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## Injury factors associated with discharge status from emergency room at two major trauma hospitals in The Gambia, Africa

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### Abstract

**Introduction**—Injuries are the leading cause of disability across all ages and gender. In this study, we identified predictors of discharge status and disability at discharge among patients who seek emergency room treatment.

**Materials and Methods**—The study was conducted in two major trauma hospitals in urban Gambia. 1,905 patients participated in the study. 74.9% were males, and 25.1% were females. The study includes injured patients from all mechanisms. However, patients' records without age, gender, injury mechanism, and disposition from the emergency room were considered incomplete and excluded. We examined distributions of injury by age, gender, mechanism, place of occurrence, intent, primary body part injured, and primary nature of injury. We identified demographic and injury characteristics associated with hospital admission (compared to emergency department discharge) and discharge disability (any level of disability compared with none).

**Results**—The leading mechanisms of injury were road traffic (26.1%), struck by objects (22.1%), cut/pierce (19.2%), falls (19.2%), and burns (5.4%). Injuries most commonly occurred in the home (36.7%) and on the road (33.2%). For those aged 19 – 44, the proportion of injuries due to assault was higher for females (35.9% than males (29.7%). Males had increased odds for admission (aOR = 1.48 95% CI=1.15 – 1.91) and for disability (aOR = 1.45; 95% CI = 1.06 – 1.99). Increased odds for admission were found for brain injuries, fractures, large system injuries, and musculoskeletal injuries when compared with soft tissue injuries. The highest odds for any

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#### Conflict of Interest

All the authors of this manuscript have no competing interest.

level of discharge disability were found for brain injuries, fractures, injuries from falls, burns, and road traffic.

**Conclusions**—Epidemiology of injuries in The Gambia is similar to other low-income countries. However, the magnitude of cases and issues uncovered highlights the need for a formal registry.

### Keywords

Traumatic injury; hospital registry; disability; road traffic injury

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## INTRODUCTION

Globally, injuries account for 12% of all disease burden and 9% of deaths. Throughout the world there are great disparities in the prevention and care of injuries, with 1 to 2 million preventable injury deaths. Over 90% of deaths from road traffic injuries occur in low and middle-income countries<sup>1,2</sup>. Injuries disproportionately affect the productive workforce, youth, and school-age children. Almost 50% of road traffic-related mortality occurs in those aged 15–44 years<sup>2</sup>. The disproportionately high injury death rate in low-income countries is due to many factors, one of which is timely access to trauma services. In addition to timely medical care, trauma hospitals provide a source for data on the trends and characteristics of injuries, which can be used to support and focus prevention efforts.

For the first time in The Gambia, this study identifies predictors of discharge and disability status among patients treated in two Emergency Departments using information from the first hospital registries established in the country. Prior to this study, there was incomplete documentation for trauma cases, and the magnitude and determinants of injuries were largely unknown. In order to build a data infrastructure in the Gambia, the University of The Gambia, in partnership with the University of Iowa Injury Prevention Research Center, established trauma registries in the two major trauma hospitals.

The need for this data may be better understood with some information on the current trauma situation in The Gambia. The Gambia is a low income country whose development and health profiles resemble many other developing countries in West Africa (Table 1). The country's health system includes a combination of eight government hospitals, seven public health clinics, and multiple NGO clinics.<sup>3,4,5</sup> The majority of these services are focused in the urban Greater Banjul area, which includes five of the eight hospitals and more than 60% of the clinics.

Only two hospitals in the urban area have full capacity to treat complex trauma cases, and these two hospitals were included in our study. Edward Francis Small Teaching Hospital (EFSTH) is the largest hospital in The Gambia with a total bed capacity of 800, and serves as the teaching hospital and the main referral hospital for the entire country. Serrekunda General Hospital (SGH) is the newest referral hospital in The Gambia, commissioned in 2009, with a capacity of 200 beds. Together the two hospitals serve the routine health care needs of the Greater Banjul Area, the only urban area which holds 59% of the country's population<sup>3</sup>. The hospitals also receive most of the complex trauma cases throughout the

country. Hospitals do not have electronic medical records, and systematic trauma data is not collected.

Although surgery, for example, is a cost effective and often necessary trauma treatment approach, access to surgical services is limited in The Gambia, as in many other low income countries. In general, major gaps in the country's surgical infrastructure include lack of access to clean water, electricity, oxygen, emergency and anesthesia equipment, as well as poorly staffed health facilities with limited provider skill sets to perform required surgical interventions<sup>3</sup>. Overall, the surgical capacity is limited and most complex trauma surgical cases are brought to the two major hospitals.<sup>3</sup> Although public health centers in The Gambia do perform minor surgical interventions<sup>3</sup>, these procedures are often completed by surgical technicians, primary care doctors, and nurses. There is no pre-hospital care system in The Gambia. The referral system in the country is still based on the infectious disease model where ambulances are based in the healthcare facilities and their function is primarily inter-facility transfer from one level of health care to another. The country does not have a functional emergency number to call in case of a traumatic injury event. The Gambia Fire and Rescue Services do have some rescue mandate, but the public is not well aware of this function and the services are not utilized. These providers decide on the healthcare facility destination on their own, without information about treatment capacity or triage protocols. The implications are that many of the more seriously injured patients are not making to the definitive care hospital. Moreover, there are no emergency physicians or nurses for the entire country<sup>6</sup>.

