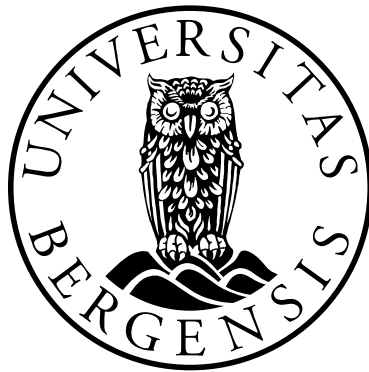


Injuries in Khartoum State, Sudan

Magnitude, consequences and healthcare utilization: a community-based survey

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All animals are equal, but some animals are more equal than others.

- George Orwell, *Animal Farm*, 1945

This thesis is dedicated to my father Osama El Tayeb and late mother Wedad El Khalifa.

Summary in English

Background

Injuries contribute significantly to the global burden of disease accounting for 5.1 million deaths annually. Fatal injuries are the tip of the iceberg and many more who survive an injury suffer the consequences with varying durations of disability. Fatal and non-fatal injuries are of increasing public health concern globally, particularly in low and middle income countries where they contribute to 90% of the global burden of injuries. Injuries mostly affect the productive age group, which results in huge socioeconomic impacts for poor populations which are caught in a poverty trap. As for Sudan the present data sources are Sudan Household Health Survey Round 2, hospital-based data, mortuary data, and police data. The scope of these data sources on injuries is limited; a household survey is needed to address the gaps. This thesis draws information from a household survey on the magnitude of injuries, consequences and healthcare use.

Methods

The studies presented in this thesis are from a retrospective community-based survey which was conducted in 50 clusters in Khartoum State during October and November 2010. The community-based survey was conducted using a household sample size of 1000. A two stage cluster design with probability of inclusion proportional to size was used to select clusters. The latest sampling frame from CBS considered the state to be 80% urban and 20% rural. In the first stage of sampling, the state was stratified according to urban and rural strata. In the second stage a probability proportionate to size method was applied. Households were selected in each cluster using systematic random sampling.

Trained data collectors collected data using structured questionnaires for face to face interviews. Details about non-fatal injuries which occurred 12 months preceding the interview were recorded. Information on fatal injuries which occurred 5 years preceding the interview was taken.

Data was cleaned and analysed using SPSS 18 and STATA 13. The incidence per 1000 person years at risk was calculated for non-fatal injuries. Poisson regression analysis was used to model injury determinants in urban and rural areas separately. Multivariate negative binomial regression using generalized linear model was applied for hospitalization and disability days. Logistic regression analysis was performed with the dependent variable being use of formal healthcare among injured individuals and with potential confounding variables included in the model.

Results

The total number of individuals included in the analysis was 5,661 residing in 973 households. The household response rate in both the urban and rural clusters was 97%. The overall injury incidence rate was 82.0/1000 person-years-at-risk (95% CI: 74.5, 90.0). Stratifying the incidence by sex showed a significant difference between males and females. The total incidence for males was 110.6/1000 person years at risk (95% CI: 98.4, 124.0), while the total incidence for females was 69.2/1000 person years at risk (95% CI: 59.6, 79.9). The leading causes of non-fatal injuries were falls followed by mechanical forces (such as cuts, stabs, struck by object, etc.) and road traffic crashes. Low socioeconomic status was a risk factor for injuries in urban areas. Males had a significantly higher risk of being injured in both urban and rural areas.

There were 28 deaths due to injuries out of a total of 129 reported deaths over 5 years. The number of disability days differed significantly between mechanisms of injury. Road traffic crashes and falls caused the longest duration of disability. Males had a higher probability than females of losing a job due to an injury.

A total of 260 individuals' accessed formal healthcare and about a quarter of the injured persons were admitted to hospital. Injured persons from road traffic crashes and males were most likely to utilize formal health services. The lowest socioeconomic strata were less likely to utilize formal healthcare.

Conclusion

The studies from this thesis give ample evidence on injury specific events, the consequences for individuals and families, and on patterns of health care use in Khartoum State. They have explored who is at risk of an injury, and which population groups and causes of injury are more likely to be associated with a longer duration of hospitalization or disability. This study has investigated injured persons' use of formal healthcare.

Injuries occurred mainly in the home and street environments. Most injured people reported being injured during work activity. The most vulnerable population groups for injuries were found to be low socioeconomic categories and males, bearing the largest burden and most serious consequences.

There is an urgent need to consider injuries in Khartoum as a public health concern, with special emphasis put on primary, secondary and tertiary prevention.

Keywords:

Injury, trauma, Sudan, low and middle income countries, socioeconomic, disability, pre-hospital care, formal healthcare use

Summary in Arabic

خلاصة

تساهم الإصابات بشكل فعال في العبء العالمي للمرض بحوالي 5.1 مليون حالة وفاة سنوياً. فالإصابات القاتلة هي ، والذين ينجون من الإصابات يعانون من تبعات تتفاوت في مدة الإعاقة. فالإصابات القاتلة وغير القاتلة هي مشكلة عالمية للصحة العامة خاصة في الدول ذات الدخل القليل والدخل المتوسط، حيث نجدها تساهم بنسبة 90% من العبء. فالإصابات غالباً ما تؤثر على المجموعة العمرية للإنتاج، مما يحدث تأثيرات اجتماعية اقتصادية على السكان الفقراء الذين يقعون فريسة الفقر. فبالنسبة للسودان فإن مصادر البيانات الحالية هو المسح الصحي للسودان الدورة الثانية والبيانات المستقاة من المستشفيات وبيانات المشرحة وبيانات الشرطة. ولكن نطاق مصادر هذه المعلومات محدود ولذا فإن هناك ضرورة لعمل مسح منزلي لسد الفجوات. وهذه الرسالة استقت المعلومات من مسح منزلي حول حجم الإصابات والتبعات المصاحبة لها واستخدام الرعاية الصحية.

الطريقة التي اتبعت في البحث

تعود الدراسات المُقدّمة في هذه الرسالة إلى مسح مجتمعي تم القيام به بأثر رجعي على 50 مجموعة في ولاية الخرطوم خلال الفترة من أكتوبر وحتى نوفمبر 2012. وقت تم القيام بالمسح المجتمعي باستخدام نموذج منزلي مكون من 1000. احتمالية إدراج يتناسب مع الحجم. وقد اعتبر CBS وقد تم اختيار المجموعات باستخدام تصميم مكون من مرحلتين مع أحدث إطار نموذج صادر من القناة التلفزيونية

بأن المتحضرين يمثلون 80% بينما يمثل الريف 20%. وفي المرحلة الأولى من النموذج فإن تقسيم الولاية إلى طبقات كان على أساس التحضر والريف. أما في المرحلة الثانية فقد تم تطبيق احتمالية الإدراج المتناسب مع الحجم. وقد تم اختيار المنازل في أي مجموعة باستخدام نموذج منهجي عشوائي.

وقام جامعو البيانات المؤهلون بتجميع البيانات مستخدمين استبيانات مصممة للمقابلات الشخصية (وجها لوجه). وقد تم تسجيل كافة تفاصيل الإصابات غير القاتلة والتي حدثت قبل المقابلة بحوالي 12 شهراً، بينما تم تسجيل كافة المعلومات حول الإصابات القاتلة والتي حدثت قبل المقابلة بحوالي 5 سنوات.

وقد تمت تنقية البيانات وتحليلها باستخدام برمجيات الإحصاء *SPSS 18* and *STATA 13*

حيث تم احتساب الإصابات غير القاتلة على 1000 مشارك وتقدير الزمن الفعلي لتعرضهم للمخاطر، كما تم استخدام تحليل بويسون لعمل نموذج الإصابات على مر السنين والتقصي حول المجموعات السكانية التي تزيد فرص تعرضهم للمخاطر. وتم استخدام التحليل المتعدد المتغيرات بالاستفادة من النموذج الإحصائي لينر العام واستخدام التوزيع السلبي الثنائي للحصول على استنتاجات قابلة للتفسير لتخطيط سياسة حول الاختلافات الجوهرية للفئات السكانية. كما تم القيام بتحليل إحصائي احتمالي على متغيرات تابعة تمثل استخدام الرعاية الصحية الرسمية لدى الأفراد المصابين وكذلك المتغيرات المُتوقّعة التابعة والمستقلة والمضمنة في النموذج

النتائج

العدد الكلي للأفراد المشاركين في التحليل هو 5661 ويقطنون في 973 منزلاً، وكان معدل استجابة ساكني المنازل في (95%CI: المجموعات الريفية والمتحضرة هو 97%. وكان معدل الزمن الفعلي لتعرضهم للمخاطر هو 82.0 / 1000 ، (74.5, 90.0)

98.4%CI:95) وعند التقسيم على أساس الجنس نجد أن هنالك اختلافاً كبيراً بين الذكور والإناث، حيث نجد أن مجموع الحالات بين الذكور هي 110.6 بين كل 1000 شخص (124, 124.0

بينما نجد المجموع الكلي للحالات بين الإناث هو 69.2 بين كل 1000 شخص (95%CI: 59.6, 79.9)

وبصورة عامة نجد أن الأسباب الرئيسية للإصابات غير القاتلة هو السقوط الذي تعقبه قوى ميكانيكية مثل الجروح أو الطعنات أو الضرب بأداة وخلافه. وكذلك حوادث المرور. وقد كان الوضع الاقتصادي الاجتماعي عامل خطورة في المناطق الريفية. والذكور يكونون أكثر عرضة لمخاطر الإصابات في المناطق الريفية والمتحضرة.

وكانت هنالك 28 حالة وفاة بسبب الإصابات من مجموع 129 حالة وفاة في خمس سنوات. ويختلف عدد أيام الإعاقات بشكل جوهري بين آليات الإصابة حيث نجد حوادث المرور والسقوط هو التي تكون أيام الإعاقات فيها أطول. ومرة أخرى نجد الذكور هم الأعلى احتمالية من الإناث في فقد الوظيفة نسبة للإصابة.

ونجد أن مجموع 260 شخصاً قد تلقوا رعاية صحية رسمية، وربع الأشخاص المصابين قد دخلوا إلى المستشفيات. كما تتم الاستفادة من الخدمات الصحية الرسمية في إصابات المرور والطرق عند الذكور، بينما نجد أن من هم أقل وضعاً اقتصادياً اجتماعياً هم الأقل احتمالاً في الحصول على الرعاية الصحية الرسمية.

الاستنتاج

لقد أعطت دراسات هذه الرسالة دليلاً ساطعاً حول الحالات المحددة للإصابات وتبعاتها على الأفراد والأسر وكذلك استخدام أنماط الرعاية الصحية بولاية الخرطوم، كما أنها قد كشفت عن من تحفهم مخاطر الإصابات وكذلك المجموعات السكانية وأسباب الإصابات التي تكون هي الأكثر احتمالاً بأن ترتبط بالبقاء لمدة أطول بالمستشفيات أو الإعاقة. وقد بحثت هذه الدراسة في استخدام الأشخاص المصابين للرعاية الصحية الرسمية.

وقد حُددت المنازل والشوارع بأنها أكثر الأماكن التي تحدث بها إصابات، كما أننا نجد أن أغلب الأشخاص المصابين الذين تم التبليغ قد تعرضوا لهذه الإصابات أثناء العمل. كما وجدت الدراسة أن أكثرية المجموعات السكانية التي تكون عرضة للإصابات هي الفئات الاجتماعية والاقتصادية الدنيا والذكور، لأنها تتحمل العبء الأكبر وأغلب التبعات الخطيرة. وفي الختام نشدد على أن هناك حاجة ملحة للاعتراف بالإصابات في الخرطوم بأنها مشكلة صحة عامة مؤرقة، مع التأكيد على توفير الوقاية الابتدائية والثانوية والوقاية من الأمراض الخطرة

الكلمات الرئيسية

الإصابة ، الصدمة، السودان ذات الدخل المتدني والمتوسط ، الاقتصادي الاجتماعي وتبعات الإعاقة والرعاية قبل المستشفى واستخدام الرعاية الصحية الرسمية

Summary in Norwegian

Bakgrunn

Akutte skadetilfeller bidrar vesentlig til den totale sykdomsbyrden i verden, med 5,1 millioner dødsfall årlig. Likevel utgjør skader med dødelig utfall bare en liten del av det totale sykdomsbildet, og de mange personene som overlever et skadetilfelle, opplever ettervirkninger av forskjellig varighet. Dødelige og ikke-dødelige skadetilfeller gir grunn til stadig større bekymring på verdensbasis, spesielt i land med lav og middels gjennomsnittsinntekt, der skadene bidrar med 90 % av den globale sykdomsbyrden som skyldes skader. Akutte skader påvirker i hovedsak den produktive aldersgruppen og resulterer i enorme sosioøkonomiske problemer i befolkninger som strever med å komme ut av fattigdom. I Sudan foreligger det allerede skadedata som er innsamlet i Sudan Household Health Survey, og dessuten data som skriver seg fra sykehus, likhus og politiet. Disse informasjonskildene har begrenset verdi, og for å fylle hullene er det nødvendig med statistiske undersøkelser som bygger på informasjon innsamlet direkte fra befolkningen. Denne avhandlingen utnytter opplysninger fra en slik undersøkelse av omfanget av skadene, konsekvensene og den påfølgende bruken av helsetjenester.

Metoder

Arbeidene som blir presentert i denne avhandlingen, bygger på en retrospektiv populasjonsbasert undersøkelse som ble foretatt i 50 grupper av husstander i Khartoum State i oktober og november 2010. Undersøkelsen ble gjennomført med et utvalg av i alt 1000 husstander. Et to-trinns forsøksopplegg ble brukt for å velge ut aktuelle husstander, slik at sannsynligheten for at en bestemt geografisk gruppe skulle komme med i utvalget, var proporsjonal med gruppestørrelsen. Utvalget var basert på oppdaterte oversikter fra Statistisk Sentralbyrå i Sudan, der 80 % av Khartoum State ble ansett som byområde og 20 % som landområde. Dette forholdet ble bygget inn i første trinn av utvalgsprosessen. I andre trinn ble grupper av husstander valgt ut tilfeldig med passende sannsynlighet. Innenfor hver gruppe ble deretter bestemte husstander valgt ut tilfeldig, slik at det samlede utvalget ble representativt for hele befolkningen.

Personene som sto for innsamlingen av dataene, ble trent opp i bruk av strukturerte spørreskjemaer under intervjuene. Alle detaljer ble registrert i forbindelse med ikke-dødelige skadetilfeller som hadde inntruffet i de siste 12 månedene før intervjuet. Opplysninger ble også samlet inn om dødelige skadetilfeller fra de siste 5 årene.

Dataene ble kontrollert og analysert ved hjelp av SPSS 18 og STATA 13. Insidensen av skadetilfellene pr. 1000 personår ble regnet ut for ikke-dødelige skadetilfeller. Poissonregresjon ble brukt for å modellere forekomsten av skadetilfeller over tid og til å undersøke om bestemte grupper av befolkningen hadde høyere skaderisiko. Multivariat analyse, basert på en generalisert lineær modell for negativt binomiske variable, ble utnyttet til å studere forskjellene i uføretid mellom befolkningsgruppene. Hensikten var å komme frem

til konklusjoner som kan være nyttige ved planlegging av helsetilbud. Logistisk regresjon ble gjennomført for å studere bruk av helsetjenester blant de forskjellige kategoriene med skadetilfeller, slik at en samtidig kunne ta hensyn til andre aktuelle forklaringsvariabler.

Resultater

Det samlede tallet på personer som ble inkludert i analysene var 5 661. Personene hørte til i alt 973 husstander. Responsraten blant alle utvalgte husstander var 97 %, både blant gruppene i by- og landområdene. Den totale insidensraten av akutte skader var 82,0/1000 personår (95 % KI: 74,5, 90,0). Ved inndeling etter kjønn ble det funnet en signifikant forskjell mellom menn og kvinner. Den totale insidensraten for menn var 110,6/1000 personår (95 % KI: 98,4, 124,0), mens insidensraten for kvinner var 69,2/1000 personår (95 % KI: 59,6, 79,9). De vanligste årsakene til ikke-dødelige skader var fall, fulgt av mekaniske årsaker (som kutt, knivstikking, treff av gjenstand i bevegelse osv.) og trafikkulykker. Lav sosioøkonomisk status var en risikofaktor for skader i byområdene. Menn hadde en høyere risiko for å bli skadet enn kvinner, både i by- og landområder.

