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# Injuries among Children and Young Adults in Uganda: Epidemiology and Prevention



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**Stockholm 2011**

## Dedication

In Science is infinite potential, only 'boxed-up' by our own imagination. Correctly apposed with human values, no challenge remains insurmountable!

This work is dedicated to persons who, for reasons of bad systems, experiences, education, contacts, health, locations and poverty, cannot be the best they are created to be: to them I say, cling to hope and faith as you keep on keeping on! Such as these could be the grounds for harnessing the coveted treasures of serendipity!

*for they are not without Hope that place their hope is in the Lord!*

## **ABSTRACT**

### **Background**

Injuries are a major morbidity and mortality cause among children and young adults worldwide. Previous Ugandan studies were limited in scope and biased towards severe adulthood injuries in referral care.

### **Aims and Objectives**

This study explored the epidemiology of childhood and young adulthood injuries in Uganda: specifically their extent, pattern, distribution, risk and determinants, and stakeholder perceptions their regarding prevention and control.

### **Methods**

Cross-sectional survey was used to describe unintentional domestic injury patterns and determinants among under-fives; facility-based surveillance, to determine the distribution, characteristics, and outcomes of violent injuries among 13-23-year-olds and all injuries among under-13s; cohort design, to explore the extent, nature and determinants of school-related risk; FGDs and KIIs, to explore stakeholder perceptions of prevention. Chi-square tests were used to evaluate categorical differences, t-tests, quantitative differences, odds ratios, associations, survival and multi-level modelling, time and contextual effects; and content and thematic analyses, stakeholder perceptions.

### **Results**

Home-, road-, school- and hospital-related childhood injuries are major but underreported. Violent injuries among youth constitute 7.3percent of total injuries, with a case fatality of 4percent. Fall and burn injuries are the greatest domestic injury risk among under-fives, while traffic, falls and sport injuries are commonest among school children. Travel, break-time activities and practical classes are most risky. Intentional injuries are skewed, peaking at 21 years; males double females' prevalence of victimisation. Students, casual labourers and housewives are most at risk. Teenager housewives have a higher victimisation risk. Blunt force, stabs/cuts, gunshots, and burns are the main injury mechanisms, with variations depending on location. Most prevalent intentional injuries are cuts/bites, open wounds and superficial injuries, majority are minor. The risk of home, school, and traffic injury is high, with age and contextual variations. The cumulative prevalence of school-related injury is 36.1percent, with a rate of 12.3/1000 person years. The case fatality rate of the non-intentional domestic childhood injuries is 1.1/100/year. The odds of domestic burns fall progressively from the first to the sixth year of life; after this, traffic and falls lead. At four, burn, fall and traffic injury odds approximate parity. Injury determinants include poor housing, poor supervision, and domestic energy type, school, HIV status, age and gender. The perceived drivers of injury spurts are staple food supply, social activities and competitive sports. Emergent explanations include childhood, parenting, and situational factors. Lack of guidance and counselling, hunger, intimate-partner violence (IPV), domestic violence, unsafe cooking and household chores, idleness, poor parental control, child maltreatment, corporal punishment, and unsafe storage of sharp objects are thought to cause injuries. Most stakeholders believe in prevention through education and environmental modification. Education, voluntary counselling and HIV testing and disclosure were recommended. Local treatments include sugar, cold water, bathroom sand, and urine for burn injuries; sticks, bandages, ropes, liniment and stretchers for fractures and dislocations; and raw eggs, cooking oil and milk for poisoning. Few NGOs work on injuries and violence in rural Uganda, yet injury care within the existing health facilities is not adequate.

### **Conclusions**

Childhood and young adulthood injuries are common in Ugandan homes, schools, and roads with age, sex, contextual differences. Injury risk is high across Uganda with travel, practical classes, break-time activities and gardening being most risky. The determinants include maternal and child age, house condition, supervision quality, gender, school and location. Linkages are thought to exist between staple food supply, major social events, and hunting seasons and injury risk. These factors interact with individual, parental, and situational factors to pattern childhood injuries in rural Uganda. Local management strategies exist, most of them based on traditional knowledge and beliefs that may require separate quantitative evaluation. Other proposed educational interventions are based on the ineffective 'victim blame template'.