The two study hospitals, Edward Francis Small Teaching Hospital and Serrekunda General Hospital, are the major trauma hospitals in The Gambia. Notwithstanding, their capacity to handle the volume of trauma patients is limited. Serrekunda General Hospital has two operating rooms and has equipment and expertise to support endotracheal intubation. However, there are no thoracotomy instruments, or chest tubes. The hospital has two general surgeons, no neurosurgeon or orthopedics specialists<sup>7</sup>. Patients with severe injuries needing specialty care (including neurological and orthopedic interventions) are transferred to Edward Francis Small Teaching Hospital. This hospital has six operating rooms with annual surgical admissions of about 5000<sup>3</sup>. However, the lack of capacity to perform equipment-intensive procedures remains. This main referral and teaching hospital does not routinely have capacity for thoracotomies, endotracheal intubation, or chest tubes. In terms of human resources for trauma and surgical care, the hospital has ten general surgeons, one neurosurgeon, one anesthesiologist, 12 anesthesiological nurses, and two orthopedic specialists<sup>8</sup>.

The objective of this project was to establish trauma registries in two major trauma hospitals to demonstrate feasibility and to provide information on injury trends. The long-term goal of the project is to provide data that can be used to advocate for injury prevention and to inform policy and practice. This analysis examines the general characteristics of injured individuals and injury characteristics, and identifies factors associated with hospital admission and disability at discharge.

## MATERIALS AND METHODS

The trauma registries included all trauma cases reported to the Accident and Emergency (A&E) Units in Edward Francis Small Teaching Hospital (EFSTH) and Serrekunda General Hospital. Among all trauma cases, 742 were admitted, 136 either died before arrival in the emergency room (n=118) or died at the emergency (n=18). Five hundred and twenty-five trauma patients were transferred for more service, of which 516 were patients transferred from SGH to EFSTH, and six from EFSTH to overseas treatment.

In this study, we used data from the trauma registries between March 1 and August 8, 2014 (n=1,961). Records missing information concerning age, gender, injury mechanism, and disposition from emergency room (2.9% of the total) were considered incomplete and excluded. Those who died at the scene were not in the sampling frame of this study. After removing duplicate records, our sample was 1,905 trauma cases. A probabilistic record linkage program, Link Plus (U.S. Center for Disease Control and Prevention (CDC), Cancer Division, V2.0), was used to identify duplicates<sup>9</sup>.

At intake, the treating physician completed the Accident and Emergency Ward Injury Study Form, which was developed with input from the participating hospitals. The form had 17 items that described the injured individual and characteristics of the injury. Data were collected based on emergency room visits in the emergency department. Information was recorded on a paper form and retrieved at the hospital site twice a week by the study coordinator. Data was entered into an Access database by the study coordinator, who then conducted a quality review and followed up to complete missing variables.

We focused on nine variables in our analysis: age, gender, place of occurrence, injury intent, mechanism of injury, primary nature of injury, primary body part injured, admission status, and disability. Based on the age distribution and objective to examine the entire lifespan, we collapsed age into three categories: 18 and younger (42.9%), 19 – 44 (48%), and 45 and older (9%). Discharge status and disability at discharge were outcome variables. Discharge status was categorized as patients who were admitted for further treatment and those who were discharged. Admitted included patients admitted to the hospital, transferred to another hospital for admission, and those who died. Non-admitted patients included those who were sent home from the Emergency Unit with or without documented procedures.

Disability was assessed upon discharge from the emergency department and included minor, moderate, and severe disability designated as either temporary or permanent. Disability status was assigned based on the diagnosis, patient's subjective complaints, and perception of limitation to function in performance of routine activities at discharge from emergency room. Information used to assess disability status by the treating physician included mental and physical status. Although Glasgow Coma Scores are not routinely recorded, the elements are used by physicians to guide diagnosis and treatment decisions and thus physicians were instructed to use altered cognitive status in their assessment. Other categories used by the treating physicians in estimating the disability of injured patients were amputation of one or more limbs; damage to internal organs; estimated time for the patient to return to usual daily activities; loss of function; and dependence on caregiver at

discharge from emergency room. Among mentally alert patients, their subjective complaints and perceptions of limitations to function in performance of routine activities at discharge from the emergency room was considered, as was their perception on ability to return to work and/or resume to previous functions. Based on these criteria, the treating physician categorized disability to be none, minor, moderate, and severe designated as temporary or permanent. Since a valid scale was not used as the basis for this designation, we collapsed responses into some level of disability versus no level of disability.

