
60 and older	14.8	0.51 (0.39-0.67)	6.9	0.26 (0.21-0.33)	31.8	0.58 (0.43-0.78)
Race/skin color						
White	33.3	1.00	20.3	1.00	48.4	1.00
Black/brown	30.6	0.92 (0.84-1.01)	24.4	1.21 (1.07-1.36)	56.8	1.17 (1.02-1.35)
Yellow/Amerindian	29.1	0.87 (0.69-1.11)	31.7	1.56 (1.23-1.99)	59.9	1.24 (0.94-1.62)
Educational level (years of education)						
9 and above	33.3	1.00	23.9	1.00	47.9	1.00
0 to 8	30.0	0.90 (0.84-0.96)	22.9	0.96 (0.87-1.06)	60.5	1.26 (1.12-1.42)
Disability						
No	31.5	1.00	24.3	1.00	55.2	1.00
Yes	29.3	0.93 (0.71-1.22)	9.3	0.38 (0.28-0.52)	20.5	0.37 (0.18-0.79)
Alcohol use						
No	36.9	1.00	24.8	1.00	56.9	1.00
Yes	8.2	0.22 (0.19-0.26)	7.5	0.30 (0.23-0.40)	20.8	0.37 (0.25-0.52)

Characteristics	Type of occurrence			
	Struck by object/person (n = 1,607)		Sprain (n = 1,512)	
	%	PR (95%CI)	%	PR (95%CI)
Total	28.2	-	38.2	-
Gender				
Female	25.1	1.00	33.8	1.00
Male	29.5	1.17 (0.95-1.44)	41.5	1.23 (1.03-1.46)
Age range (years)				
18 to 29	22.0	1.00	35.9	1.00
30 to 39	38.0	1.73 (1.35-2.22)	44.2	1.23 (1.03-1.47)
40 to 59	34.6	1.57 (1.22-2.04)	42.2	1.18 (0.98-1.40)
60 and older	13.1	0.60 (0.29-1.24)	12.9	0.36 (0.17-0.76)
Race/skin color				
White	29.9	1.00	38.3	1.00
Black/brown	27.0	0.90 (0.78-1.04)	38.6	1.01 (0.84-1.21)
Yellow/Amerindian	31.7	1.06 (0.62-1.82)	28.2	0.74 (0.45-1.21)
Educational level (years of education)				
9 and above	26.1	1.00	34.3	1.00
0 to 8	31.8	1.22 (1.03-1.46)	44.1	1.29 (1.13-1.46)
Disability				
No	28.3	1.00	38.8	1.00
Yes	23.3	0.82 (0.40-1.67)	17.4	0.45 (0.20-0.99)
Alcohol use				
No	29.0	1.00	39.6	1.00
Yes	10.5	0.36 (0.15-0.88)	8.9	0.22 (0.10-0.53)

it continues

Tabela 4. continuation

Characteristics	Type of occurrence					
	Struck by falling object (n = 1,334)		Foreign body (n = 1,200)		Accident with animals (n = 978)	
	%	PR (95%CI)	%	PR (95%CI)	%	PR (95%CI)
Total	60.8	-	49.7	-	18.1	-
Gender						
Female	28.5	1.00	20.0	1.00	8.6	1.00
Male	71.0	2.49 (2.02-3.07)	57.6	2.89 (1.99-4.20)	26.7	3.09 (2.06-4.66)
Age range (years)						
18 to 29	69.9	1.00	56.9	1.00	18.4	1.00
30 to 39	61.6	0.88 (0.79-0.98)	55.4	0.97 (0.84-1.12)	20.3	1.10 (0.76-1.60)
40 to 59	58.2	0.83 (0.73-0.95)	43.5	0.76 (0.67-0.87)	20.6	1.12 (0.69-1.81)
60 and older	29.2	0.42 (0.29-0.61)	23.2	0.41 (0.27-0.61)	9.9	0.54 (0.28-1.03)
Race/skin color						
White	54.4	1.00	50.8	1.00	18.9	1.00
Black/brown	64.0	1.18 (1.02-1.36)	48.8	0.96 (0.83-1.11)	17.8	0.94 (0.59-1.49)
Yellow/Amerindian	55.0	1.01 (0.69-1.47)	57.5	1.13 (0.75-1.71)	8.3	0.44 (0.15-1.29)
Educational level (years of education)						
9 and above	58.4	1.00	46.5	1.00	13.1	1.00
0 to 8	62.9	1.08 (0.96-1.21)	53.0	1.14 (0.99-1.32)	23.5	1.80 (1.22-2.65)
Disability						
No	61.4	1.00	50.3	1.00	18.5	1.00
Yes	42.3	0.69 (0.39-1.21)	32.0	0.64 (0.36-1.11)	8.9	0.48 (0.10-2.30)
Alcohol use						
No	62.1	1.00	50.6	1.00	18.6	1.00
Yes	26.0	0.42 (0.22-0.80)	14.3	0.28 (0.10-0.77)	9.1	0.49 (0.15-1.61)