Det ble registrert 28 dødsfall som var forårsaket av akutte skader, blant til sammen 129 rapporterte dødsfall over 5 år. Antallet uføredager varierte signifikant mellom skadegruppene med forskjellig årsak. Trafikkulykker og fall ga opphav til de lengste periodene med uførhet. Menn hadde større sannsynlighet enn kvinner for å miste arbeidet på grunn av en skade.

I alt 260 individer gjorde bruk av formelle helsetjenester, og omkring en fjerdedel av de skadede personene hadde sykehusopphold. Formelle helsetjenester ble mest brukt ved trafikkulykker og blant menn. De laveste sosioøkonomiske gruppene var mindre tilbøyelige til å oppsøke formelle helsetilbud.

Konklusjon

Arbeidene i denne avhandlingen gir informasjon om faktorer som spiller inn ved skadetilfeller, om konsekvenser for enkeltindivid og familie, og om bruk av helsetjenester i Khartoum State. Det er blitt undersøkt hvem som har høyere risiko for skader, og hvilke befolkningsgrupper og årsaksfaktorer som viser sammenheng med lang varighet av sykehusopphold eller uførhet. Studien har også tatt opp bruken av helsetjenester etter at en skade har inntruffet.

Boliger og gater er blitt pekt ut som steder der de fleste skadene inntreffer. Flest skadede rapporterer at de ble skadet mens de utførte arbeidet sitt. De mest utsatte kategoriene i befolkningen var lavt plasserte sosioøkonomiske grupper og menn, som også opplevde de mest alvorlige ettervirkningene av skadene.

Studien viser at akutte skader bør anses som et alvorlig folkehelseproblem i Khartoum, og at det bør legges stor vekt på primær, sekundær og tertiær forebygging.

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Scientific environment

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Original papers

This thesis is based on the following papers:

Paper I

Sally El Tayeb, Safa Abdalla, Odd Mørkve, Ivar Heuch, Graziella Van den Bergh

Injuries in Khartoum state, the Sudan: a household survey of incidence and risk factors.

International Journal of Injury Control and Safety Promotion. 2013 May 8

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Paper II

Sally El Tayeb, Safa Abdalla, Ivar Heuch, Graziella Van den Bergh

Socioeconomic and disability consequences of injuries in the Sudan: a community based survey in Khartoum State. Injury Prevention. 2013 Nov 13

(DOI: 10.1136/injuryprev-2013-040818)

Paper III

Sally El Tayeb, Safa Abdalla, Graziella Van den Bergh, Ivar Heuch

Use of healthcare services by injured people in Khartoum State, Sudan: a household survey.

Submitted for publication

List of abbreviations

CBS	Central Bureau of Statistics
CI	confidence interval
DALY	disability adjusted life year
GBD	Global Burden of Disease
HIV	human immunodeficiency virus
HIC	high income countries
ICD	International Classification of Disease
LMIC	low and middle income country
NHIS	National Health Interview Survey
PAU	popular administrative unit
RTI	road traffic injuries
SHHS-1	Sudan Household Health Survey-Round 1
SHHS-2	Sudan Household Health Survey-Round 2
TASC	The Alliance for Safe Children
UNICEF	United Nations International Children's Emergency Fund
US	United States
WHO	World Health Organization

1. Introduction

Global burden of injuries

Globally injuries cause 5.1 million deaths per year which corresponds to 9.6% of deaths from all causes [1]. This is equivalent to 11 deaths every minute. The total number of injury deaths exceeds death from tuberculosis, malaria and HIV/AIDS combined (see Figure 1) [2, 3]. Unintentional injuries account for the majority of these deaths. Globally the leading causes of deaths are road traffic crashes ranked eighth, self-harm ranked fourteenth and falls on the twenty-second place [1, 4]. Injuries mostly affect the productive age group, which results in huge social and economic repercussions and large amounts of years of life lost [4]. The latest Global Burden of Disease study (GBD) has produced expanded universal data set with an enhanced quality and improved comparability. This was mainly due to the inclusion of a larger list of disease and injury causes, risk factors, more age groups and utilizing improved estimation methods [5]. The GBD study has reported 13.4% increase from the 1990 estimates in number of death from injuries [4]. The annual cost of injuries according to the World Bank is 518 billion US dollars [6, 7].

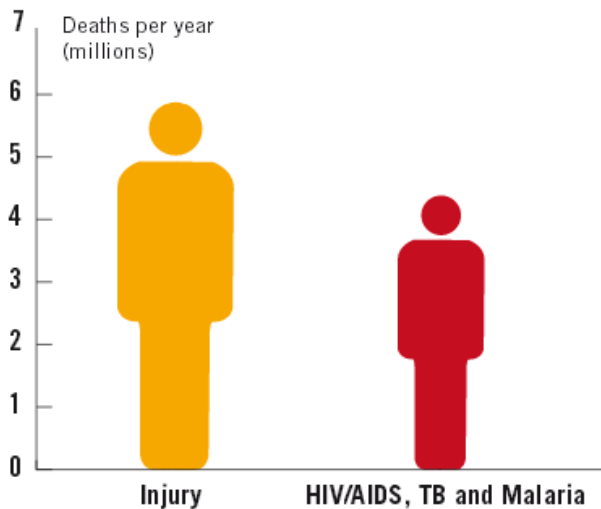


Figure 1: Injury deaths compared to other causes of mortality [2, 3]

In high income countries where injury prevention programmes have been carried out, injuries are still one of the leading causes of death among men in age group 10-24 years. Injuries are the leading cause of death in the WHO European region among the age group 5-17 years [8]. In 2004 it has been reported that 42,000 children among the 0-19 year old have died from unintentional injury in Europe where 16,400 have died from traffic crashes [8]. Injury mortality has increased by 10% in the United States over the past decade [9]. In 2010 unintentional injuries in the United States were the leading cause of death for the age group 1-44 [10]. In the United Kingdom self-harm and road injuries have been identified as the leading causes of years of life lost (YLL) in the age group 20-54 years [11]. A study from Norway analysed trauma death from 1998-2007 and revealed a mortality rate of 28.7/100,000, with rural areas reporting higher mortality rates by 52% [12]. China has also reported a similar gap in injury mortality rate, where rural areas have twice the death rate of urban areas (30.1 vs 70.7 per 100,000) [13]. In Arab high income countries (HIC) road traffic injuries were the second leading cause of death [14].

Low and middle income countries (LMICs) are experiencing a health transition due to demographic and social changes, which represents an epidemiologic situation with a shift from communicable diseases to non-communicable diseases and injuries, and the leading causes of deaths include injuries [1, 15]. Counting death in epidemiology only measures the tip of the iceberg, ignoring the burden of disease and suffering from injury disability by

individuals and families. Many of the injured will be left with disabling sequelae, and in some cases, permanent ones. Therefore, measuring disability adjusted life years (DALYs) and years lived with a disability (YLD) are more reflective measures of the burden of disease and injury. Figure 2 shows that in sub-Saharan Africa about 50% of the DALYs are lost to non-communicable diseases, while the corresponding figure for South America and Asia is about 70%.

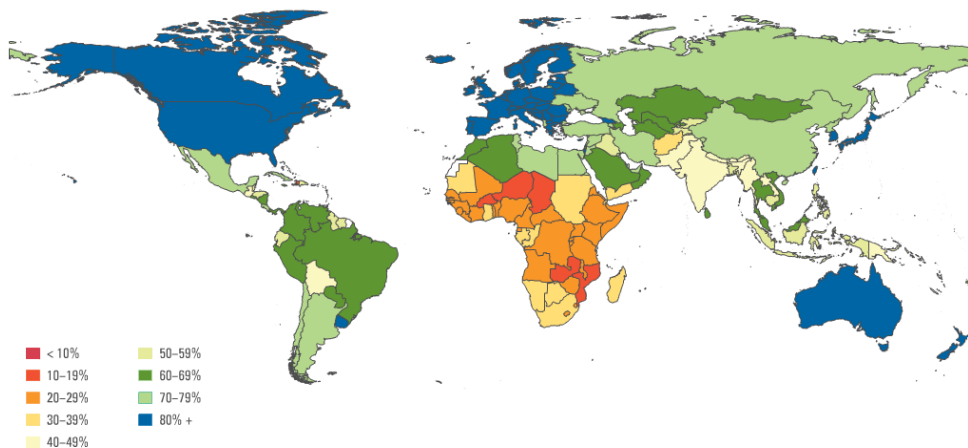


Figure 2: Health transition percent of global DALYs lost due to non-communicable diseases, 2010 [16]

More than 90% of the world's deaths from injuries occur in LMICs where implementation of injury prevention is limited, and health-care systems have not got sufficient resources to provide adequate medical care to the population [1, 6]. Low and middle income countries have only 48% of the world's registered vehicles, yet they bear 90% of the world's traffic fatalities [17]. Africa has reported double the rate of death for road traffic injuries (21/100,000 population) as compared to high income countries (10/ 100,000 population) which are motorized to a much higher extent [18]. Southeast Asia has the highest death rate for falls, followed by high income countries. Africa has ten times the rate of interpersonal violence compared to high income countries (see Table 1) [18].

Table 1 Estimates of the rate of death per 100, 000 associated with cause-specific injuries by Norton & Kobusingye [18]

Cause of Death	High-Income Countries	Low-Income and Middle-Income Countries					
		Africa	The Americas	Eastern Mediterranean Region	Europe	Southeast Asia	Western Pacific Region
<i>rate per 100,000 persons</i>							
Unintentional injuries							
Road-traffic injuries	10.3	20.9	17.6	21.6	17.2	17.6	21.2
Falls	7.8	2.4	3.7	4.1	5.7	12.0	8.2
Drowning	1.8	5.2	2.8	3.9	5.5	5.5	5.7
Fires	0.9	4.9	0.7	5.2	4.2	4.8	0.9
Poisoning	4.1	4.9	0.7	2.8	18.1	1.8	2.9
Other	10.9	16.9	11.8	13.6	30.6	22.8	14.4
Intentional injuries							
Self-harm	13.4	6.3	5.8	5.5	16.9	15.6	11.4
Interpersonal violence	2.7	20.1	24.1	3.9	9.9	5.8	2.9
War and conflict	0.1	3.6	1.2	17.7	1.2	2.3	0.2

The rapid increase in the number of injuries is mainly due to the change in life style which is concurrent with the global phenomenon of rapid urbanization. Injuries disproportionately affect the productive age groups and result in loss of productivity. The economic cost of injuries increases health expenditure, and most LMICs have no social security policies and provision for their populations, and they have poorly developed trauma care systems [19-21]. Even if a person survives an injury the treatment and rehabilitation can be inadequate and may subsequently lead to a permanent disability. A single injury event can lead families into the poverty trap and as result create an increase in vulnerable populations [22].

Injuries account for 11% of global DALYs with road traffic injuries making the largest contribution [23]. Globally, unintentional injuries are the second leading cause of YLDs in the age group 10-24 after neuropsychiatric disorders [24].

In LMICs the leading causes of unintentional injuries are road traffic injuries, falls, and drowning [1, 18]. In sub-Saharan Africa intentional and unintentional injuries account for a total of 15.4% of DALYs. Future projections point out that the largest change in DALYs due to injuries is expected in sub-Saharan Africa [23, 25]. Homicide rates for children in South Africa were double the global average [26]. There is limited knowledge in the field of injuries in LMICs and as a result scarce attention given to this new epidemic. The injuries' burden is significant, preventable by cost effective means and needs to be addressed [27].

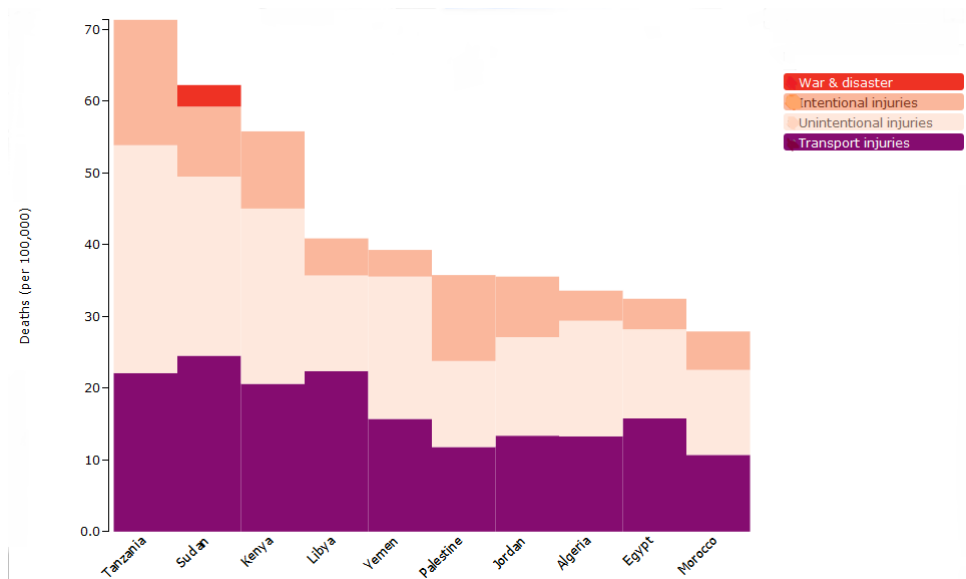


Figure 3: Mortality rate per 100,000 population in various countries GBD data, 2010

The burden of injuries in Sudan

Sudan has been no exception to the global health transition. This is mainly due to the population growth, rapid urbanization and the change in life styles. The overall injury annual mortality rate estimated by the GBD study 2010 was 62 /100,000 population [28]. The GBD study has reported that the rate in Sudan of unintentional injuries deaths was 25 /100,000 population, intentional injuries death accounted for 10 /100,000 population, war and disaster 3/100,000 population. As in comparison to neighbouring and regional countries, Sudan has a higher mortality rate of 25/100,000 population due to road traffic death, whereas Tanzania has

a rate of 22/100,000 population and Kenya 21/100,000 population (see Figure 3). The burden of injuries estimated in DALYs was 538,221 in 2010 for road traffic injuries alone [28].

Among the top twenty causes of death are injuries caused by road traffic crashes and self-harm [28]. Road injury in Sudan has risen from the 11th rank in 1990 to the 6th rank in 2010 (see Figure 4). War related injuries have decreased tremendously from the 16th rank in 1990 to the 34th in 2010, which is mainly due to the peace agreement between Sudan and South Sudan (see Figure 4). In comparison to LMICs in the African or Arab regions, Sudan is among the most burdened countries with injuries. The Sudan Household Health Survey round-1 (SHHS-1) had no injury module; in 2010 the Sudan Household Health Survey round-2 (SHHS-2) has estimated 2% incidence of injuries in Sudan.

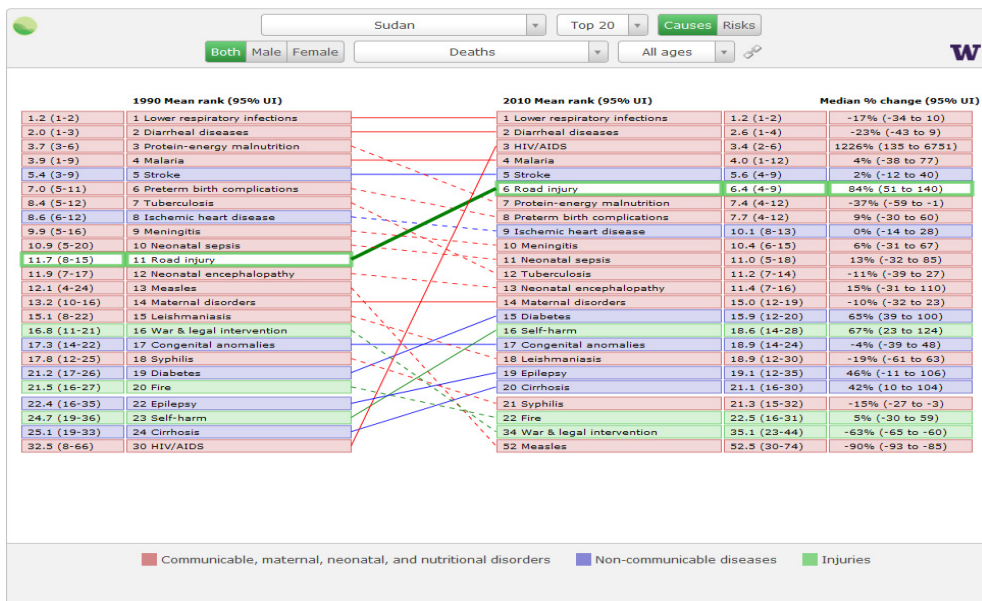


Figure 4: Top 20 causes of death for all ages in Sudan, 2010 [28]

Definition of injuries

An injury is defined by the World Health Organization (WHO) as “the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. It can be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e. water, air, warmth), as in drowning, strangulation or freezing” [29].