Distributions of the primary injury variables were examined by age and gender categories to identify general characteristics and trends and evaluated for differences using chi-square tests. Logistic models were used to identify the association of demographic and injury characteristics using discharge status (admitted vs. discharged). All six covariates were examined for inclusion in the logistic model using a forward selection method with a specified level of entry set at  $p < 0.15$ . All analyses were performed using SAS 9.4 (SAS Institute, Inc., Cary, NC, USA).

### Ethics

Ethical approval was obtained from the joint Gambia Government and Medical Research Council Ethics Committee, and the University of Iowa Institutional Review Board. Data collection exercise was done in accordance to the Helsinki Declaration. A written consent was obtained from the patients or their escorts for the publication of the research results.

## RESULTS

As shown in Figure 1 (and Table 2), road traffic was the most common injury mechanism, with 44.8% being adults. Home was the most common location for injury (36.5%) followed by roadway injuries (33.2%). The proportion of road injuries by gender was similar across all ages ( $p > 0.05$ ). Notwithstanding, the number of unintentional injuries was only 2.2 times higher than assault injuries among young adults, but 11 and 4.6 times higher among children and adults respectively. Unlike other age groups, the proportion of assault injuries among young adult females (35.9%) were higher than those of males (29.7%).

More than half (52%) of injured victims treated at the emergency departments of the two study hospitals were either upper extremity or lower extremity/pelvis/hip injuries (Table 3). About one-third were treated for head/skull and face/neck injuries. The number of males treated for both upper and lower extremity injuries were two to four fold higher than their female counterparts across age groups. However, only 7.6% were treated for fractures, while the majority of injured victims (76.4%) were treated for soft tissue injuries. The proportion of concussion/brain injuries was higher in females than males in all age groups.

Disability was assessed in all patients treated at the emergency room of the two hospitals. Four hundred and fifteen (415, 22.3%) of the patients had some form of disability of which 26 (6.3%) were coded as permanent and 389 (93.7%) were coded as temporary (Table 4). Since disability codes were not validated, we combined all levels of assessed disability into one category. More than three-quarters of those categorized by the treating physician as having some level of disability had either soft tissue injuries (50.2%) or fractures (26.1%).

Three-fourth of all disability associated-injuries were as a result of road traffic (43.7%), and injuries that occurred at home or by home properties (31.6%).

Overall, 44% of patients required further care (Table 5). Victims who were admitted, transferred, or died were more likely to be male (aOR=1.48, 95% CI=1.2–1.9), had experienced a concussion/brain injury (aOR=13.8, 95% CI=4.1–46.2) or fracture/dislocation (aOR=9.1, 95% CI=5.6–15.0) (compared to soft tissue injuries), sustained a fire/scald (burn) injury (aOR=4.5, 95% CI=1.7–11.5) (compared to struck by object), or injured in the thoracic area/lumbar spine (aOR=2.6, 95% CI=1.5–4.4), multiple body parts (aOR=2.4, 95% CI=1.1–5.3), and head/skull (aOR=1.9, 95% CI=1.4–2.6) (vs. upper extremity injuries) than those discharged to their home.

## DISCUSSION

Our findings suggest that almost three-quarters of injuries reported to the study hospital occurred among men. This is consistent with similar studies in Ghana, Cameroon, and Kenya<sup>10–12</sup>. Gender differences in developing countries are important in road traffic safety because they may be markers for differences in how men and women interact with the roadway environment. As transportation infrastructures grow, for example, men may be more likely to drive automobiles, either industrial or personal, while women may comprise an increasing proportion of pedestrians, who are among the most vulnerable road users.

Male were more frequently admitted or transferred than females. The association was stronger among those diagnosed with concussion/brain injury (vs. soft tissue) and/or injured in the thoracic area/lumbar spine, or with injury to multiple body parts (vs. upper extremity). In a retrospective study of severity of head and neck injuries in Qatar, Bener et al. found head and neck injuries were 6.1 times higher in males than females<sup>13</sup>. Furthermore, these injuries were 50% more likely to be seen in male adults (45+ years) than male children, which is consistent with findings from similar studies in Sri Lanka<sup>14</sup>.

Males were more likely to be assessed with some level of disability than females. Disability tended to be highest among male adults (45+ years) with a fracture or concussion/brain injury, injured from fire/scalds, road traffic or from a fall. Loss of function due to bone or joint deformity will likely lead to prolonged periods of immobility or reduced function, which can affect the ability to perform daily activities of living or work duties. Injuries that permanently affect mobility, such as severe fractures and amputations, and injuries that affect neurological status, such as brain or spinal cord injuries, are likely to result in permanent disability.