Characteristics	Type of occurrence			
	Burn (n = 588)		Other accidents ^b (n = 1,119)	
	%	PR (95%CI)	%	PR (95%CI)
Total	38.9	-	52.6	-
Gender				
Female	22.8	1.00	33.6	1.00
Male	51.4	2.25 (1.55-3.26)	60.7	1.81 (1.44-2.27)
Age range (years)				
18 to 29	40.0	1.00	58.1	1.00
30 to 39	50.6	1.26 (0.89-1.80)	52.4	0.90 (0.79-1.03)
40 to 59	34.0	0.85 (0.62-1.16)	51.9	0.89 (0.76-1.05)
60 and older	10.7	0.27 (0.12-0.61)	29.3	0.50 (0.30-0.84)
Race/skin color				
White	27.6	1.00	49.4	1.00
Black/brown	45.7	1.65 (1.25-2.18)	54.9	1.11 (0.90-1.38)
Yellow/Amerindian	12.5	0.45 (0.07-3.12)	42.7	0.86 (0.47-1.59)
Educational level (years of education)				
9 and above	41.8	1.00	50.0	1.00
0 to 8	35.6	0.85 (0.66-1.10)	57.4	1.15 (1.01-1.30)
Disability				
No	39.5	1.00	53.8	1.00
Yes	24.4	0.62 (0.30-1.27)	29.5	0.55 (0.31-0.98)
Alcohol use				
No	38.9	1.00	55.3	1.00
Yes	13.5	0.35 (0.07-1.85)	8.9	0.16 (0.07-0.37)

Source: Ministry of Health, Health Surveillance Secretariat, Surveillance System for Violence and Accidents (Sistema de Vigilância de Violências e Acidentes – VIVA), 2011 Survey. ^a Except Manaus – Amazonas State (AM) and São Paulo – São Paulo State (SP);

^b Includes suffocation, drowning, poisoning, intoxication, injury due to firearms, crushing and other non-classified injuries.

Significant differences appear in bold (p<0.05). PR: prevalence ratio; 95%CI: 95% confidence interval.

Discussion

External causes are an important reason for hospitalization and urgent and emergency care assistance in health-care services. Among such cases, OAs exhibit high relevance and magnitude. According to the 2011 VIVA Survey data, approximately one-third of all treatments were for injuries occasioned by work-related events. The victims of work-related accidents were primarily male, young (30 to 39 years old), brown and black, industrial goods and services workers, farmers or repair and maintenance service workers. The occurrences were more frequent during the daytime and from Monday to Friday. OAs were more prevalent among accidents that involved being struck by falling objects, puncture wounds, foreign bodies and burns. The locations with the highest OA occurrence were factories/plants/construction sites, stores/service establishments/bars, public streets and schools.

OAs are the leading cause of work-related deaths and severe disabilities worldwide, although many countries do not differentiate their accident statistics with respect to occupational illnesses. The population afflicted by OAs constitutes an important recipient group of emergency services treatments¹¹. This study reaffirms this finding, demonstrating that more than one-third of the injuries treated at the urgent and emergency care units were work-related, which agrees with a study conducted by Conceição *et al.*⁸ in Salvador (Bahia State – BA), who found 31.6 % of emergency assistance services were provided to OA victims.

Treatments identified by the VIVA Survey could be an invaluable source of information on these occurrences and support the understanding of work-related events. Current data on OAs reported to the INSS using CAT do not cover all types of worker because the system is exclusively dedicated to formal workers, who represent less than half the active work force⁸.

Currently, OAs generate significant social and economic losses, with large amounts spent on welfare benefits paid by the INSS. It is estimated that approximately half a million working days are lost per year because of OAs. Among the conditions and diseases that generate benefits, 7.3 % are the result of OAs, with a higher ratio among workers in the manufacturing and construction/electricity/gas industries¹².