How are injuries classified?

Another way of classifying injuries is by the intent, injury either being intentional or unintentional. The intentional category can further be divided into self-harm and violence (personal or collective). Unintentional harming is not caused on purpose, for example road traffic injuries, falls, burns and poisoning. The International Classification of Disease (ICD) is a conceptual framework developed by WHO in 1989. The purpose of ICD is to provide a systematic international categorization of diseases and other health related problems. This was originally developed for mortality coding only but now it is used also for the purpose of classifying morbidity. This classification translates diagnosis into alphanumeric codes, which makes it easier for indexing, storing and analysing the data in epidemiology or other involved disciplines. This reporting procedure provides a common international platform which helps countries to work together to tackle and be aware of health related issues. This thesis has classified aspects of injuries’ cause, intent and nature accordingly.

Brief history historical overview of injury prevention

In industrialized countries, the history of injury epidemiology and prevention began in the United States at the end of the 19th century, when road traffic injuries started to occur. In 1913 the National Safety Council was founded in the United States to fill in safety data and information, with the three ‘E’s, Education, Engineering and Enforcement used as principles to control causes of accidents [30]. Around 1950 the public health understanding of injuries changed and it became accepted that an injury is not a haphazard event. The epidemiological triad which traditionally was an applied model to understand infectious disease was

transferred to illustrate how injury events occur. In the 1960s William Haddon, called the ‘father’ of injury epidemiology, introduced ground breaking perspectives of injury prevention, while advocating control of the agent of injuries, which is the energy. The strategies he proposed led to the development of injury prevention in the motor vehicle field which later was extrapolated to other causes of injury [31-33]. In the 1970s a pilot study for safe communities was conducted in a Swedish city which resulted in a 30% reduction of injuries. Then the first world conference on injury prevention was established in 1989 and the outcome of this conference was the ‘Safe Communities’ initiative [34]. The Advanced Life Support, which is emergency pre-hospital care given to patients during transport, was established in the 1970s and has also contributed greatly to trauma care [35]. The United Nations General Assembly has proclaimed road traffic death and injury has a major public health issue, and as a result the Decade of Action for Road Safety 2011-2022 was launched for full dedication and commitment by 100 countries [36]. The WHO adopted violence as a major global public health issue in 2012. The 7th World Conference on Injury Prevention and Control, Austria, has also featured road safety research of high importance [37].

The Haddon matrix

Haddon developed in 1970 a matrix with the main purpose to facilitate the epidemiological analysis of injuries [33]. The Haddon matrix divides an injury event into three phases: pre-event, event, and post-event [31]. These phases are affected by an agent, a host, and physical and social environment (see Figure 5). If we take an example of road traffic crashes and fill the cells with the specifics and characteristics, pre-event will pin-point primary prevention, event secondary and post event tertiary prevention. Other scholars have contributed to this module by adding more dimensions like decision-making processes to further understand injury phenomena. Combining the use of the Haddon matrix inside the public health approach [38, 39] and approaches for injury interventions have also been recommended for LMICs [40, 41]. The present study has been inspired by this epidemiological conceptual framework to understand the different phases of injuries.

	Agent	Host	Physical Environment	Social Environment
Pre-event				
Event				
Post-event				

Figure 5 : Haddon Matrix

Current health situation in Sudan

Sudan is still endemic for lower respiratory infections, diarrheal diseases, malaria, and tuberculosis; on the other hand there is a growing burden of non-communicable diseases and injuries [28]. The annual death rate for malaria is 67.4/100,000 and for HIV 63.6/100,000 [42]. The maternal mortality and child mortality are still high (see Table 1). In comparison to other countries in the same WHO region (Eastern Mediterranean Region), Sudan is among the worst off countries in terms of health indices. The Sudan's life expectancy at birth as of 2011 was 60 years for males and 64 years for females, with a minimal change since 2004 (see Figure 6) [43]. In terms of life expectancy Sudan was better than most Sub-Saharan African countries and is ranking lower than other LMICs (see Figure 6). The WHO produced a cooperation document with the Ministry of Health to work on a strategic plan for Sudan for the period 2008-2013. Non-communicable diseases and injury prevention were included in the plan to reduce their burden. This plan recommended injury prevention with a special focus on road traffic injuries [44].

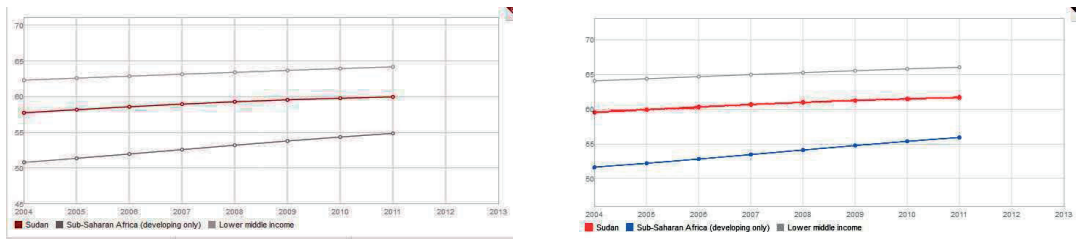


Figure: 6 Life expectancy at birth for males and females, Sudan

Historical background of modern medical services in Sudan

Western medicine was first brought to Sudan through the colonial powers at the time of the Turco-Egyptian regime in the 1800s as mentioned in Bayoumi's book on the history of Sudan's Health Services [45]. The establishment of the system was mainly to target the army rather than the indigenous populations. Few hospitals were set up in Khartoum, Wad Madani and El Obeid. Doctors at that time were recruited from Europe and later Arab doctors were transferred to work all over the provinces in Sudan. The medical organization in Sudan started in 1830, with a centralized medical body. The epidemiological picture reflected mainly infectious disease outbreaks. Vaccination against smallpox and control of outbreaks were the main purposes of the services [45].

In 1924 the first School of Medicine in Khartoum University was initiated and Sudan started producing its own medical manpower. The Sudan Medical Service was constituted by the Public Health Division, Hospitals Division and the Laboratories and Research divisions [45]. In 1951 the Ministry of Health was legislated and subsequently in 1954 Sudan was admitted to the WHO [45]. The medical field has shown an upward trend of uptake of patients and government spending on health. Public health initiatives have started in the late 1960s, and the healthcare system has been expanding in terms of manpower and hospitals to supply the growing population [45].

The current health system in Sudan

The health system in Sudan is structured into three administrative strata, being the federal, state and locality level (see Figure 7). The Federal Ministry of Health (FMOH) is responsible for policy, planning, and international coordination. The FMOH is connected to 15 State Ministries. The FMOH is responsible for managing 21 tertiary level hospitals and specialized centres. Each State Ministry is further subdivided into authorities at locality levels. The local health system is similar to the district health system which aims to approach the local communities and address their needs; primarily the focus is primary health care with a bottom-up approach. The locality level manages health centres. It has been reported that 71% of the population is within 5 kilometres of reaching a health facility [46]. In addition to these main bodies, health services are also provided through armed forces, the police, universities and the private profit and non-profit sector.

A health reform in 1991 led to privatization and introduction of user fees in the healthcare system. Out-of-pocket health expenditure for outpatient clinics in Khartoum is 79%. This reform introduced changes in the administrative system as well. All hospitals, clinics and primary care units started to report to the Health Information System. Most of the resources are pooled to the monitoring and scanning of infectious disease outbreaks, implying that priority is on fighting infectious diseases despite the epidemiologic transition that is occurring in the country. Moreover, there is a flourishing presence of the private practice sector which 26% of the population is utilizing [46].

Traditional medicine is deeply rooted in society and is acknowledged by the Ministry of Health in the form of licensing their practices. There are spiritual healers which offer more of a religious based treatment and they are not recognized by the Ministry of Health. The Sudan Household Health Expenditure survey of 2009 also reported that around 1% of Sudan's population visits the traditional healers [46]. The SHHS-2 reported that 35 % of Sudan's population has sought traditional healers in the first week after acquiring an injury [47].

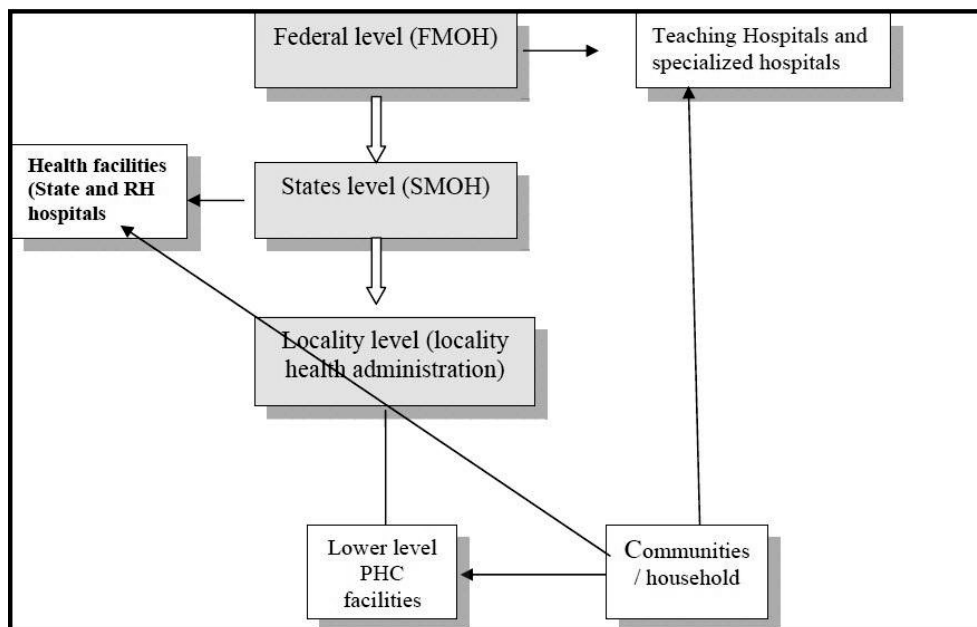


Figure 7: Sudan's health system profile [48]

Existing data sources on injuries

Data sources provide important documentation in epidemiology, which helps in understanding how disease or injury events occur, their distribution and the way forward in tackling problems. Injury information is important to help identify the nature of injuries, the magnitude and the population groups at risk. Therefore, data sources are crucial. The status of data sources for injuries in LMICs and HICs reflect quite different realities. In HICs most trauma registries have a strong base and are well established [49-51]. Vital registration in HICs is of good quality and the mortality data from these countries are known to be reliable. In LMICs there are still discrepancies reported between different countries and poor quality of data is common [52, 53]. In most HICs almost the whole population has access to health services and as a result all injuries requiring medical attention are brought to a health facility [54]. Despite this there are still challenges with hospital records in terms of completeness, up-to-date classifications and storage. Poor access to healthcare in LMICs results in a fraction of the injuries reaching health facilities.

As for Sudan the present data sources available on injuries are SHHS-2, hospital-based data, mortuary data, and police data. The SHHS-2 has a short module on injuries which quantifies

the magnitude of injuries when medical attention was sought. It was a step forward to include injuries in a national health survey but SHHS-2 lacks injury event details. From an epidemiologic point of view, the Sudanese morgue data have the weakness that not every dead person is necessarily passing through the morgue before the funeral proceedings. Due to the cultural and religious context of the country a dead person is buried as soon as possible. The only situation where the dead person is brought to the morgue is where the police are involved and investigates what could represent a homicide or intentional injury death. If the death is from a natural cause, bypassing the morgue is the most likely scenario. There are few morgues in Sudan to which only people living within close proximity of the cities have access. In the case of police data, these focus on road traffic crashes and on criminal events and data do not cover other information of public health interest. Moreover, weaknesses and discrepancies in police data and hospital data have been reported in many countries [55-57]. Media reports, has been observed in other settings, are another possible source of information in Sudan which might be limited though by its sheer journalistic purpose [58].

Rationale for this study

The burden of injuries is to a large extent preventable and thus cannot be neglected. Existing data sources show that injuries have a substantial effect on the burden of disease and death rates. Research is needed to fill existing data gaps in Sudan and other LMICs. At the time of the study planning there was a lack of knowledge about the specifics of injury events and the nature of injuries, for example the severity of the injury and implications for individuals and households in Sudan, and coping mechanisms experienced. There is lack of evidence on utilization of formal healthcare system and the number of injuries treated at health facilities. There is a need to explore how people use the formal health care services or other options and the reasons behind their choices. So far, the challenges involving reliable data sources have resulted in scarce attention given to injury prevention and few strategies for tackling this public health challenge. There is a need to provide essential information for health policy makers and other bodies responsible for formulating and implementing injury prevention programmes.

2. Aims

General objectives

- 1- To study population-based characteristics of injuries in Khartoum State, Sudan in order to provide evidence to assist in developing injury prevention policies and strategies.
- 2- To assess injury consequences and healthcare utilization patterns in Khartoum State, Sudan for promoting of a suitable trauma health system and health security policies.

Specific objectives

Paper I

1. To estimate the incidence of nonfatal injuries in Khartoum State.
2. To determine causes and risk factors leading to injuries in Khartoum State.

Paper II

3. To determine socioeconomic consequences of disability caused by injuries in Khartoum State.
4. To report associations between injury disability period and demographic factors.

Paper III

5. To determine factors promoting and inhibiting healthcare use by the injured in Khartoum State.
6. To explore the likelihood for injured persons to address the formal healthcare system.

Focus of the thesis

The present study resulted in three papers, and in the first paper the magnitude of injuries is measured from a community-based approach. The definition of an injury in our study allowed us to include those who have not used the formal healthcare system. This study helps therefore to identify populations who are at risk and who are more vulnerable to injuries. Our second paper addresses the socioeconomic and disability consequences of injuries. No study in Sudan has gathered this type of information and there is very limited literature on the topic in the African context. The third paper covers the variety of healthcare services used after injuries. Going beyond the SHHS-2, our study addresses in depth which groups are more or less likely to utilize the formal and traditional healthcare system and the reasons expressed by respondents for their choices.

3. Methods

Study setting

Sudan was the largest country in Africa prior to the secession of South Sudan in 2011; it is now placed as the third largest country in Africa, and is located in the north-eastern region of the African continent. It is composed of 17 administrative states with a total area of 1,861,484 km². The survey reported in this thesis was conducted in Khartoum State in 2010.

Khartoum State is centrally located at the confluence of the White and Blue Nile and the state has an area of 22,736 km² [59]. Comparatively, Cairo is 453 km², Lagos is 999.6 km² and Johannesburg is 1,645 km², thus making of Khartoum the largest African metropolitan area in terms of surface area. Khartoum State houses the national capital Khartoum with a population density of 6,013 people/ km² in 1998 [60]. It is administratively divided into seven localities which are: Khartoum, Jabel Awliya, Sharq El Nil, Bahari, Umdurman, Umbadda and Karrari (see Figure 6). Khartoum State counts a total of around one million households [61].