The findings suggest that in The Gambia, domestic violent make up 20% of injury events. More than one-third (36.5%) of victims treated for injuries were incidents that occurred at home or by home properties and most of them were children and women. Moreover, young adult females had more assault related injuries than their male counterparts. These findings are consistent with a study on wife beating among men in six sub-Saharan African countries<sup>15</sup>. This study suggests that younger men may be more likely than older men to have attitudes that are supportive of wife beating. Contrary to our findings, similar studies



have found that assault victimization is higher among men<sup>16,17</sup>. In those studies, however, the presence of alcohol or being injured in a public space were found to be factors associated with both assault and self-harm. Domestic violence can be associated with long-term negative effects such as psychological and cognitive problems, and as well as severe brain injury<sup>17</sup>. Efforts to better understand the dynamics of intimate partner violence can help inform primary prevention campaigns to change cultural norms about domestic violence.

One study limitation is that the study hospitals are located in urban Gambia and do not treat all injuries in the country. Thus, our study is not population based and thus we did not calculate injury rates. Since our sampling was based in two hospitals, our study population does not include individuals who died at the scene. However, injuries that require advanced care are likely to be treated in one of the two study hospitals, and thus our sample represents the more severe spectrum of injuries. Additionally, our study collected hospital data for only five months, due to limited funding. One of our primary outcomes of interest was disability status, which was coded subjectively by the treating physicians. Since a validated scale was not used, we combined disability status into binary variables (some vs. none). Additionally, injury groups (for instance concussion vs brain injuries) likely differ in severity. These pathological differences may introduce bias in the findings. Due to resource and personnel limitations in these busy emergency departments, as well as the lack of an electronic medical record system, we were unable to collect variables such as the Injury Severity Score or clinical indicators. Despite these limitations, this paper provides essential information that government authorities in The Gambia and collaborators need to table the need to improve injury prevention.

## CONCLUSIONS

In The Gambia, like other low income countries, men 19–44 years and 45+ years constitute majority of workforce that drive the economy, education, health and other sectors of the country's development aspirations, like The Gambia's vision 2020. However, considering this result, men will become more of a liability to national economies, and most importantly time and resources of the spouse/family to care of them, as government does not yet have the facilities to care for such individuals. Trauma response system is non-existence in The Gambia. Coupled with shortages in physical and human resources, these double challenges are likely to negatively influence injury outcomes in The Gambia.

Our study also suggests that violent activities against women and children are eminent in homes in The Gambia. Since our data is from a hospital trauma registry, we did not have details on the determinants of such violence. Our findings are in accord with recent global discussions led by the World Health Organization and the United Nations that recognize that violence against women and children in low income countries hinders progress to achieving development targets.

This paper presents the magnitude and variety of factors associated with trauma in The Gambia. The Gambia has a poorly developed public health infrastructures, and has not prioritized injury prevention as a public health problem. To improve the current state of affairs, formal trauma registries to identify the burden of injuries, their causes as well as

field research on consequences is critically needed in order to establish the evidence base necessary for effective intervention and prevention programs.

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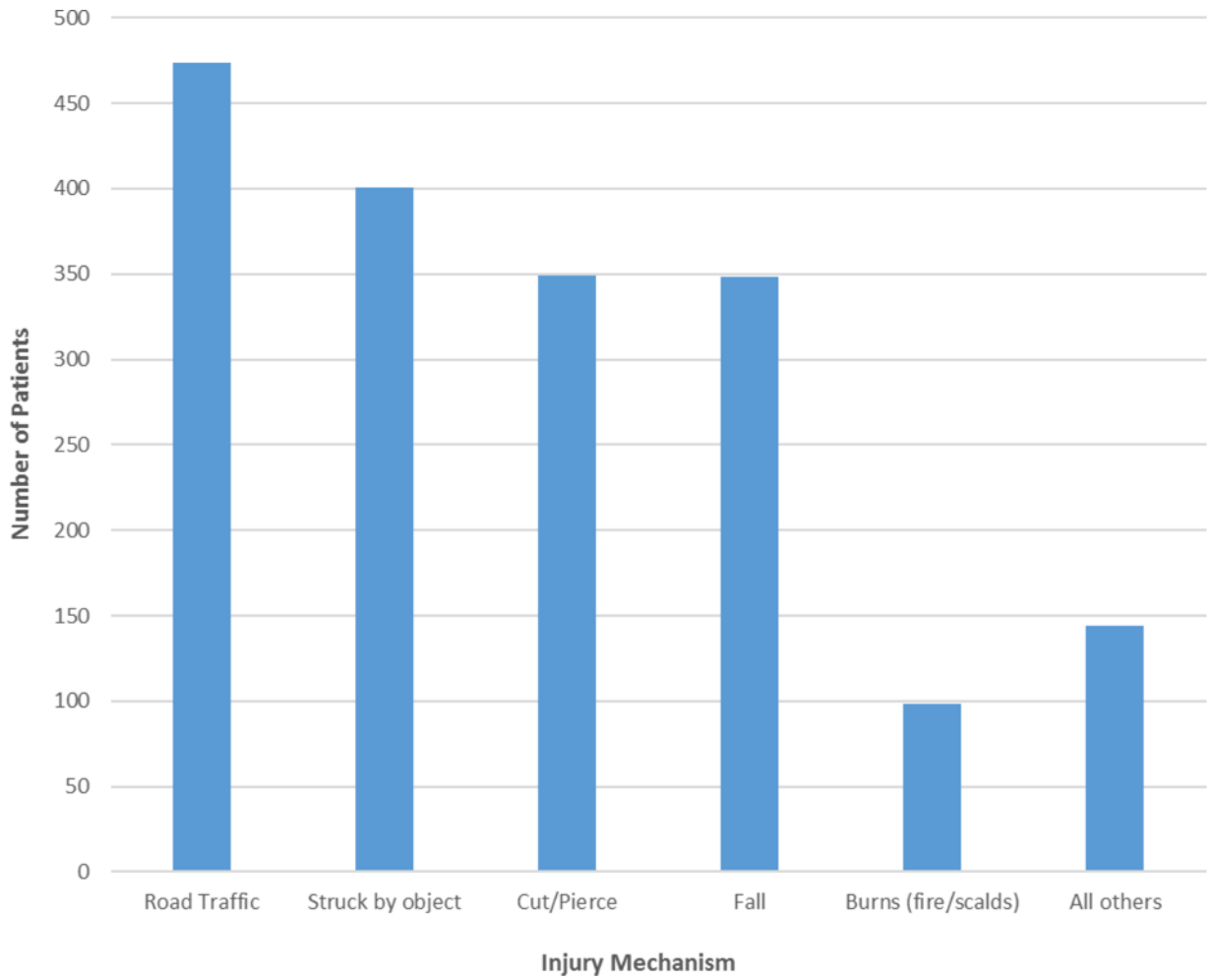
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**Figure 1.**  
Number of Injured Patients by Injury Mechanism, 2015