Regarding sociodemographic factors, the VIVA Survey indicated the predominance of male, young (30 to 39 years), brown and black,

less-qualified workers. Except for the predominance of women, this profile is in agreement with findings from a community-based cohort study on 2,512 individuals residing in Salvador (BA). Specifically, 628 workers reported an OA in the follow-up period, with a predominance of women (64 %), young adults between 18 and 30 years old (41.6 %), blacks (66.4 %), and individuals with a low educational level (51.4 %), low socioeconomic status (55.1 %) and informal employment (54.3 %)¹¹.

The data from the VIVA Survey also exhibited a higher prevalence ratio of workers from the industrial goods and services sector, farmers and repair and maintenance service workers compared with science and art professionals, which was also observed by Santana *et al.*¹² This outcome may be the result of the higher risk involved in these sectors, in which more caution is required for the execution of the job and the use of personal protective equipment and measures to guarantee a safer workplace are necessary.

By analyzing the logistic regression of a database of typical OAs reported to the INSS, other authors have found that educational level and income were predictive variables for OAs, whereas the remaining variables, such as age, race/skin color, smoking, and alcohol use disappeared after the adjustment for educational level and income²². This type of analysis was not the aim of the present study. However, the predominance of brown/black victims and workers with a low educational level could be identified as proxy for low socioeconomic status.

Regarding the distribution of emergency treatments for work-related injuries according to the Brazilian state capitals and Federal District, the lowest ratio was found in North and Northeast Brazilian cities, whereas the highest ratio was found in the cities of South, Southeast and Center-West Brazil. This profile coincides with the level of development in the country. The more developed regions exhibited a higher ratio of work-related accidents, possibly because of their higher concentration of industries and maintenance and repair services.

In a survey performed by Santana *et al.*²³, 78.1 % of all OAs treated in emergency care services were classified as mild or moderate, and 14.8 % required an average 3.2 days of hospitalization. Data from the VIVA Survey indicated that 77.7 % of all treatments evolved to discharge, and 15.3 % required hospitalization. Another aspect evaluated was the consumption of alcoholic beverages prior to the accident. Alcohol

consumption was associated with 9 % of all OA cases, which is a lower occurrence compared with other types of accidents and violence (44 %)¹⁹.

The majority of the emergency treatments were the result of traffic accidents, of which 31.3 % were work-related. However, other characteristics of today's world that are linked to the informal labor market have broadened the array of events, including traffic accident victims who work on the streets, such as street traders, paper and cardboard collectors, motorcycle couriers, and motorcycle taxi drivers. A study conducted in Campinas (SP)⁹ revealed that most OA victims (59.0 %) were active in the informal labor market at the time of death. This finding suggests a higher vulnerability of the informal worker in addition to the greater exposure to the street and direct contact with the public of such workers, thus increasing the risk of traffic accidents and violence in general. Although other types of treatment were less frequent, they exhibited the highest prevalence of OAs: being struck by falling objects, puncture wounds, foreign bodies and burns. These occurrences are the most frequent in occupations in the services, maintenance and farming sectors, which exhibited the highest OA ratio relative to professionals with a higher educational level.

Ordinance no. 1823 of August 23, 2012, which instituted the National Worker's Health Policy, established the compulsory notification of severe and fatal OAs²⁴. However, a significant number of minor and moderate accidents (approximately 80 %) do not require reporting. OA victims increasingly require assistance at urgent and emergency care services, considering the magnitude of such accidents (approximately 30 % of all treatments) and the social and economic impact they entail. Many of these accidents remain invisible to the INSS. Thus, studies performed in urgent and emergency care units are vital to providing more reliable measurements of the occurrence of these accidents. The VIVA Survey identifies occurrences in urgent and emergency care services of the Brazilian state capitals and thereby includes the low-income population that works in the informal labor market that is not included in the National Social Security system. This information can help improve the information on OAs and offer a more accurate diagnosis of their actual occurrence in Brazil. Additionally, it can provide support for the implementation Worker's Health Surveillance activities.

Collaborations

MDM Mascarenhas contributed to the study concept and design, data analysis and writing the manuscript. RA Monteiro contributed to data mining and analysis. MG Freitas, MMA da Silva, DC Malta and C Minayo Gómes contributed to data analysis and interpretation and reviewed the manuscript. All of the authors have reviewed the text and approved the final version.

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