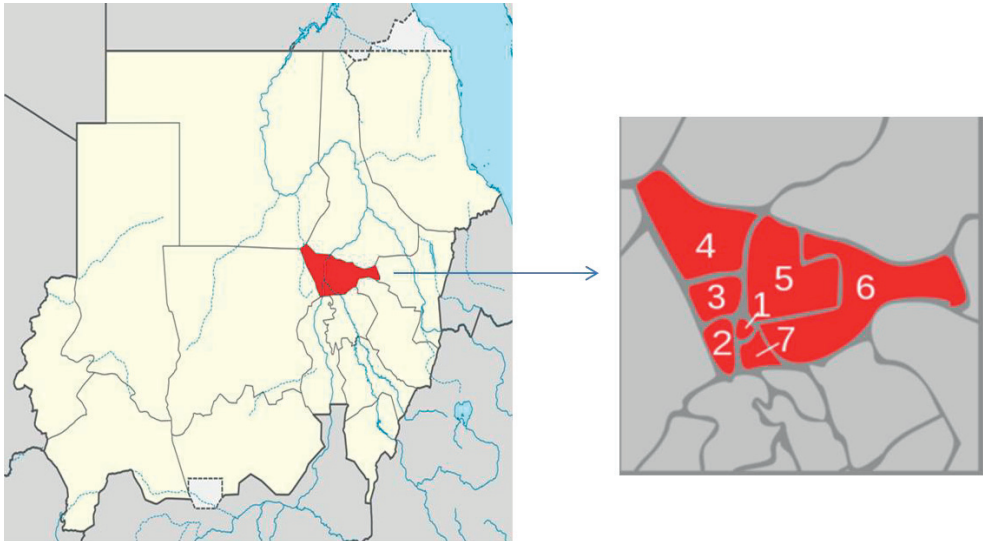


Figure 8: Map of Sudan and Khartoum State [62, 63]

1.Khartoum 2. Um Badda, 3. Omdurman, 4. Karari, 5. Bahri 6. Sharq El Nil, 7. Jabel Awliya

Study population

Sudan has a population of 32.7 million [61], with 41% below the age of 15, and 38% living in urban areas [32]. According to the World Bank, Sudan's Gini index is 35.3 in 2009 where 0 represents perfect equality and 100 represents perfect inequality [64]. The population is very diverse and is composed of hundreds of tribes. Sudan has suffered a civil war which lasted 22 years, and the country still suffers an ongoing war in the western region (Darfur). As of mid-2013 there are about 2 million internally displaced across Sudan [65]. Khartoum had a total population of 5.7 million in 2010 [61], before the secession of South Sudan, of which 1.2 million were internally displaced persons from all over the country. This migration has led to the development of urban slums [60]. The economy of the country was previously mainly dependent on agriculture, yet since 1999 Sudan has started exporting oil. The economy has boomed ever since, resulting in Khartoum State being fast growing in economy and population. Rapid urbanization is a combined result of rural-urban migration and of population growth. Khartoum has witnessed a horizontal expansion without sufficient infrastructural transformation to accommodate this growth [66]. Rapid expansion with uncontrolled growth of informal settlements has led to poorer populations living in unfavourable conditions [67]. At the same time, there is 40% of the population still living below the poverty line [68].

Table 1: Selected demographics for Sudan and Khartoum State [43, 47, 60, 61, 69]

	Sudan	Khartoum state
Total population	37,195,000	5,274,321
Population under age 15 years (%)	35	36
Gross national income per capita (international \$)	2,12	-
Life expectancy at birth m/f (years)	60/64	-
Probability of dying between 15 and 60 years m/f (per 1 000 population)	279/216	-
Public per capita health care spending (Intl \$, 2006)	13	-
Total expenditure on health as % of GDP (2011)	8	8
Living under poverty line (% population)	47	26
Under five child mortality per 1000 live birth	83	67
Maternal mortality per 100,000	216	175
Drinking water source piped into dwelling (%)	9	69
Sanitation facilities (%)	70	94
Incidence of tuberculosis (per 100,000 people)	114	101
Prevalence of HIV, total (% of population ages 15-49) 2011	1.1	-
Percentage of population with disability	4	-

Study design and sampling frame

A retrospective cross-sectional community-based survey was conducted between October and November 2010 in Khartoum State using structured questionnaires.

The community-based survey was conducted using a household sample size of 1000. The most recent information about the target population from the Central Bureau of Statistics (CBS) was used. A two stage cluster design with probability of inclusion proportional to size was used to select clusters. The latest sampling frame from CBS considered the state to be 80% urban and 20 % rural. In the first stage of sampling, the state was stratified according to urban and rural strata.

In the second stage a probability proportionate to size (PPS) method was applied. The state has a total of thirty-six administrative units, which are divided further into quarters or popular administrative units. Our cluster was the smallest geographical unit defined as popular administrative unit. The number of clusters was reached by dividing the total sample of 1000 households by 20 (households interviewed per day), which yielded 50 clusters to be sampled.

The PPS technique was utilized because the number of households varied between clusters so the selection probability was made proportionate to size. The probability given to the larger clusters was higher and smaller clusters were given a lower probability to be chosen. The primary sampling unit was the household. The average number of persons living in a household was six according to the latest census in 2008 for Khartoum State [61].

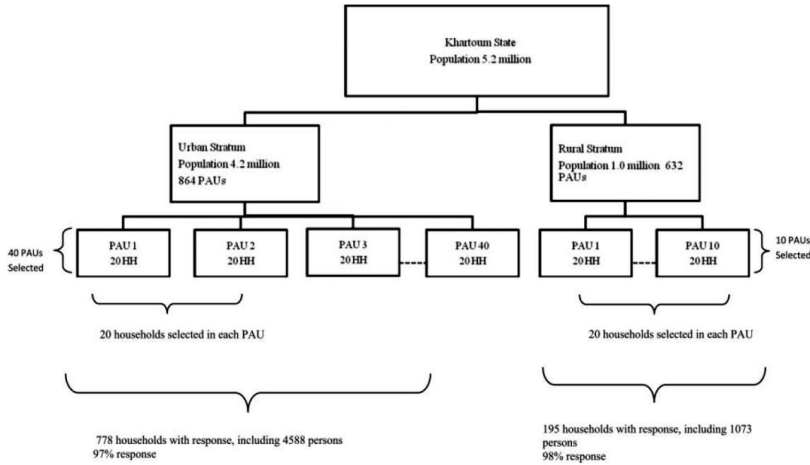


Figure 9: Sampling frame, El Tayeb et. al. [70]

Sample size calculation

The sample size calculation for the survey among Khartoum State population from 2008 census was used as a basis for the calculation for two stage cluster sampling [29, 61, 71, 72]. The sample size was calculated prior to the field work. It was based on the fact that the prevalence of injuries in Sudan is unknown, and different scenarios were calculated to give a range of sample sizes. The table 2 below shows sample sizes for a cross sectional study at 95% confidence level using different estimates of prevalence and different levels of precision. The sample calculation formula is given below:

$$s = 1.96^2(r)(1-r)(f)(1.1)/e^2(p)(n)$$

s= sample size

z= level of confidence 1.96

r= prevalence

e= absolute precision

n= average persons per household

f= design effect (2)

d= absolute precision

1.1 = factor necessary to raise sample size by 10% to allow non-response

p= proportion living with low socioeconomic status ¹

¹ Low socioeconomic status was defined as those below the 20th percentile of Sudan's wealth index from SHHS-1

The estimated prevalence chosen to calculate the sample size is 10% at a confidence level of 95% and absolute precision of 3%, which gives a sample size of 1006 households.

Table 2: Sample size calculation

Estimated prevalence	Sample size	Confidence level	Absolute precision
5%	531	95%	3%
10%	1006	95%	3%
15%	1425	95%	3%
20%	1789	95%	3%
20%	644	95%	5%
50%	1006	95%	5%

Definitions of terms

The most common definitions as below were given to the data collectors. The definition of causes was derived from the ICD-10 and WHO.

Household was defined as a group of people or one person who most often belong to the same family, who not only live together but also eat and share the same food source [29].

The injury definition was the WHO definition and examples of injuries were given to participants [29].

Violence was defined by the World Report on Violence and Health: "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, mal-development, or deprivation." [73]

Road traffic injury is an injury which resulted from a road traffic crash which encompasses motorized and non-motorized vehicles [74].

Falls were defined as unintentional events which result in a person resting on the ground or lower level [74, 75].

Burns were defined as 'an injury to the skin either due to heat, or chemicals, electricity, radiation or friction' [74, 76].

Poisoning is an injury caused by drugs, medicaments, gas and biological substances [74].

Drowning is 'the process of experiencing respiratory impairment from submersion/immersion in liquid' [77].

Disability days were defined as the days a person was not able to perform normal daily activities such as brushing teeth, bathing, cooking, and going to school or work.

Logistics' environment

The fieldwork was coordinated from an office location in the center of Khartoum city. The preparation, printing and photocopying of questionnaires took place in this location. A stationary shop was allocated to provide all the stationary equipment needed for the survey. The training of data collectors was carried out in the CBS building where a seminar room was provided. The data collectors were recruited from the CBS and all had previous experience with household survey work. Their educational background was either university graduate or undergraduate. The twelve data collectors were divided into three teams and each team had a field supervisor appointed. Mini-vans were provided with a driver for the three teams. The author of this thesis was driving a car to the different study locations for purpose of supervision. For the rural locations which were off road a Land Rover was rented to overcome the road challenges. Ahfad University for Women (Sudan) has facilitated the logistics in cooperation with the CBS and the Federal and State Ministry of Health.

Data collection

Questionnaires

Three data collection tools were used for this survey. Face to face interviews using structured questionnaires were utilized to collect the data. All questionnaires were structured in English, translated into Arabic and back translated. The first questionnaire focused on socio-demographics of all household members and housing characteristics using the SHHS-1 and the latest census variables [61, 78]. The second questionnaire focused on details in connection with an injury event, with a recall period of 12 months. This questionnaire used the guidelines for surveys on injuries and violence, and the nature of injuries and body site matrix was developed by using existing surveys The Alliance for Safe Children and National Health Interview Survey, (UNICEF/TASC and the NHIS/US surveys) [79, 80]. The third questionnaire dealt with fatal injuries which had occurred during the past 5 years preceding the incident, and it was developed by the author of this thesis and co-authors. The data collectors were vigorously trained on how to approach households in order to decrease non-response. All the questionnaires were pretested with further training of research assistants and modifications were made.

The female heads of household were identified as respondents. In Sudan, female heads of household are usually more knowledgeable of the events affecting the family and other relevant details. The national surveys in Sudan (e.g. Sudan Household Health Survey) normally rely on them as main respondents.

Pretest

A pre-test was conducted in order to refine the questionnaires. The sample size of the pre-test was 100 households. On the basis of the pre-test, modifications were carried out and a field definition manual was produced. Due to challenges with the disability term in Arabic it was modified to ‘days unable to perform normal daily activities’ and clarifications were given to the data collectors.

Data collectors

Data collectors were recruited from the CBS based on their previous exposure to household surveys and a level of education above secondary schooling. Job interviews were carried out where potential candidates were evaluated for a prospect to work with the survey. Twelve data collectors (8 women and 4 men) with previous household survey experience were recruited and trained over three days. The field supervisors with fieldwork experience were chosen on the basis of a recommendation of the CBS. The data entry personnel underwent the same process of recommendation.

The data collection process

Information was collected on all household members by interviewers who administered the questionnaires. The sampling process took an average of 3-4 hours each day. The data collectors used the structured questionnaires to collect the data. The interview process for each household took an average time of 45 minutes up to one hour. Three clusters in total were sampled and interviewed by the three data collection teams. The principal investigator (PI) chose to randomly attend the interview process with the different data collectors in different cluster sites. The principal investigator examined all questionnaires to check for consistency and completeness.

Data entry and cleaning

Three data entry persons with previous data entry experience were recruited. The data entry process was completed in a total of one month. The data were double entered for 15 percent of the questionnaires for verification. The questionnaires were transported to Norway with the principal investigator for data cleaning by screening, diagnosing errors, and editing as proposed by Van den Broeck et. al [81]. The first variables to be checked for errors were the sociodemographic variables, the injury causes, the data entry for each injury event and disability days. Frequencies and cross tabulations were used to detect any outliers. The program used for data entry was CS-Pro Version 4.1 (U.S. Census Bureau) and data cleaning was performed in IBM SPSS version 18.

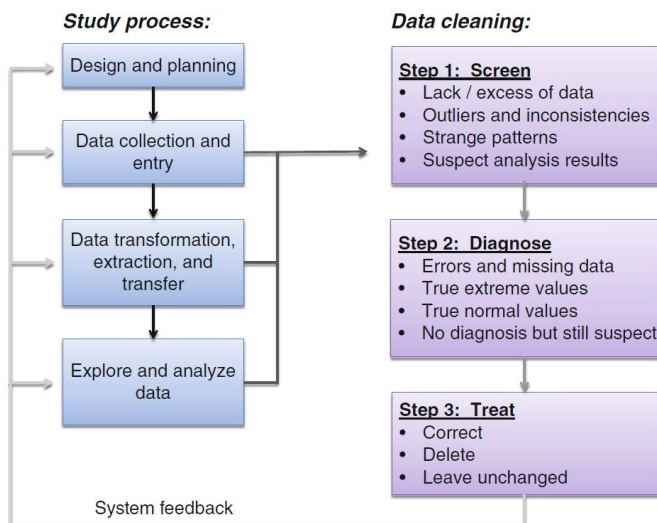


Figure 10: Data cleaning framework by Fadnes & Van den Broeck [82]

Data analysis

The data set was analysed according to the pre-analysis plan by the principal investigator and co-authors. Two programs were used to analyse the data: IBM SPSS version 18 and STATA

version 11 (Stata Corporation). The SPSS program was used to run principal component analysis, regression models, chi-square tests and simple frequencies. The incidence rates were computed using STATA and in addition modelled by Poisson regression.

We utilized a proportionate probability sampling technique which produced a self-weighted data set. We obtained similar results to the census data with minimal discrepancies, which confirms that our data were self-weighted (see Figure 10 and 11) for illustration. Age distribution for survey and census were almost the same for age groups 0-4 (~12%), 15-24 (~22%), and 25-44(~28%) (see Figure 10 and 11). A high response rate ensures representativeness of our results. When carrying out complex analysis for survey data, applying weights would in practice not make any substantial difference. Therefore, the analysis was presented without such a procedure.

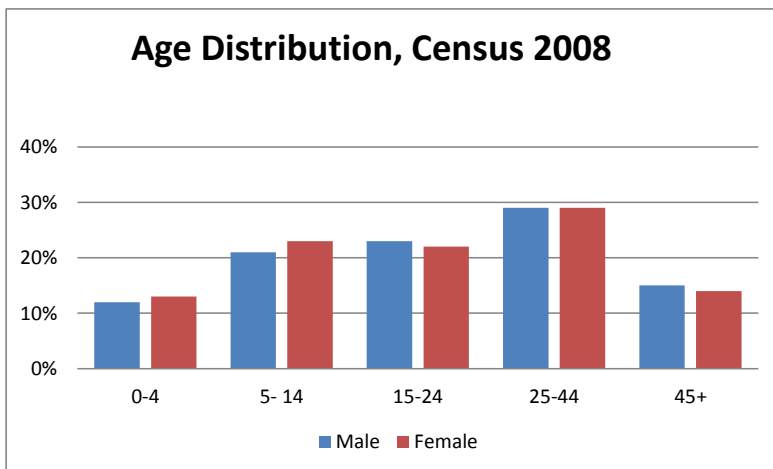


Figure 11: Census 2008, Age Distribution

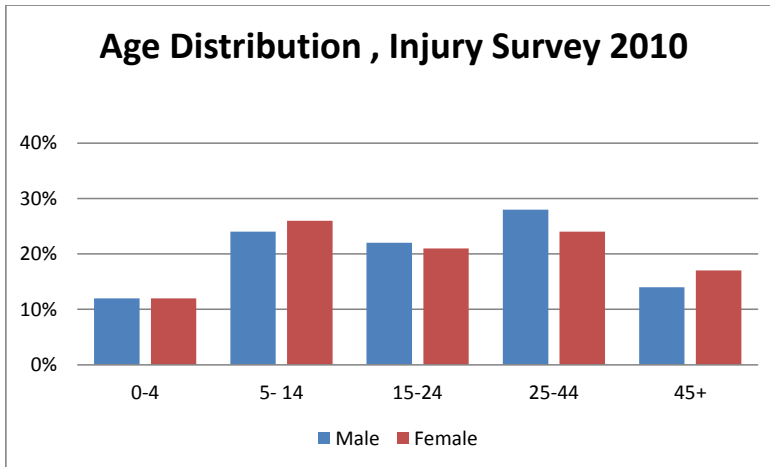


Figure 12: Injury Survey 2010, Age Distribution

Principal component analysis was carried out to construct a *wealth index* from the following variables: home ownership, dwelling type, number of rooms, water source, type of toilet facility, source of lighting, type of fuel used for cooking and assets owned by the household. The construction of the wealth index was based on specific recommendations for developing countries and the method was validated [83-87]. Information on income was not enquired about due to the sensitivity of the subject which might hinder a successful questionnaire process. Therefore, this analysis has produced a proxy wealth index for the household.