**Table 1**

Selected health indicators for Gambia, Ghana, low income country and WHO African Region

Characteristics	Gambia	Ghana	Low income Country	WHO African Region
Total Population (in thousand) <sup>1</sup>	1,849	25,905	848,668	927,371
Human Development Index Rank <sup>1</sup>	175	140	N/A	N/A
Gross Domestic Product (GDP) Per Capita <sup>2</sup>	1,608	3,864	2,904	N/A
Total annual expenditure on health as % of GDP (2012) <sup>2</sup>	6.2	5.2	5.1	5.6
General Government Expenditure on health as % of total expenditure on health (2012) <sup>2</sup>	17.0	50.0	38.8	50.8
Physician density per 10,000 population	1.1	1.0	2.5	2.7
Nurses and midwifery personnel per 10,000 population <sup>2</sup>	8.7	9.3	5.3	12.4
Density of Health Infrastructure and Technology, Hospitals (per 100,000) <sup>2</sup>	0.7	1.4	0.8	0.8
Life expectancy at birth, both sexes (2013) <sup>2</sup>	60	63	62	58
Age standardized mortality rate, communicable diseases (per 100,000 population) <sup>2</sup>	590	476	502	683
Age standardized mortality rate, non-communicable diseases (per 100,000 population) <sup>2</sup>	630	670	625	652
Age standardized mortality rate, injuries diseases (per 100,000 population) <sup>2</sup>	96	76	104	116
Years of life lost, communicable diseases (per 100,000 population) <sup>2</sup>	35,805	28,622	32,289	44,628
Years of life lost, non-communicable diseases (per 100,000 population) <sup>2</sup>	11,970	12,863	11,333	12,045
Years of life lost, injuries (per 100,000 population) <sup>2</sup>	5,295	4,004	5,520	6,480

<sup>1</sup>Source: United Nations Development Programme Human Development Report, 2015.<sup>2</sup>Source: World Health Organization, World Health Statistics 2015.

Table 2

Injury event factors by age (years) and gender

Factors	<19 <sup>3,5,6</sup>			19-44 <sup>3,5,6</sup>			45+ <sup>3,6</sup>			
	N (%)	Male (n=560)	Female (n=232)	Total (n=792)	Male (n=698)	Female (n=187)	Total (n=885)	Male (n=122)	Female (n=44)	Total (n=166)
<b>Mechanism of Injury<sup>4</sup></b>										
Road traffic	474 (26.1)	106 (19.1)	55 (24.1)	161 (20.5)	186 (27.2)	54 (29.7)	240 (27.7)	52 (43.7)	21 (47.7)	73 (44.8)
Struck by object	401 (22.1)	99 (17.8)	20 (8.8)	119 (15.2)	211 (30.8)	46 (25.3)	257 (29.6)	19 (16.0)	6 (13.6)	25 (15.3)
Cut/pierce	349 (19.2)	105 (18.9)	42 (18.4)	147 (18.8)	152 (22.2)	31 (17.0)	183 (21.1)	14 (11.8)	5 (11.4)	19 (11.7)
Fall	348 (19.2)	162 (29.1)	53 (23.2)	215 (27.4)	79 (11.5)	25 (13.7)	104 (12.0)	21 (17.6)	8 (18.2)	29 (17.8)
Fire/scald (Burns)	98 (5.4)	32 (5.8)	40 (17.5)	72 (9.2)	12 (1.8)	11 (6.0)	23 (2.7)	1 (0.8)	2 (4.5)	3 (1.8)
All others <sup>1</sup>	144 (7.9)	52 (9.4)	18 (7.9)	70 (9.0)	45 (6.6)	15 (8.2)	60 (6.9)	12 (10.0)	2 (4.6)	14 (8.6)
<b>Place of Occurrence<sup>4</sup></b>										
Home and home property	670 (36.5)	267 (47.9)	133 (57.3)	400 (50.7)	150 (21.6)	84 (44.9)	234 (26.5)	18 (14.8)	18 (40.9)	36 (21.7)
Road	610 (33.2)	150 (26.9)	63 (27.2)	213 (27.0)	243 (34.9)	75 (40.1)	318 (36.0)	57 (46.7)	22 (50.0)	79 (47.6)
Patient's worksite	204 (11.1)	24 (4.3)	1 (0.4)	25 (3.2)	144 (20.7)	7 (3.7)	151 (17.1)	27 (22.1)	1 (2.3)	28 (16.9)
Public space	192 (10.4)	45 (8.1)	10 (4.3)	55 (7.0)	106 (15.2)	16 (8.6)	122 (13.8)	12 (9.8)	3 (6.8)	15 (9.0)
All others <sup>2</sup>	162 (8.7)	71 (12.7)	25 (10.7)	96 (12.1)	53 (7.7)	5 (2.6)	58 (6.6)	8 (6.4)	0 (0.0)	8 (4.8)
<b>Intent<sup>4</sup></b>										
Unintentional	1444 (79.5)	498 (90.4)	211 (93.4)	709 (91.2)	484 (70.0)	118 (64.1)	602 (68.8)	98 (80.3)	35 (83.3)	133 (81.1)
Assault	364 (20.0)	51 (9.3)	13 (5.8)	64 (8.2)	205 (29.7)	66 (35.9)	271 (31.0)	22 (18.0)	7 (16.7)	29 (17.7)
Self-harm	3 (0.2)	1 (0.2)	0 (0.0)	1 (0.1)	1 (0.1)	0 (0.0)	1 (0.1)	1 (0.8)	0 (0.0)	1 (0.6)
Unknown	5 (0.3)	1 (0.2)	2 (0.9)	3 (0.4)	1 (0.1)	0 (0.0)	1 (0.1)	1 (0.8)	0 (0.0)	1 (0.6)

<sup>1</sup> All other mechanisms include: Machinery, animal attacks, sports, poisoning, gunshot, and other

<sup>2</sup> All other places include: Education facility, sports/athletics area, business/commercial, farm (excl. home), and other specified/unspecified place

<sup>3</sup> %'s based on column totals

<sup>4</sup> Totals do not add up to 1,905 due to missing age, gender, and factors

Mechanism of injury (p < 0.05)  
Place of occurrence (p < 0.05)