The matrix which was designed to capture the affected *body site* and *nature of injuries* resulted in 70 variables in the dictionary, which subsequently led to small numbers in many combinations. For this reason complete cross-tabulation of body site and nature of injury was not feasible. As a result the data set was analysed by aggregating the variables to produce meaningful results.

The frequencies of *fatal injuries* were presented in the results. The sample size calculation was not meant to capture deaths and due to the small numbers we could not calculate the mortality rate. The mortality findings were still relevant to present and are too precious to be disregarded, given the dearth of representative population-based injury mortality data at cause level in Sudan.

The *disability days* were computed in various categories of the data set. Technically they are annual counts since they represent the number of days being disabled 12 months preceding the interview. The intention was to present numbers based on our sample. In this manner, the relative size between different categories could be regarded as an estimate of the corresponding relative contributions to the days lost in the underlying study population.

With regard to incidence calculation, complex cluster sampling analysis was performed to take into account the clustering effect. In the regression analysis the results were almost identical with the same point estimates and only slightly wider confidence intervals. Therefore, we have chosen to present the original results without the complex analysis.

Chi-square tests were used in cross-tabulations to test for significant differences between various categories. In addition a chi-square test for trend analysis was used in contingency tables.

A Poisson regression analysis was used to model injuries occurring in the 12 month period before the interview. The person-years were included in the model, the dependent variable being the injury and independent variables sociodemographic characteristics to identify sample population groups which were at higher risk of an injury.

Multivariate analysis utilizing a GLM (generalized linear model) based on the negative binomial distribution was used to produce interpretable conclusions for policy planning about significant differences over population categories. The dependent variables were the number of disability and hospitalization days. The estimates of the associations were not included because it is difficult to interpret what risk means with these dependent variables. Therefore we have reported only the p-values.

We have used logistic regression analysis to take into account potential confounding of other variables when you are looking at effects on the probability of using formal healthcare or not. Potential confounding factors such as age, sex, occupation, socioeconomic status etc. were included in the models.

Table 3: Statistical methods utilized in the study

Analysis	Paper I	Paper II	Paper III
Frequencies	+	+	+
Means		+	
Median		+	
Pearson's chi-square	+	+	+
Principal component	+	+	+
Incidence per 1000	+		
Poisson regression	+		
Negative binomial		+	
Logistic regression			+

Statistical significance was considered as attained for a P value of < 0.05 and confidence intervals at 95% were used.

Ethics

The study was approved by the National Health Research Ethical Committee (Sudan). A written consent was obtained from interviewed respondents. Not all injured persons in the survey were respondents. If the injured was absent or below age of 18 a proxy was the respondent. No one below the age of 18 was interviewed alone. A thumb print was obtained from the illiterate respondents, or they were asked to put a mark next to the signature part in the consent form. The third party consent was obtained from all households interviewed.

Data collectors were told to be understanding and compassionate towards victims. If the respondents were too upset the data collectors were told to pull out from the interview and come back the following day.

Competing interests

The author of this thesis and co-authors declare no competing interests.

4. Results

Background characteristics of the survey's population (Paper I + Paper II + Paper III)

The actual number of individuals included was 5661, residing in 973 households. The household response rate in both the urban and rural clusters was 97%. The average household size for the state was 5.8. The overall male to female sex ratio was 0.98:1, and 39% of the sample was below the age of 15 years. Injuries that resulted in at least one day of normal daily activity lost were 441.

Paper 1

Injuries in Khartoum state, the Sudan: a household survey of incidence and risk factors

In this paper we reported incidence rates, causes and risk factors for non-fatal injuries. The total person time calculated was 5377 person-years. Analysis of incidence by urban–rural stratification was conducted, showing no significant difference ($p = 0.75$). In urban areas, 91% of injuries were unintentional, compared to 95% in rural areas. The overall injury incidence rate was 82.0/1000 person-years-at-risk (95% CI: 74.5, 90.0). Stratifying the incidence by sex showed a significant difference between males and females. The total incidence for males was 110.6/1000 person-years-at-risk (95% CI: 98.4, 124.0) while the total incidence for females was 69.2/1000 person-years-at-risk (95% CI: 59.6, 79.9).

The overall leading causes of non-fatal injuries were falls followed by mechanical forces (such as cuts, stabs, struck by object, etc.) and road traffic crashes. The distribution of causes differed among males and females ($p < 0.001$).

Risk factors

The multivariate analysis showed that males had an increased likelihood of injury. After adjustment for other potential risk factors, level of education was associated with injury rates in rural areas only. In that stratum, persons with lower level of education were protected against being injured by 60%. Socioeconomic status was associated with injury rates in urban areas only, with the lowest and low quintiles carrying a higher risk.

Paper 2

Socioeconomic and disability consequences of injuries in the Sudan: a community-based survey in Khartoum State.

In this paper we explore the socioeconomic consequences of disability caused by injuries.

Mortality

There were 28 deaths due to injury out of a total of 129 reported deaths over five years. The death toll affected males mostly (n=23). A total of 15 victims were above the age of 45. The place of death was the site where the injury occurred. The majority of deaths occurred immediately (n=13).

Body site and nature of injury

Cross tabulation of body site and mechanism of injury showed that the most affected body sites in falls were the upper and lower limbs. The falls were responsible for 60.0% of fractures and 48.1% of dislocations. About 40% of the spine injuries were due to road traffic crashes.

Disability

Among the non-fatal injuries, 48 (10.9%) claimed they had a permanent disability. A total of 320 persons with non-fatal injuries claimed they had suffered a physical disability as a consequence of an injury. Major presentations of disability were limping and inability/difficulty of using a hand/arm.

Mean hospitalization days depended significantly on socioeconomic status, injury mechanism and activity when injured. Low socioeconomic status was associated with long hospitalization. Falls had a longest mean hospitalization followed by traffic crashes with 13.8 days. Road traffic crashes led to the longest period of disability followed by falls. The most serious injuries in terms of disability days occurred during paid work.

The crude number of disability days corresponded to a burden of 215 days per year in a population of size 100,000. More disability days were reported by males than females for minor injuries (less than 30 disability days) except in the age group 45+. For both minor and major injuries the age group 16-44 years carried the largest number of disability days and

contributed with 50.3% of the total number. Major injuries in males caused by road traffic crashes represented the leading mechanism in terms of the burden to society expressed by disability days. In the same category for females, falls represented the leading cause.

The stratification by socioeconomic status showed that for minor injuries, males with low socioeconomic status had the largest total number of reported disability days (353 days). For major injuries males in the higher middle socioeconomic stratum had the highest number of disability days (699 days).

Economic impact

Among those injured who had been employed at the time of the injury, a total of 9.3% lost their job as a consequence, 34% of whom were heads of households. The percentage differed significantly between genders, 13.4% of males having lost their jobs compared to 4.2% of the females. In lower socioeconomic strata about 15.8% reported to have lost their jobs and in higher socioeconomic strata about 5.4%.

Paper 3

Utilization of healthcare services by the injured in Khartoum state, Sudan: a household survey

The aim of this paper is to examine healthcare utilization for those who are injured in urban and rural Khartoum state. A total 260 out of 441 injury events was followed by use of formal healthcare, of which 177 (68%) persons went to hospitals and 66 (25%) persons went to clinics/health units/doctors independently of the facility belonging to the private or government sector. The 38% representing those who used informal healthcare, corresponded to 26% using home treatment and 12 % seeking help of bonesetters and traditional medicine.

Pre-hospital care and type of health care

First aid was provided for almost half of the total number of injury events (46%) by the family or friends (34%). About 20 per cent of the injured persons who utilized formal healthcare were admitted to hospital. Public formal health care facilities treated half of the total number of injuries. Three quarters of those suffering road traffic injuries (RTI) utilized public health

services while about 38% of those injured after falls were treated at the public facilities. Almost half of the burns were treated at home.

Transport

One third of the lowest socioeconomic group walked or used public transport to reach a health facility. In the case of the highest socioeconomic group, half of those affected used a private car to reach the facility. A quarter of urban and rural residents who were injured used a private car as means of transport to reach the health facility, with no significant difference between the two areas. Almost 60% of the middle socioeconomic strata preferred to use a taxi or public transport. The majority reached the health facility in less than an hour in urban area.

Use of healthcare services: a regression analysis

Males were almost twice as likely to utilize the formal healthcare services as females. Compared to those with no education, persons with primary education were less likely to utilize healthcare service. The lowest socioeconomic group was less likely to utilize the formal health services. Cause of injury also played an important role for choosing formal health care, where those injured after falls followed by mechanical injuries and burns, were less likely to utilize the healthcare facilities than those affected by RTI. Acquiring an injury in a sports/athletic arena made it less likely to utilize formal healthcare as well.

Reasons for and against utilizing formal healthcare

Among the lowest socioeconomic strata the main reason for utilizing formal health care services was the seriousness of the injury, while for the highest socioeconomic strata the main reason was the distance to the health facility. The proximity of the health facility was expressed as one of the main reasons to utilize formal healthcare services across all the socioeconomic groups. For those who did not utilize formal health care the main reason given was that they suffered a minor injury only, for both males and females. Distance was another barrier expressed by persons in lower socioeconomic strata. Affordability of the formal health service was ranked as a third cause among those injured.

5. Discussion

5.1 Methodological considerations

Epidemiologic studies are meant to measure the distribution of disease or injury events, and sometimes they do not tend to measure exactly what they are supposed to. This is due to bias which is defined by Rothman as the ‘error to be the difference between the unknown correct effect measure value, such as an incidence rate ratio, and the study’s observed effect measure value’ [88]. Bias is a systematic error [88]. In addition there is random error which can also be referred to as chance. Confidence intervals can give an indication of the magnitude of the random error [89].

Study design

The survey design used in this study enabled the collection of data on various domains of injury metrics in a large sample at relatively low cost. In our study there was no substantial difference between the study sample and the state’s population’s sociodemographic characteristics. This ensured that all major subgroups of the population were represented in the sample. The cluster size was 20 households which yielded higher statistical precision.

The study power with regard to fatal injuries was limited because the sample size calculation did not target fatal injuries. Thus, the fatal injuries captured in this study could not be included in any complex statistical analysis, due to the small numbers. A recall period of 5 years was used to capture fatal injuries. Nevertheless, the captured deaths give valuable information about the most serious potential outcome after injuries.

Internal validity

The internal validity of the results produced by this study may be affected by information bias, selection bias and confounding. Each type of bias will be discussed.

Information bias

The questionnaire was pretested to ensure higher data quality through identifying practical problems with implementation. However, *recall bias* in our study was due to the 12 months recall period. A recall period of 3 months has been proven by studies in Vietnam to be more reliable to capture seasonal variations and capture most minor injuries [90, 91]. A recall period of 12 months has been shown to capture severe injuries in a study from Tanzania [92]. The long term aim of our study was to lay the groundwork for preventing major injuries, due to their extensive effect on individuals and the society. This is why the specific recall period was chosen to capture major injuries. This might have resulted though in underestimation of minor injuries which have occurred earlier in the recall period. Respondents were told about major events in the preceding year's calendar in order to help them retrieve information.

Missing data can also introduce bias; in this survey it was minimal ranging from 0.005% to 10% in some individual questionnaire items.

Another kind of bias which might have been encountered when conducting the survey is the *social desirability bias*. Social desirability bias may have been present when asking about sensitive issues such as violence and self-harm [93, 94]. Injuries resulting from gender-based violence and political abuse of power may have been problematic to communicate during the survey. Self-harm injuries are considered a criminal offense and sinful in Sudan and other similar settings [95]. In other conservative societies this has been a challenging topic to address in research [95, 96]. To minimize these bias data collectors were trained rigorously to make respondents comfortable and assured on confidentiality when approaching questions which dealt with these sensitive areas.

Reliability and validity

The validity expresses how sure we are that the tool was set to measure what it is supposed to measure. The questionnaires were constructed on the basis of previously tested tools including WHO guidelines for injury surveys, SHHS-1, UNICEF/TASC and the US/NHIS surveys. Test-retest reliability of survey tools is usually studied to determine whether there are variations in the measurements taken by a single person or by the tool. The degree of agreement gives an impression of how stable and consistent the tool is. This test-retest has not been carried out for the survey tool due to logistic reasons.

Selection bias

Community-based surveys are usually less prone to *selection bias* since they include most subgroups of the population. The injury definition we have utilized in this survey included all categories of severity of injuries, without restrictions, unlike the definition of an injury as ‘severe enough to seek medical attention’. We saw this type of definition problematic in a setting like Sudan where there is no free basic health coverage for the whole population, which subsequently restrains the healthcare utilization. Including all injuries, regardless of healthcare sought, contributes to minimizing selection bias. To reduce selection bias, the number of days a person was unable to perform normal daily activities after an injury were recorded and taken as a proxy of severity instead of relying on the type of healthcare sought. The analysis included injuries which caused at least one day disability.

Non-response can result in selection bias. The non-response to individual questionnaire items in this study was in the range of 3-4 %. This means that most likely all major subgroups of the population were properly represented in the study.

Confounding

Confounding is where the effect between exposure and outcome is distorted by another variable which is associated with exposure, and is an independent determinant of the outcome but is not a mediator of the association in the casual pathway [88, 89]. Potential confounders were controlled for in this study when analyzing associations [88]. Bivariate and multivariate analysis in addition to stratification was performed to adjust for several potential confounders. The potential confounders such as age, sex, level of education, socioeconomic status, and occupation were included in the model. We have not included severity as a potential confounder in the regression model for formal healthcare utilization of the injured (Paper III). Instead we have included the mechanism of an injury and activity to compensate for severity variable.

External validity

The results obtained from the three articles in this thesis can be extrapolated to the Khartoum state's population because The sample was representative of the state's population for age and sex distribution. The results cannot be generalized to the whole of Sudan, because Khartoum State has different population characteristics and is therefore not representative of all Sudan.

5.2 *Discussion of the main findings*

The burden of injuries

Although fatal injuries were reported in a descriptive way, the data have still generated important results. The majority of the deaths occurred immediately and at the place of injury. This finding highlights the importance of immediate emergency response where lives can be saved. Having an ambulance available does not guarantee prevention of death but the important issue is rather what management is given to patients during transport time [97]. In a setting with resource constraints the training of potential responders has been proven to lower mortality [97, 98]. Most of the trauma deaths were due to road traffic crashes, which give an indication of the severity of injuries they cause.

We have tried to quantify the magnitude of non-fatal injuries by calculating an incidence rate. The incidence of injuries for Khartoum State was found to be 82/1000 person years. The national percentage of people who suffered an injury in the past 12 months was found to be 2% by the SHHS-2 [99]. A possible explanation for the difference could be that SHHS-2 covered many aspects of health while our survey was geared to injury specifics. Interestingly, Ghana had a higher an incidence of 178/1000 person years for major injuries and 19/1000 person years for minor injuries in urban settings [100]. In rural communities in Vietnam and Nigeria, an incidence of 89/1000 and 75/1000 person years has been reported [90] [101]. Although persons from rural areas are exposed to different risks due to their work activities, our results might have been similar to those from rural environments because Khartoum State, although mostly urban, is less densely populated than most African urban-settings. A study from Iran had a higher incidence of injuries, 189/1000 person years, while studies from China and Uganda reported lower rates of injuries [102-104].

Main risk factors for injuries

Socioeconomic risk factors

Findings from Papers I, II and III have shown clear associations between socioeconomic status and various aspects of injuries. As in many health-related issues the socioeconomic status plays a central role in determining health outcomes [105-107]. Even in high income countries low socioeconomic groups have worse health outcomes [108]. Paper I has shown that the magnitude of injuries is larger in lower socioeconomic groups. Paper II findings related to consequences of injuries; here the days lost to a disability were found to be much higher in lower socio-economic strata. The low socioeconomic groups had a higher percentage losing their jobs and seeking economic adaptation strategies such as borrowing money and selling belongings. Paper III showed that the lowest socioeconomic stratum is less likely to utilize formal health care services. Many studies have confirmed the influence of socioeconomic status on the risk of injuries, either at the individual or the community level [109, 110]. Our results are in line with other studies from high income [111, 112] and low income countries [109]. Although the findings are not new in the area of global public health, they still constitute valuable evidence which can be used to develop social welfare policies and injury prevention programmes targeting this vulnerable part of the population.

Gender and injuries

We found that males were represented in 60% of the fatal injuries although they represent 53% of the population of Khartoum [61]. Males are more at risk of dying, which can be attributed to more risk taking behaviours. Males in our study were twice as likely to acquire an injury as females. Our findings are confirmed by what is reported by the SHHS-2 on a national basis [99]. Males are usually more exposed to work environments that subject them to risk of injuries. Males in Sudan are usually the breadwinners in households, and they are most commonly employed in comparison to females. The gender disparity in health outcomes has been well documented [113] and evidence from our study supports this. In paper II males were found to have a higher number of disability days, which means that males tend to have more serious injuries. They are also more likely to lose a job, leaving them and their families at risk of economic adversity [22]. In other African settings males also reported longer

disability durations and more severe economic consequences [100, 104] . It is important when planning injury prevention programmes to have a special focus on males.

Causes of injuries

The leading causes of injuries are important to identify in order to determine injury prevention targets. In our study these were falls, mechanical forces, and road traffic crashes (Paper I). This pattern has been reported in many studies from Nigeria, Iran, Sri Lanka, and Nicaragua, where similar methodology was used to collect data [114-116]. These leading causes include minor and major injuries, which can be misleading when examining the magnitude without taking into account the disability days. When exploring the leading causes by adjusting for the mean disability days we find that the leading causes are road traffic crashes, falls and violence. A study from Ghana and Tanzania reported falls and transport injuries as the leading causes of disability days [100, 117]. The leading causes for mean hospitalization days were falls, road traffic crashes and violence.

Workplace injuries are becoming increasingly demanding and they are responsible for a large proportion of injuries in LMICs [118]. Globally, the number of work-related injuries has been estimated to be 100 million annually [119]. In our study injuries which resulted in the longest disability period were observed when people were involved in work activities. There are few studies in Sudan which have explored occupational injuries after 2005 when new laws were introduced which made documentation of work injuries mandatory in the industrial sector [120]. Research from Zambia's 2009 Labour Survey concluded that 8% of their study sample sustained an injury during work in the past 12 months preceding the interview and as a result about 60% of that proportion were absent from work [121]. It is important when planning prevention programmes to consider occupational injuries and promote safer work environments. Sudan has compensation laws but the implementations of these laws are unknown.

Health care utilization by injured persons

In our study first aid was found to be given to only half of the injured. This may imply that there are few people with first aid training and that emergency care was not given before reaching the health facility. Moreover there was only minimal health system response to trauma emergencies, and the majority of injured persons reached healthcare facilities by

private car or by using public transport. The responsiveness of the health system is crucial for population's trust and satisfaction [122]. If the health system cannot provide transportation and pre-hospital care in constrained resource settings, there is a need for training potential lay responders in first aid. This has been recommended in various LMICs. Razzik and Kellermann have suggested that primary health care centres should be involved and trained to respond to emergency cases, not only for the provision of primary prevention [123]. Primary care centres are usually within close proximity of communities. Training medical professionals in these centres in providing basic emergency care and in stabilizing patients for transport to tertiary care may save many lives and prevent disability [123].

Only half of the injured in our study utilized the formal healthcare system. This pattern has been documented from many countries and with different disease phenomena [123, 124]. In Ghana it was reported that only about half of the injured used formal healthcare [125]. Evidence from our regression analysis shows, that injured persons in low socioeconomic strata were less likely to use formal healthcare. A study from Khartoum State on women delivery care seeking behaviour has also shown that households with low income utilize modern delivery care less frequently [126]. Poor use of modern health services is a natural repercussion after the health reform that introduced user fees in Sudan, making formal health care less approachable for lower socioeconomic groups. In a country where the out-of-pocket expenditure on health is estimated to be 95% this makes it harder for poor populations [127]. User fees have been identified as barriers to use of formal healthcare in African settings [128]. This situation calls for solutions such as universal health coverage, as proposed by WHO, to lower the burden of disease and injuries on the population and to mitigate economic hardship [97, 129].

Use of informal healthcare

Informal healthcare has been chosen by a large number of respondents in our study, with 26% using home treatment and 12% using traditional medicine/bonesetters. Traditional medicine is part of the Sudanese culture and has been historically present [45, 130]. The use of bonesetters or traditional orthopaedic practitioners has been observed in various places both in Sudan and in other LMICs [131-134].

The preference for home care use in our study could be due to the individual's or family's perception of how serious the injury was, or by barriers experienced, leading injured persons to resolve to home remedies. A national health seeking behaviour survey has reported that 70% of last child deliveries occurred at home, administered by midwives, which reflects a low utilization of healthcare services [135].

6. Conclusions and recommendations

Evidence from studies in this thesis gives essential information on all cause injury specific events, on consequences for individuals and families, and on health care use patterns in Khartoum State. There is a need for priority setting on the prevention of injuries in Khartoum State by policy makers and hopefully the information elicited in this study can contribute to that process.

The overall incidence rates reported by this study provide baseline information on injuries in the most urbanized state in Sudan. There is an urgent need to consider injuries in Khartoum as a public health concern. The leading causes of injuries are falls, mechanical forces and road traffic crashes. The most disabling injuries are road traffic injuries and fall injuries. Special emphasis should be given to primary prevention of the leading causes of injuries by prioritizing falls and road traffic crashes. Studies specific to road traffic crashes and falls are needed for planning and evaluating injury prevention programmes.

Home and streets have been identified as the places where most injuries occur. Urbanization of Khartoum State has resulted in an infrastructure boom. Therefore, the evaluation and modification of the built environments where people live, eat, play and work, in a multi-sectoral approach, can aid in developing injury prevention strategies. Such types of studies are in line with global initiatives on road safety to reduce the burden of road traffic injuries in LMICs. Raising awareness of safe home environments with minimal hazards is necessary by different stakeholders.

Most injured people in this study reported being injured during work activities. Preventive measures within an occupational health framework should be implemented. Research on magnitude of and risk factors for occupational injuries is needed to help prevent these types of injuries and ensure safer working environments.

The most vulnerable population groups for injuries were found to be low socioeconomic groups and males, bearing the largest burden and most serious consequences. Health and social security policies should aim at targeting high risk groups in order to minimize the burden. The economic cost of an injury on individuals, families and the health system was not investigated in our study. However, there is a need to quantify the actual cost of injuries

and their implications. This study has looked at all cause-injury risk factors, therefore future studies are needed for exploring cause-specific risk factors and identifying groups of the population at risk.

The consequences of injuries expressed in disability and hospitalization days have reflected the necessity to follow up patients and observe the long-term outcomes of these disabilities. There is a serious paucity of long-term disability research globally. This kind of research will help the health system forecast and prevent further complications of injuries.

For most fatal injuries in this study death seemingly occurred at the injury location. In non-fatal injuries only half of the injured received first aid, and almost half received treatment from the formal healthcare system. The upper and lower limbs were the most affected body regions presenting with fractures. Secondary or tertiary prevention of injuries in terms of upgrading the trauma care system and rehabilitation is important. How the health system responsiveness towards trauma patients can be enhanced needs further investigation. There is a need for cost effective solutions to formal emergency care, by collaborative programmes with medical professionals for training of potential first aid responders.



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9. Appendix

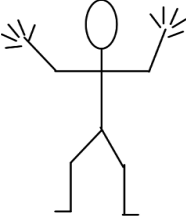
A. Socio economic status			
No.	Question	Category	Code
23.	What is the type of ownership of the household?	Freehold1 Leasehold2 Rented.....3 Staff housing.....4 Gifted.....5 Other.....9	<input type="checkbox"/>
24.	What is the nature of the household building	Rakuba.....1 Tent.....2 One floor (mud house).....3 One floor (bricks/ cement).....4 Flat.....5 Villa.....6 Other.....9	<input type="checkbox"/>
24.	How many rooms belong to this household?	Number of rooms.....	<input type="text"/>
25.	What is the main source of drinking water in this household?	Water filtering stations (with common network/pipes).....1 Mechanical boreholes (with common network/pipes)2 Hand pumps3 Running open water source (river , pond, tura'a)4 Water Vendor (tanker, cart-bearer) from deep boreholes.....5 Other(<i>specify</i>)9	<input type="checkbox"/>
26.	What is the main source of lighting for this household?	No lighting1 Public electricity.....2 Private electricity (generator).....3 Paraffin lantern.....4 Paraffin lamp.....5 Other(<i>specify</i>)9	<input type="checkbox"/>
27.	What type of fuel your household mainly use for cooking?	Firewood.....1 Charcoal.....2 Gas3 Electricity.....4 Paraffin.....5 Animal dung6 Agricultural crop residue7 Other (<i>specify</i>)9	<input type="checkbox"/>
28.	What is the main type of toilet facility used by this household?	Pit latrine (private).....1 Shared pit latrine.....2 Flush toilet3 Other(<i>specify</i>).....9	<input type="checkbox"/>
29.	Do you have a refrigerator?	Yes1 No2	<input type="checkbox"/>
30.	Do you have a satellite dish or cable subscription?	Yes1 No2	<input type="checkbox"/>
31.	Do you have an air cooler/ conditioner?	Yes1 No2	<input type="checkbox"/>
32.	Do you have a car?	Yes1 No2	<input type="checkbox"/>
33.	Do you have a computer?	Yes1 No2	<input type="checkbox"/>
34.	Do you have an internet prescription?	Yes1 No2	<input type="checkbox"/>

Questionnaire 2 for injured persons:

1. Locality: 2. Administrative unit 3. Popular administrative unit:
4. Cluster: 5. Household serial no. 6. The injured person line no.
- Injured person name: _____
7. Injury Number:
8. Who is the respondent for this interview?
The injured person is the respondent: yes=1 no=2 Interviewer name /I.D.....
9. Date of injury in the past 12 months:

No.	Question	Category and code	code
	A. Injury event factors		
10.	Where were you when you/injured person were injured?	home 01 school 02 street/highway..... 03 sports and athletic area 04 farm..... 05 industrial/construction..... 06 commercial area (shop, store, office) 07 lake, river, wells..... 08 other (<i>specify</i>)..... 96 unknown..... 99	<input type="text"/> <input type="text"/>
11.	What were you doing when you/injured person (same applies to questions and responses) were injured?	Paid work..... 21 Going to and from work..... 22 Unpaid work (including housework)..... 23 Education..... 24 Sports and athletic area..... 25 Leisure/play..... 26 Vital activities (i.e. sleeping, eating, washing)..... 27 Travelling..... 28 Unspecified activities (hanging around, doing nothing)..... 29 Other (<i>specify</i>)..... 96 Unknown..... 99	<input type="text"/> <input type="text"/>
12.	What caused your injury (how were you hurt)? (how was the injured person hurt)?	Traffic 31 Fall..... 32 Struck/hit by person or object 33 Stab..... 34 Gun shot..... 35 Fire, flames or heat 36 Drowning or near-drowning..... 37 Poisoning 38 Animal bite..... 39 Electricity shock..... 40 Other (<i>specify</i>)..... 96 Unknown..... 99	<input type="text"/> <input type="text"/>
13.	How did the injury happen? Was it an accident, did someone else hurt you, or did you hurt yourself?	It was an accident (unintentional)..... 1 Someone else did it to me deliberately (intentional)..... 2 I did it to myself deliberately (self-inflicted)..... 3 Don't know..... 9	<input type="text"/>

14. What physical injuries did you sustain?
(Point on diagram)



	Head	Neck	Face	Chest	Abdomen, waist, pelvis	Upper extremity	Lower extremity	Spine
Fracture								
Sprain/Strain/Twist								
Dislocation								
Cut/Bite/Bruise Superficial (only skin)								
Cut/Bite/Bruise Deep (Skin and underlying muscle)								
Burn								
Poisoning								
Concussion with loss of consciousness								
Internal Injury (Requiring abdomen or chest surgery)								
Other (specify)								

15. In the 6 hours before you were injured, did you have any alcohol to drink (even one drink)?

Yes.....1
 No.....2
 Not applicable.....3
 Refused.....7
 Don't know/can't remember.....9

C. Medical care and treatment

16. Did anyone try to help you by giving you first aid? (For example like help with the breathing, stop the bleeding, fixation of the fracture...etc this doesn't include helping to stand or walk or riding the vehicle)

Yes1
 No (**skip the next question17**).....2
 Don't know9

17. Who gave you first aid after you were injured?
(can have more than one answer)

Bystander.....21
 Friend/family.....22
 Teacher.....23
 Police.....24
 Ambulance personnel.....25
 Doctor.....26
 Nurse.....27
 Fire brigade personnel.....28
 Other (specify).....96
 Don't know.....99

18. After you were injured, did you seek medical attention/treatment?

Yes.....1
 No.....2
 Don't know/Can't remember.....9

19.	What type of health facility did you go to?	Governmental.....1 Private.....2 Not applicable (traditional healers, home treatment).....3 Don't know.....9	<input type="checkbox"/>																
20.	Where did you seek medical treatment for your injury? (can have more than one answer)	Home treatment.....01 Hospital.....02 clinic.....03 health centre.....04 health unit/post.....05 dispensary.....06 health worker.....07 mobile/outreach clinic.....08 Traditional practitioner/healer/bone setter.....09 Pharmacy/drug store.....10 Outside the country.....11 Other (specify).....96	<table border="1" style="width: 100%; height: 100%; text-align: center;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>																
21.	If you have sought medical treatment list the order from first place, second place, ..etc (according to the choices given above)	1..... 2..... 3..... 4..... 5.....	<table border="1" style="width: 100%; height: 100%; text-align: center;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>																
22.	According to the answers in Q.19 : Why did you seek health care in the first place sought? Why did you seek health care in the second place sought? Why did you seek health care in the third place sought? Why did you seek health care in the fourth place sought?	cheap21 close to where I live22 medicine available23 serious injury24 not serious injury25 short waiting time26 for known treatment27 health insurance.....28 other (specify).....96 unknown.....99	<table border="1" style="width: 100%; height: 100%; text-align: center;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>																
23.	If you did not use governmental health services or had home treatment, why? (Can have more than one response)	Not available31 Expensive32 Not serious injury33 Too far34 Long waiting time35 Mistreatment36 Corruption37 No available drugs38 No health insurance.....39 Does not apply(used government services).....40 Other (specify)96	<table border="1" style="width: 100%; height: 100%; text-align: center;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>																
24.	If you used the medical healthcare, were you admitted to the hospital ward or health facility for treatment of your injury?	Yes.....1 No(skip Q 25,26, 27).....2 Don't know/can't remember.....9	<input type="checkbox"/>																