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**Table 3**

Injury type/region by age (years) and gender

	< 19 <sup>2,5</sup>						19-44 <sup>2,5</sup>						45+ <sup>2</sup>							
	Overall Total <sup>2</sup>		Male (n=560)		Female (n=232)		Total (n=792)		Male (n=698)		Female (n=187)		Total (n=885)		Male (n=122)		Female (n=44)		Total (n=166)	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
<b>Primary Body Part Injured<sup>3</sup></b>																				
Upper extremity																				
	486 (26.6)	125 (22.6)	53 (22.8)	178 (22.6)	214 (30.9)	54 (29.2)	268 (30.5)	29 (24.2)	11 (25.0)	40 (24.4)										
Lower extremity/Pelvis/Hip																				
	474 (25.9)	149 (26.9)	64 (27.6)	213 (27.1)	152 (21.9)	49 (26.4)	201 (22.9)	47 (39.2)	13 (29.6)	60 (36.6)										
Head/skull																				
	427 (23.3)	149 (26.9)	49 (21.1)	198 (25.2)	164 (23.7)	32 (17.3)	196 (22.3)	23 (19.2)	10 (22.7)	33 (20.1)										
Face/Neck																				
	246 (13.5)	80 (14.4)	27 (11.6)	107 (13.6)	96 (13.9)	27 (14.6)	123 (14.0)	10 (8.3)	6 (13.6)	16 (9.8)										
Thoracic area/lumbar spine																				
	87 (4.8)	18 (3.2)	14 (6.0)	32 (4.1)	38 (5.5)	8 (4.3)	46 (5.2)	8 (6.7)	1 (2.3)	9 (5.5)										
Multiple body parts																				
	51 (2.8)	11 (2.0)	11 (4.7)	22 (2.8)	15 (2.2)	10 (5.4)	25 (2.8)	2 (1.7)	2 (4.5)	4 (2.4)										
Abdominal area																				
	30 (1.6)	13 (2.3)	6 (2.6)	19 (2.4)	7 (1.0)	3 (1.6)	10 (1.1)	1 (0.8)	0 (0.0)	1 (0.6)										
Other/Unknown																				
	27 (1.5)	9 (1.6)	8 (3.4)	17 (2.2)	7 (1.0)	2 (1.1)	9 (1.0)	0 (0.0)	1 (2.3)	1 (0.6)										
<b>Primary Nature of Injury<sup>3</sup></b>																				
Soft tissue/Open wound/abrasion/contusion																				
	1400 (76.4)	419 (75.6)	151 (65.1)	570 (72.5)	573 (82.3)	143 (77.3)	716 (81.3)	86 (71.1)	28 (63.6)	114 (69.1)										
Fracture																				
	140 (7.6)	54 (9.7)	14 (6.0)	68 (8.7)	40 (5.7)	5 (2.7)	45 (5.1)	21 (17.4)	6 (13.6)	27 (16.4)										
Dislocation/sprain/strain/muscle/tendon/bv/nerves																				
	84 (4.6)	15 (2.7)	12 (5.1)	27 (3.4)	36 (5.2)	8 (4.3)	44 (5.0)	10 (8.3)	3 (6.8)	13 (7.8)										
Burns/scalds																				
	79 (4.3)	26 (4.7)	30 (12.9)	56 (7.1)	12 (1.7)	9 (4.9)	21 (2.4)	0 (0.0)	2 (4.5)	2 (1.2)										
Concussion/brain injury																				
	32 (1.7)	13 (2.3)	8 (3.4)	21 (2.7)	5 (0.7)	5 (2.7)	10 (1.1)	0 (0.0)	1 (2.3)	1 (0.6)										
Severe large system injuries <sup>4</sup>																				
	24 (1.3)	8 (1.4)	4 (1.7)	12 (1.6)	10 (1.4)	1 (0.5)	11 (1.2)	1 (0.8)	0 (0.0)	1 (0.6)										
Other/Unknown <sup>1</sup>																				
	73 (4.0)	19 (3.5)	13 (5.6)	32 (4.1)	20 (2.9)	14 (7.5)	34 (3.9)	3 (2.5)	4 (9.1)	7 (4.2)										

<sup>1</sup> Other/Unknown includes: poisoning, foreign body, and other/unknown

<sup>2</sup> %'s based on column totals

<sup>3</sup> Totals do not add up to 1,905 due to missing age, gender, and factors

<sup>4</sup> Severe large system injuries include: crush, amputation, internal organ, suffocation, and multiple injuries

<sup>5</sup> Primary nature of injury (p < 0.05)



**Table 4**

Injury factors by levels of disability

Factors	No Disability		Disability (Any level)	
	N	(%)	N	(%)
<b>Age (years)</b>				
< 19	609	(42.4)	180	(44.2)
19–44	712	(49.6)	176	(43.2)
45+	114	(7.9)	51	(12.5)
<b>Gender</b>				
Female	369	(26.2)	93	(23.0)
Male	1042	(73.8)	312	(77.0)
<b>Primary nature of injury</b>				
Soft tissue	1209	(84.1)	208	(50.2)
Burns/scalds	54	(3.8)	27	(6.5)
Concussion/Brain injury	9	(0.6)	18	(4.3)
Fracture	35	(2.4)	108	(26.1)
Severe large system injuries <sup>3</sup>	13	(0.9)	5	(1.2)
Other/Unknown <sup>4</sup>	69	(4.8)	5	(1.2)
Disloc/sprain/strain/muscle/tendon/bv/nerves	48	(3.3)	43	(10.4)
<b>Mechanism of injury</b>				
Struck by object	368	(25.8)	44	(10.9)
All others <sup>5</sup>	113	(7.9)	32	(7.9)
Fall	249	(17.5)	102	(25.2)
Fire/scald (Burns)	70	(4.9)	31	(7.7)
Road traffic	308	(21.6)	156	(38.6)
Cut/Pierce	316	(22.2)	39	(9.7)
<b>Place of occurrence</b>				
Home/Home property	548	(38.1)	131	(31.6)
All others <sup>6</sup>	128	(8.9)	40	(9.7)
Patients worksite	170	(11.8)	38	(9.2)
Road	423	(29.4)	181	(43.7)
Public space	171	(11.9)	24	(5.8)
<b>Primary body region</b>				
Upper extremity	402	(28.0)	96	(23.2)
Head/Skull	340	(23.7)	75	(18.2)
Lower extremity/Pelvis/Hip	347	(24.2)	142	(34.4)
Multiple body parts	33	(2.3)	12	(2.9)
Other/Unknown <sup>7</sup>	42	(2.9)	14	(3.4)
Thoracic area/Lumbar spine	62	(4.3)	23	(5.6)
Face/Neck	208	(14.5)	51	(12.3)

<sup>1</sup> 150 observations were deleted due to missing values for the response or explanatory variables; n=1755)