25.	How many days did you stay in the hospital for treatment of your injuries? days	<input type="text"/>
26.	If you used the formal healthcare how did you get to the health facility for treatment of your injuries?	By foot..... 1 By private car..... 2 By taxi/amjad..... 3 By public transport..... 4 By ambulance..... 5 By bicycle..... 6 By animal cart..... 7 Other (<i>specify</i>)..... 8 Don't know..... 9	<input type="text"/>
27.	How long did it take you to get to the health facility?	Less than 1 hour.....1 1–2 hours.....2 3–6 hours.....3 7–9 hours.....4 10–12 hours.....5 13–24 hours.....6 More than 24 hours.....7	<input type="text"/>
28	D. Transport injuries Yes= 1, No=2		<input type="text"/>
29.	How were you travelling at the time you were injured?	Walking.....31 Pickup, van, jeep or minibus (vehicle that seats less than 10 people).....32 Bus.....33 Bicycle.....34 Motorcycle.....35 Raksha.....36 Animal cart.....37 Car.....38 Truck /lorry.....39 Train40 Other (<i>specify</i>).....96 Don't know/can't remember.....99	<input type="text"/>
30.	What was your role in the traffic crash?	Pedestrian.....1 Driver.....2 Passenger.....3 Other (<i>specify</i>).....7 Unknown.....9	<input type="text"/>
31.	What did you (or your vehicle) collide with?	Pedestrian.....1 Bicycle.....2 Motorcycle.....3 Motorized vehicle.....4 Fixed object.....5 Other (<i>specify</i>).....7 Don't know/can't remember.....9	<input type="text"/>
32.	E. Violence-related injuries Yes= 1, No=2		<input type="text"/>
33.	Please indicate the relationship between yourself and the person or persons who caused your injury. (can have more than one answer)	Intimate partner.....01. Parent.....02 Child, sibling, or other relative (e.g. brother, cousin, sister).....03 Friend or acquaintance.....04 Unrelated caregiver.....05 Stranger.....06 Official or legal authorities.....07 Refused.....77 Other (<i>specify</i>).....96 Unknown.....99	<input type="text"/> <input type="text"/>

35.	In the past 12 months, have you been frightened for the safety of yourself or your family because of the anger or threats of another person or persons? <i>(ask only if the injured person is the respondent)</i>	Yes.....1 No(skip Q35).....2 Refused.....7 Don't know/can't remember.....9	<input type="checkbox"/>
36.	If yes, specify by whom <i>(ask only if the injured person is the respondent)</i>	Intimate partner.....31 Parent.....32 Child, sibling or other relative (e.g. brother, cousin, sister).....33 Friend or acquaintance.....34 Unrelated caregiver.....35 Stranger.....36 Official or legal authority (e.g. police officer, soldier).....37 No one (not been frightened for safety).....38 Refused.....77 Other (<i>specify</i>).....96 Unknown.....99	<input type="checkbox"/> <input type="checkbox"/>
37.	Have you carried a weapon on your person outside the home in the last 30 days?	No.....1 Yes, for protection.....2 Yes, for work.....3 Yes, for sport (e.g. hunting target practice).....4 Refused.....7 Unknown.....9	<input type="checkbox"/>
38.	F. Poisoning related injuries	Yes= 1, No=2	<input type="checkbox"/>
39.	Describe what type of substance you came in contact with that caused your poisoning injury	A drug or medical substance used mistakenly or in overdose.....1 A solid or liquid toxin (e.g. hair dye, pesticides, household cleaning products, rat poison).....2 Inhaling gases or vapours.....3 Eating a poisonous plant or the substance mistaken for food.....4 A venomous animal.....5 Other (<i>specify</i>).....7	<input type="checkbox"/>
40.	G. Burn related injuries	Yes= 1, No=2	<input type="checkbox"/>
41.	What caused your burn?	Contact with a hot liquid, steam or other gas.....1 Contact with a hot object or solid substance (e.g. cooker, kettle, stove, iron).....2 Contact with flames/fire.....3 Inhalation of smoke from burning object/substance.....4 Electricity.....5 Chemical substance.....6 Smoke/ from Sudanese wood substance e.g taleh, shaf).....7 Other (<i>specify</i>).....8 Don't know/can't remember.....9	<input type="checkbox"/>
42.	H. Falls related injuries	Yes= 1, No=2	<input type="checkbox"/>
43.	What height did you fall from when you were injured?	Same level as you were standing.....1 Height less than 2 metres.....2 Height greater than 2 metres.....3 Below ground level.....4 Other (<i>specify</i>).....6 Don't know/can't remember.....9	<input type="checkbox"/>
44.	What did you fall from when you were hurt?	Ground level.....01 Stairs.....02 Ladder.....03 Tree.....04 Roof.....05 Balcony.....06 Back of an animal.....07 Hole on the ground.....08 Other (<i>specify</i>).....96 Don't know/can't remember.....99	<input type="checkbox"/> <input type="checkbox"/>

G. Injury-Related Disability			
45.	As a result of the injury, did you/person injured suffer any disability or impairment ?	Yes.....1 No(skip Q.46).....2 Don't know/can't remember.....9	<input type="checkbox"/>
46.	In what ways were you or injured person physically disabled? <i>(can have more than one answer)</i>	Unable to use hand or arm31 Difficulty using hand or arm.....32 Walk with a limp.....33 Loss of hearing.....34 Loss of vision.....35 Weakness or shortness of breath.....36 Inability to remember things.....37 Inability to chew food.....38 Other (specify).....96 Don't know/can't remember.....99	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
47.	If Yes, how many days were you disabled or injured person suffered a disability?days	<input type="text"/> <input type="text"/>
H. Post injury impact			
48.	Since the time when you were injured, have you been able to return to normal activities?(like play, home duties , work, studies)	Yes, fully.....1 Yes, but only partially.....2 No.....3 Don't know/can't remember.....9	<input type="checkbox"/>
49.	If answer yes fully, how many days were you unable to perform your usual activitiesdays	<input type="text"/> <input type="text"/> <input type="text"/>
50.	Did you lose your job as a result of the injury?	Yes.....1 No.....2 Not applicable.....3 Don't know/can't remember.....9	<input type="checkbox"/>
51.	Did anyone in your household lose days of work or school to take care of you?	Yes.....1 No.....2 Don't know/can't remember.....9	<input type="checkbox"/>
52.	Did the household have to borrow money to care of you?	Yes.....1 No.....2 Don't know.....9	<input type="checkbox"/>
53.	Did the household have to sell anything to pay for your medical treatment or to make up for loss of income?	Yes.....1 No.....2 Don't know.....9	<input type="checkbox"/>

Questionnaire 3 for Death from Injury

The deceased person line no

1. Locality: 2. Administrative unit: 3. Popular administrative unit:
4. Cluster: 5. Household serial no.
6. Was the death due to an injury? Yes=1, No=2 (example of injuries transport injuries, poisoning, burn, falls, violence...etc)
7. The deceased person line no
Deceased from injury name: _____
8. Date of death

Interviewer name /I.D: _____

Question	Category	Code
9.	How old was the person when he /she died? If below 1 year record 00 If above 95 record 99 years	<input type="text"/> <input type="text"/>
10.	Where did the person die? At the place where the injury occurred.....1 At a health facility (e.g. hospital, clinic, health centre).....2 At home.....3 Other (specify).....6 Don't know/can't remember.....9	<input type="text"/>
11.	How long after the injury occurred did the injured person die? Immediately.....1 Less than 1 hour after the injury.....2 Between 1 and 6 hours after the injury.....3 More than 6 hours but less than 12 hours after the injury.....4 Between 12 and 24 hours after the injury.....5 More than 1 day but less than 1 week after the injury.....6 More than 1 week after the injury.....7 Don't know/can't remember.....9	<input type="text"/>
12.	What is the main cause of death ? Traffic31 Fall.....32 Struck/hit by person33 Stab.....34 Gun shot.....35 Fire, flames or heat36 Drowning.....37 Poisoning38 Animal bite.....39 Electricity shock.....40 Other (specify).....96 Unknown.....99	<input type="text"/> <input type="text"/>
13.	How did the death happen? Did the deceased hurt him/herself or did someone hurt them? It was an accident (unintentional).....1 Someone else did it to them deliberately (intentional).....2 They did it to themselves deliberately (self-inflicted).....3 Don't know.....9	<input type="text"/>

الإصابات في السودان : عوامل الانتشار ، المخاطر والحصول على الرعاية الصحية

- 1-المحلية :
 2-الوحدة الإدارية :
 3-الإدارة الشعبية :
 4- العنقود :
 5. مسلسل الأسرة داخل العنقود :-
 6 -الشخص المستتبين :
 7-اسم الباحث/ I.D :

22	21	20	19	18	17	16	15	14	13	12	11	10	الاسم	رقم السطر
الموت 1.نعم 2.لا	الإصابة 1.نعم 2.لا 3.أدري	الأمراض المزمنة 1.نعم 2.لا 3.أدري	هل كتبت تريبط حزام المقعد عندما تكون في السيارة ؟	الإصابة في فترة 12 شهراً الأخيرة	المهنة	أعلى مستوى تعليمي	هل سبق يتمرنه أو الخبوة ؟ (5سنين وما فوق	هل تعرف القرابة والكتابة (5 سنوات)	الحالة الاجتماعية (12 سنة وما فوق)	كم عمر الفرد (سنة)	النوع	ما علاقة الاسم بإرب الأسرة ؟		
					الرجاء تحديد تخصص المهنة	1.ابتدائي 2.ثانوي 3.بليوم 4.جامعي 5.فوق الجامعي (17 خبرة .	1.نعم 2.لا 3.لا يطبق	1.نعم 2.لا 3.لا يطبق	1.متزوج 2.أعزب 3.ارحل 4.مطلق 5 لا يطبق	أقل من سنة سجل 00 أكثر من 95 سنة سجل 99	1.ذكر 2.أنثى	1.رب أسرة 2.زوج/زوجة 3.ابن/ابنة 4.اب / أم 5.خولة/خبوية 6.اخ/اخت 7.زوجة ابن/زوج ابنة 8.نسب/نسبية 9.قارب آخرون 10.بدون قرابة		0 1 0 2 0 3 0 4 0 5 0 6 0 7 0 8 0 9 1 0 1 1 1 2 1 3

الرمز	الفئة	السؤال	الرقم
<input type="checkbox"/>	1. ملك حر 2. ملك حيازة 3. ايجار 4. اساكن موظفين 5. هبة مجانية 9. اخرى	ما نوع ملكية المنزل ؟	23
<input type="checkbox"/>	1. رواكيب 2. خيمة 3. طابق واحد طين 4. طابق واحد طوب أو خرصانة 5. شقة 6. فيلا 9. اخرى	ما هي طبيعة البنيان بالمنزل ؟ (سجل ملاحظتكم)	24
<input type="checkbox"/>	عدد الغرف	كم عدد الغرف المستخدمة لنوم الأسرة ؟	25
<input type="checkbox"/>	1. محطة تنقية (توصيلات منزلية) 2. ابارجوفية (توصيلات منزلية) 3. مضخة 4. مياه جارية (نهر، ترعة) 5. مياه منقولة من ابارجوفية (كارو / تانكر) 9. اخرى (يرجى تحديدها)	ما هو المصدر الرئيسي لمياه الشرب لهذه الأسرة ؟	26
<input type="checkbox"/>	1. لاتوجد اضاءه 2. كهرباء عامة 3. كهرباء خاصة (جنرير، سولر) 4. رتيئة 5. لمبه جاز 9. اخرى يرجى تحديدها	ما هو المصدر الرئيسي للضاءة لهذه الأسرة ؟	27
<input type="checkbox"/>	1. نار حطب 2. فحم 3. غاز 4. كهرباء 5. جاز 6. روث البهائم 7. مخلفات المحاصيل الزراعية 9. اخرى (يرجى تحديدها)	ما هو نوع الوقود الذي تستخدمه الأسرة للطبخ عادة ؟	28
<input type="checkbox"/>	1. مرضاض حفرة (خاصة) 2. مرضاض حفرة (مشترك) 3. سايفون (خاص) 9. اخرى (يرجى تحديدها)	ما هو نوع المراض الرئيسية المستخدم ؟	29
<input type="checkbox"/>	1. نعم 2. لا	هل لديكم ثلاجة ؟	30
<input type="checkbox"/>	1. نعم 2. لا	هل لديكم ريسيفر (دش) او اشترك في القناة ؟	31
<input type="checkbox"/>	1. نعم 2. لا	هل لديكم مبرد او مكيف هواء ؟	32
<input type="checkbox"/>	1. نعم 2. لا	هل تملكون سيارة ؟	33
<input type="checkbox"/>	1. نعم 2. لا	هل لديكم كمبيوتر ؟	34
<input type="checkbox"/>	1. نعم 2. لا	هل لديكم اشترك في الانترنت ؟	35

الاستبيان رقم 2 عن الأشخاص المصابين

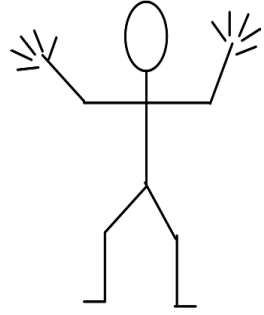
- 1 - المحلية: 2-الوحدة الإدارية: 3-الادارة الشعبية:
- 4-العنقود: 5-مسلسل الأسرة 6- سجل رقم السطر المصاب:
- اسم الشخص المصاب :-
- 7 - رقم الإصابة:
- 8- من المستجيب لهذه المقابلة ؟ نعم = 1 لا = 2 اسم الباحث / I.D
- 9-التاريخ حدوث الإصابة في فترة 12 شهر المصت :

أ/ عوامل حدوث الإصابة (أجب على البنود جيم و دال و هاء و واولام حسب سبب الإصابة)

الرمز	الفئة	السؤال	الرقم
<input type="checkbox"/>	01..... في المنزل 02..... في المدرسة 03..... في الطريق 04..... في مكان الرياضة 05..... في المزرعة 06..... في مكان صناعي/ مكان بناء 07..... في منطقة تجارية 08..... عند البحيرة/النهر/البيئر 96..... منطقة أخرى يرجى تحديدها. 99..... غير معروف.	10 أين كنت عند حدوث الإصابة ؟ (إذا كانت اجابة 96 اكتب السبب هنا)	
<input type="checkbox"/>	21..... أثناء ساعات العمل 22..... الذهاب والعودة للعمل 23..... اثناء أداء عمل بدون أجر (يتضمن عمل منزلي). 24..... اثناء الدراسة 25..... في الرياضة 26..... في وقت الترفيه او لعب 27..... نشاطات حتمية (نوم ، أكل ، غسيل) 28..... السفر 29..... أعمال غير محددة (جلسات تسامر ونقاش). 96..... أخرى (يرجى تحديدها) 99..... غير معروفة.	11 ماذا كنت تفعل وقت حدوث إصابتك/ الشخص المصاب ؟ (إذا كانت اجابة 96 اكتب السبب هنا)	
<input type="checkbox"/>	31..... حركة السير 32..... السقوط 33..... ضرب بشخص آخر او جسم 34..... بسبب الطعن 35..... طلق ناري 36..... بسبب الحريق أو الحرارة 37..... بسبب الغرق 38..... بسبب التسمم 39..... بسبب عضه الحيوان 40..... بسبب صعق كهربائي 96..... سبب آخر (يرجى تحديده).	12 ما هو السبب في اصابتك ؟ كيف تمت الإصابة ؟ (إذا كانت اجابة 96 اكتب السبب هنا)	
<input type="checkbox"/>	1..... كانت حادثاً عرضياً (غير مقصود). 2..... شخص آخر تسبب فيه عمداً (كان مقصوداً). 3..... تسببت فيه بنفسي عن عمد (اضرار ذاتي). 9..... لا أدري	13 كيف حدثت الإصابة ؟ هل كانت مصادفة أم أن شخصاً آخر قد تسبب في إصابتك أم أنك تسببت في إصابة نفسك ؟	

العمود الفقري	الاطراف السفلي	الاطراف العلوية	بطن، وسط، حوض	وجة	عنق	راس	
							كسر (كسر للعظم)
							التواء أو شد عضلي
							خلع (فكك)
							جرح -عضة -كدمة سطحي (الجلد فقط)
							جرح -عضة-كدمة عميقة (الجلد و العضل)
							حريق
							تسمم
							ارتجاج / إصابة في الرأس مع فقد وعي
							إصابة داخلية / إصابة عضوية داخلية (تحتاج الي عملية في البطن او الصدر)
							اخرى (يرجى تحديده)

(علم على الرسم)



- 1 نعم
 2 لا
 3 لاينطبق
 7 رفض الإجابة
 9 لا أدري

في فترة 6 ساعات السابقة للإصابة ، هل تعاطيتم أي مشروب كحولي، حتى ولو مرة واحدة ؟

15

ب/ الرعاية الطبية والعلاج الطبي

	1 نعم..... 2 لا (إذا كانت الإجابة بلا يرجى الانتقال الي السؤال (18)) .. 9 لا أدري	هل حاول أي شخص مساعدتكم بإعطائكم الاسعافات الأولية ؟ (مثلا مساعدة علي التنفس ، وقف نزيف، تثبيت الكسور ..الخ وهذا لا يتضمن المساعدة علي الوقوف او المشي و ركوب السيارة)	16
	21..... احد المتفرجين 22..... صديق / الأسرة 23..... المدرس 24..... رجل الشرطة 25..... موظف الاسعاف 26..... طبيب 27..... ممرض 28..... طاقم المطافئ 96..... شخص آخر (يرجى تحديده) 99..... لست أدري.....	من الذي أعطاك الاسعافات الأولية بعد الإصابة ؟ يمكنكم إعطاء أكثر من إجابة (إذا كانت إجابة 96 اكتب السبب هنا)	17
	1 نعم 2 لا 9 لا أدري	هل سعيت للحصول علي العلاج الطبي بعد الإصابة ؟	18

<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>1.....حكومي</p> <p>2.....خاص.</p> <p>3.....لا ينطبق (علاج منزل , علاج بلدي / معالج كسور).</p> <p>4.....لا أدري ..</p>	<p>نوع الجهة التي قصدها الي العلاج؟ (يمكن إعطاء أكثر من اجابة)</p>	19
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>01.....علاج منزلي ..</p> <p>02.....المستشفى ..</p> <p>03.....عيادة ..</p> <p>04.....طبيب ..</p> <p>05.....المركز الصحي ..</p> <p>06.....وحدة صحية ..</p> <p>07.....شفاخنة ..</p> <p>08.....عيادة متنقلة ..</p> <p>09.....علاج بلدي / معالج كسور (بصير) ..</p> <p>10.....صيدلية / مخزن أدوية ..</p> <p>11.....علاج بالخارج ..</p> <p>96.....علاج آخر (يرجى تحديده).....</p>	<p>الي أي جهة ذهبت للحصول علي العلاج؟ (يمكن إعطاء أكثر من اجابة)</p> <p>(إذا كانت اجابة 96 اكتب السبب هنا)</p>	20
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<p>.....-1</p> <p>.....-2</p> <p>.....-3</p> <p>.....-4</p> <p>.....-5</p>	<p>إذا قصدت جهة للعلاج سجلها حسب ترتيب اللجو إليها أولاً ثم ثانياً الخ ؟ رتب الجهات حسب الخيارات أعلاه. استخدم الرمز الوارد في السؤال (20)</p>	21

<input type="checkbox"/> <input type="checkbox"/>	<p>21.....لرخصها</p> <p>22.....لقرابها من مكان سكني ..</p> <p>23.....لتوفر الدواء ..</p> <p>24.....لخطورة الإصابة ..</p> <p>25.....لعدم خطورة الإصابة ..</p> <p>26.....لقلة وقت الانتظار ..</p> <p>27.....لمعرفة العلاج ..</p> <p>28.....تأمين صحي ..</p> <p>96.....سبب آخر (يرجى تحديده) ..</p> <p>99.....سبب غير معروف ..</p>	<p>حسب الاجابة في السؤال (21) : لماذا ذهبت الي الجهة المذكورة أولاً ؟ (يمكن إعطاء أكثر من اجابة)</p>	22
<input type="checkbox"/> <input type="checkbox"/>		<p>لماذا ذهبت الي الجهة المذكورة ثانياً؟</p>	
<input type="checkbox"/> <input type="checkbox"/>		<p>لماذا ذهبت الي الجهة المذكورة ثالثاً ؟</p>	
<input type="checkbox"/> <input type="checkbox"/>		<p>لماذا ذهبت الي الجهة المذكورة رابعاً؟</p>	

		1 بأحد المارة 2 بدراجة هوائية 3 بدراجة نارية 4 بمركبة 5 بجسم ثابت 7 بشئ آخر (يرجى تحديده) 9 لا أدري	31 لماذا أصطدمت انت؟ أو لماذا اصطدمت مركبتكم؟
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32. د/ الإصابة المرتبطة بالعنف: نعم = 1 2 = لا

		01 علاقة حميمة 02 علاقة أوية 03 قرابة (أخ أو أخت، اقارب اخرون) 04 صديق أو معرفة 05 مقدم رعاية بدون قرابة 06 شخص غريب 07 سلطات رسمية أو قانونية 77 رفض الإجابة 96 علاقة أخرى (يرجى تحديدها) 99 علاقة غير معروفة	33 يرجى بيان العلاقة بينكم وبين الشخص أو الأشخاص الذين تسببوا في وقوع الإصابة؟ (يمكن منح أكثر من إجابة)
		1 إطلاق النار بمسدس الطعن، الحريق، الخنق، أو الاعتداء بشئ آخر (مثال 2: زجاجة، بفاش أو خنجر، سكين، بسائل ساخن، حبل) 3 بالضرب أو الصفع أو الدفع أو اللكم أو الرفس بدون سلاح 6 رفض الإجابة 7 عنصر آخر (يرجى تحديده) 9 عنصر غير معروف	34 يرجى بيان أي العناصر التالية كانت الأهم في سبب الإصابة؟
		1 نعم 2 لا (انقل الي س.36) 7 رفض الإجابة 9 لا أدري	35 في فترة الأثني عشر شهراً الماضية هل شعرت بالخوف علي حياتك أو حياة أسرتك بسبب الخطر الذي يمثله شخص آخر أو أشخاص آخرون؟ (يوجه السؤال فقط إذا كان المستجيب هو الشخص المصاب). (إذا كانت الإجابة بلا يرجى الانتقال الي السؤال 36)
		31 من شريك حميم 32 من الوالد 33 من قريب (أخ ، أخت) 34 من صديق 35 من مقدم رعاية دون قرابة 36 من شخص غريب 37 من سلطات رسمية ، أو قانونية (رجل شرطة، أو جيش) 77 رفض الإجابة 96 شخص آخر (يرجى تحديده) 99 شخص غير معروف ومجهول	36 إذا كانت الإجابة بنعم يرجى تحديد الشخص (يوجه السؤال فقط إذا كان المستجيب هو الشخص المصاب).
		1 لا 2 نعم من أجل الحماية 3 نعم من أجل العمل 4 نعم بغرض الرياضة (تدريب علي اصطلياد الهدف) 7 رفض الإجابة	37 هل حملت سلاحاً خارج المنزل في مدة الثلاثين يوماً الماضية؟

38. هـ/ الإصابات المرتبطة بالتسمم: نعم = 1 لا = 2

<input type="checkbox"/>	<p>دواء أو مادة طبية استخدمت بالخطأ أو بزيادة الجرعة..... 1</p> <p>مادة سامة صلبة، وسائلة (المبيدات، منتجات نظافة المنزل أو سم فار)..... 2</p> <p>استنشاق الغاز أو البخار..... 3</p> <p>أكل نبات سام أو مادة غذائية بالخطأ..... 4</p> <p>عضة حيوان سام..... 5</p> <p>لا أدري..... 7</p> <p>أخرى حددها..... 9</p>	<p>39 صف نوع المادة التي تعاطيتها وتسببت في إصابتكم بالتسمم</p>
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40. و/ الإصابات المرتبطة بالحريق: نعم = 1 لا = 2

<input type="checkbox"/>	<p>1 تعرض لسائل حار أو بخار ساخن أو غاز..... 1</p> <p>الاتصال بجسم ساخن أو مادة صلبة (جهاز طبخ، غلاية، موقد الحديد)..... 2</p> <p>الاتصال باللهب/ النار..... 3</p> <p>استنشاق الدخان من جسم/مادة محترقة..... 4</p> <p>صعقة كهربائية..... 5</p> <p>مواد كيميائية..... 6</p> <p>الدخان (الطلح، الشاف، النخل، الخ)..... 7</p> <p>شيء آخر (يرجى تحديده)..... 8</p> <p>لا أدري..... 9</p>	<p>41 ما السبب الذي أصابك بالحريق؟ أو الشخص الذي تعرض للحريق؟</p>
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42. ل/ الإصابات المرتبطة بالسقوط: نعم = 1 لا = 2

<input type="checkbox"/>	<p>1 نفس الارتفاع الواقف عليه..... 1</p> <p>ارتفاع أقل من مترين..... 2</p> <p>ارتفاع أكثر من مترين..... 3</p> <p>تحت سطح الأرض..... 4</p> <p>شيء آخر (يرجى تحديده)..... 6</p> <p>لا أدري..... 9</p>	<p>43 ما هو الارتفاع الذي تم منه السقوط عندما حصلت الإصابة؟</p>
<input type="checkbox"/>	<p>01 الأرض.....</p> <p>02 درج.....</p> <p>03 السلم.....</p> <p>04 شجرة.....</p> <p>05 سطوح.....</p> <p>06 بلكونة.....</p> <p>07 ظهر ماشية.....</p> <p>08 حفرة.....</p> <p>96 شيء آخر (يرجى تحديده).....</p> <p>99 لا أدري.....</p>	<p>44 من أي شيء تم السقوط</p>

ز/ الإصابة المسببة للإعاقة :

<input type="checkbox"/>	<p>1 نعم 2 لا (انتقل س.8) 9 لا أدري.....</p>	<p>45 هل تعاني من إعاقة او عجز نتيجة من الإصابة ؟</p>								
<table border="1" style="width: 100%; height: 100%;"> <tr><td style="width: 50%; height: 20px;"></td><td style="width: 50%; height: 20px;"></td></tr> <tr><td style="width: 50%; height: 20px;"></td><td style="width: 50%; height: 20px;"></td></tr> <tr><td style="width: 50%; height: 20px;"></td><td style="width: 50%; height: 20px;"></td></tr> <tr><td style="width: 50%; height: 20px;"></td><td style="width: 50%; height: 20px;"></td></tr> </table>									<p>31 عدم القدرة على استعمال اليد 32 الصعوبة في استعمال اليد 33 المشي مع العرج 34 فقد السمع 35 فقط النظر 36 ضعف أو ضيق التنفس 37 عدم القدرة على تذكر الأشياء 38 عدم القدرة على مضغ الطعام 96 شكل آخر (يرجى تحديده) 99 لا أدري</p>	<p>46 في أي شكل تمثلت اعاقتم الجسدية؟ (يمكنكم إعطاء أكثر من إجابة)</p>
<table border="1" style="width: 100%; height: 100%;"> <tr><td style="width: 33%; height: 20px;"></td><td style="width: 33%; height: 20px;"></td><td style="width: 33%; height: 20px;"></td></tr> </table>				<p>..... يوماً</p>	<p>47 إذا كانت الإجابة بنعم فكم يوماً لم تستطع أن تمارس أنشطتك الطبيعية ؟</p>					

ح/ الآثار اللاحقة للإصابة :

<input type="checkbox"/>	<p>1 نعم وبشكل كامل 2 نعم ولكن بشكل جزئي 3 لا 9 لا أدري.....</p>	<p>48 منذ اصابتم هل استطعتم العودة لممارسة أنشطتكم العادية ؟ (مثل العب , اعمال منزلية , الدراسة, العمل...الخ)</p>			
<table border="1" style="width: 100%; height: 100%;"> <tr><td style="width: 33%; height: 20px;"></td><td style="width: 33%; height: 20px;"></td><td style="width: 33%; height: 20px;"></td></tr> </table>				<p>..... يوم</p>	<p>49 اذاء كانت الاجابة نعم وبشكل كامل كم يوم كنت غير غادر علي ممارسة أنشطتكم العادية ؟</p>
<input type="checkbox"/>	<p>1 نعم 2 لا 3 لا ينطبق 9 لا أدري</p>	<p>50 هل فقدتم وظيفتكم نتيجة للإصابة ؟</p>			
<input type="checkbox"/>	<p>1 نعم 2 لا 9 لا أدري</p>	<p>51 هل فقد أي من أفراد الأسرة بعض أيام العمل أو الدراسة من أجل رعايتكم ؟</p>			
<input type="checkbox"/>	<p>1 نعم 2 لا 9 لا أدري</p>	<p>52 هل اضطرت الأسرة لاقتراض أموال من أجل رعايتكم ؟</p>			
<input type="checkbox"/>	<p>1 نعم 2 لا 9 لا أدري</p>	<p>53 هل اضطرت الأسرة الي بيع أي شئ لتغطية تكاليف علاجكم أو للتعويض عن فقد الدخل ؟</p>			

الاستبيان رقم 3 سبب الوفاة من الإصابة

- 1 - المحلية:
 2.الوحدة الإدارية:
 3-الإدارة الشعبية:
 4-العقود:
 5 مسلسل الأسرة داخل العقود
 6-هل كانت الوفاة بسبب الإصابة : نعم=1 , لا=2 (مثل حوادث السير, السقوط , العنف , حريق, التسممالخ)
 7 - سجل رقم السطر المتوفى بسبب الإصابة:
 اسم الشخص المتوفى بسبب الإصابة - _____
 8. تاريخ الوفاة
 اسم الباحث / I.D.....

الرقم	السؤال	الفتنة	الرمز
9	كما كان عمر الشخص عند وفاته ؟	<p>أقل من سنة سجل 00</p> <p>أكثر من 95 سنة سجل 99</p> <p>سنة</p>	<input type="checkbox"/> <input type="checkbox"/>
10	أين توفي الشخص ؟	<p>1. في مكان حدوث الإصابة</p> <p>2. في مرفق صحي (مستشفى، عيادة ، مركز صحي).....</p> <p>3. في المنزل</p> <p>6. مكان آخر</p> <p>9. لا أدري ، لا أنكر.....</p>	<input type="checkbox"/>
11	متى توفي الشخص المصاب بعد وقوع الإصابة ؟	<p>1. بعد الإصابة مباشرة</p> <p>2. بعد ساعة من وقوع الإصابة</p> <p>3. بين ساعة و 6 ساعات من وقوع الإصابة</p> <p>بعد أكثر من 6 ساعات ولكن أقل من 12 ساعة من وقوع الإصابة.....</p> <p>4. بين 12 الي 24 ساعة بعد وقوع الإصابة</p> <p>5. بعد أكثر من يوم وأقل من أسبوع بعد وقوع الإصابة</p> <p>6. بعد اسبوع وأكثر بعد حدوث الإصابة</p> <p>7. لا أدري</p> <p>9. لا أدري</p>	<input type="checkbox"/>
12	ما هو السبب الرئيسي في الوفاة ؟	<p>31. حركة السير</p> <p>32. السقوط</p> <p>33. ضرب بشخص آخر أو جسم</p> <p>34. بسبب الطعن</p> <p>35. طلق نارى</p> <p>36. بسبب الحريق أو الحرارة</p> <p>37. بسبب الغرق</p> <p>38. بسبب التسمم</p> <p>39. بسبب عضه الحيوان</p> <p>40. بسبب صعق كهربائى.....</p> <p>96. سبب آخر (يرجى تحديده).....</p>	<input type="checkbox"/> <input type="checkbox"/>
13	كيف حدثت الوفاة ؟ هل كانت حادثاً غير مقصود او كان مقصوداً او كان إضرار عن عمد ؟	<p>1. كانت حادثاً عرضياً (غير مقصود).....</p> <p>2. شخص آخر تسبب فيه عمداً (كان مقصوداً).....</p> <p>3. تسببت فيه المتوفى بنفسه عن عمد (انتحار).....</p> <p>9. لا أدري</p>	<input type="checkbox"/>

Republic of Sudan
National Ministry of Health

HEALTH RESEARCH COUNCIL

NATIONAL RESEARCH ETHICS REVIEW COMMITTEE

Ethical Clearance Certificate

Date: 7 / 7 / 2010

This is to certify that the proposal (No. 126-5-010) entitled (Prevalence, risk factors and access to the health system) introduced by : Dr. Sally Osama Hassan El Tayeb from University of Bergen Norway has been approved by the National Health Research Ethics Committee, National Ministry of Health to be carried out in the Sudan.

The principal investigator is requested to submit a copy of the final report to the National Health Research Ethics Committee.



Dr. Iman Abdalla Mustafa

Reporter of the

National Research Ethics Review Committee