<sup>2</sup>Significant at the  $p < 0.05$  level

<sup>3</sup>Severe large system injuries include: crush, amputation, internal organ, suffocation, and multiple injuries

<sup>4</sup>Other/Unknown includes: poisoning, foreign body, and other/unknown

<sup>5</sup>All other mechanisms include: Machinery, animal attacks, sports, poisoning, gunshot, and other

<sup>6</sup>All other places include: Education facility, sports/athletics area, business/commercial, farm (excl. home), and other specified/unspecified place

<sup>7</sup>Other/Unknown includes abdominal region

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Table 5

Multivariate logistic regression model predicting disposition<sup>1/</sup>

Factors	Sent Home		Admitted/Transferred/Died		aOR	95% CI
	N	(%)	N	(%)		
<b>Age (years)</b>						
< 19	422	(40.8)	374	(45.9)	1.00	Ref
19-44	531	(51.4)	357	(43.9)	0.92	0.73 – 1.16
45+	81	(7.8)	83	(10.2)	1.20	0.81 – 1.78
<b>Gender</b>						
Female	275	(27.1)	185	(22.9)	1.00	Ref
Male	741	(72.9)	624	(77.1)	1.48	1.15 – 1.91 <sup>2</sup>
<b>Primary nature of injury</b>						
Soft tissue	895	(86.4)	517	(62.7)	1.00	Ref
Burns/scalds	23	(2.2)	59	(7.2)	1.44	0.53 – 3.92
Concussion/Brain injury	3	(0.3)	30	(3.6)	13.76	4.09 – 46.24 <sup>2</sup>
Fracture	22	(2.1)	122	(14.8)	9.14	5.55 – 15.04 <sup>2</sup>
Severe large system injuries <sup>3</sup>	6	(0.6)	18	(2.2)	2.52	0.86 – 7.34
Other/Unknown <sup>4</sup>	54	(5.2)	21	(2.5)	0.37	0.19 – 0.70 <sup>2</sup>
Disloc/sprain/strain/muscle/tendon/bv/nerves	33	(3.2)	57	(6.9)	3.46	2.12 – 5.66 <sup>2</sup>
<b>Mechanism of injury</b>						
Struck by object	258	(25.2)	148	(18.2)	1.00	Ref
All others <sup>5</sup>	77	(7.5)	67	(8.3)	1.54	1.00 – 2.38 <sup>2</sup>
Fall	185	(18.0)	165	(20.3)	1.15	0.82 – 1.61
Fire/scald(Burns)	28	(2.7)	74	(9.1)	4.48	1.74 – 11.54 <sup>2</sup>
Road traffic	240	(23.4)	242	(29.8)	1.20	0.77 – 1.87
Cut/Pierce	237	(23.1)	116	(14.3)	1.17	0.84 – 1.65
<b>Place of occurrence</b>						
Home/Home property	384	(37.0)	293	(35.5)	1.00	Ref
All others <sup>6</sup>	84	(8.1)	83	(10.0)	1.35	0.91 – 2.00

Factors	Sent Home		Admitted/Transferred/Died		aOR	95% CI
	N (%)	N (%)	N (%)	N (%)		
Patients worksite	131 (12.6)	75 (9.1)	0.90	0.61 – 1.31		
Road	319 (30.8)	300 (36.3)	1.20	0.77 – 1.87		
Public space	119 (11.5)	75 (9.1)	1.06	0.73 – 1.55		
<b>Primary body region</b>						
Upper extremity	315 (30.4)	176 (21.5)	1.00	Ref		
Head/Skull	225 (21.7)	206 (25.1)	1.90	1.39 – 2.59 <sup>2</sup>		
Lower extremity/Pelvis/Hip	262 (25.3)	222 (27.1)	1.16	0.86 – 1.55		
Multiple body parts	19 (1.8)	31 (3.8)	2.40	1.08 – 5.34 <sup>2</sup>		
Other/Unknown <sup>7</sup>	21 (2.0)	35 (4.3)	4.63	2.28 – 9.42 <sup>2</sup>		
Thoracic area/Lumbar spine	32 (3.1)	56 (6.8)	2.56	1.50 – 4.38 <sup>2</sup>		
Face/Neck	162 (15.6)	94 (11.5)	1.17	0.82 – 1.68		

<sup>1</sup> 144 observations were deleted due to missing values for the response or explanatory variables; n=1761

<sup>2</sup> Significant at the p < 0.05 level

<sup>3</sup> Severe large system injuries include: crush, amputation, internal organ, suffocation, and multiple injuries

<sup>4</sup> Other/Unknown includes: poisoning, foreign body, and other/unknown

<sup>5</sup> All other mechanisms include: machinery, animal attacks, sports, poisoning, gunshot, and other

<sup>6</sup> All other places include: education facility, sports/athletics area, business/commercial, farm (excl. home), and other specified/unspecified place

<sup>7</sup> Other/Unknown includes abdominal region