### List of Original Publications

1. Kiguli, S., **Mutto, M.**, & Mukanga, O. D., (2005), Unintentional home injuries among children under five years in a slum area of Kampala, Uganda: Prevalence and risk factors, *East and Central African Journal of Surgery*, 10; 01: 21-25
2. **Mutto, M.**, Lett, R., Lawoko, S., Nansamba, C., & Svanstrom, L., (2010), Intentional injuries among Ugandan youth: a trauma registry analysis. *Injury Prevention Journal*. 16:333e336. doi:10.1136/ip.2008.02049
3. **Mutto, M.**, Lawoko, S., Nansamba, C., Ovuga, E., & Svanstrom, L., (2010), Unintentional injury Patterns, odds, and outcomes among under-twelve year olds accessing emergency care in Kampala. *Journal of Injury and Violence Research*. 3; 1: 13-18 doi: 10.5249/jivr. v3i1.56
4. **Mutto, M.**, Lawoko, S., Ovuga, E., & Svanstrom, L., (2011), Childhood and Adolescent Injuries in Rural Elementary Schools in North Western Uganda: Extent, Risk and Associated Factors. (*Submitted to International Journal of Injury Control and Safety Promotion*)
5. **Mutto, M.**, Lawoko, S., Kimuli, G., Ovuga, E., & Svanstrom, L., (2011), Stakeholder Views and Perceptions on Epidemiology and Management of Childhood and Adolescent Injuries in North Western Uganda. (*Submitted to the East African Medical Journal*)

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## ACRONYMS AND ABBREVIATIONS

CDC	Centres for Disease Prevention and Control
DRC	Democratic Republic of Congo
EFA	Education for All
EPI	Expanded Programme for Immunisation
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
GoU	Government of Uganda
HIV	Human Immuno-Deficiency Syndrome
HMIS	Health Management Information Systems
ICC	Intra-Class Correlation
ICC-U	Injury Control Centre-Uganda
IMCI	Integrated Management of Childhood Illnesses
IPV	Intimate-Partner Violence
KIIs	Key Informant Interviews
KTS	Kampala Trauma Score
MDGs	Millennium Development Goals
MGLSD	Ministry of Gender, Labour and Social development
MLA	Multi-level Modelling
MoES	Ministry of Education and Sports
MoFPED	Ministry of Finance, Planning and Economic Development
MoH	Ministry of Health
NDP	National Development Plan
NGO	Non-Governmental Organisation
PEAP	Poverty Eradication Action Plan
PTA	Parent Teacher Association
PTSD	Post-Traumatic Stress Disorder
SCF	Save the Children Fund
STDs	Sexually Transmitted Disease
TB	Tuberculosis
TPGIL	The Pincer Group International
UBOS	Uganda Bureau of Statistics
UNCST	Uganda National Council for Science and Technology
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Awareness
UNGA	United Nations General Assembly
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNMHCP	Uganda National Minimum Health Care Package
UNO	United Nations Organisation
UNOCHA	United Nations Office for Coordination of Humanitarian Affairs
URTI	Upper Respiratory Tract Infections
USA	United States of America
VCT	Voluntary Counselling and Testing
WHA	World Health Assembly
WHO	World Health Organisation

## 1. INTRODUCTION

Injuries are a major childhood and adolescent public health problem globally (WHO, 1996; Murray et al., 1997; Peden et al., 2002; Peden et al., 2008). They are responsible for an estimated 16 000 daily global deaths and 15.1% of DALYs (WHO, 2008; Murray et al., 1997). In Africa and Uganda, injuries are ranked among the top ten mortality and morbidity causes in all age brackets (Norberg, 1994; MoH-CDC, 1996; Kobusingye et al., 2001; Mutto et al., 2010) with traffic and violence as the leading causes (Kobusingye et al., 2002; Lett et al., 2006; Mutto et al., 2010). Homes, roads, and schools are the commonest (injury) locations (Krug et al., 2002; Peden et al., 2002; Kobusingye et al., 2002), although the actual extent and nature of the risk in those locations is not well known. At least 60percent of the injuries are attributed to unintentional causes. However, the differences between the intentional and unintentional home-, school- and road-related childhood and young adulthood injury hazards are not well understood.

While Uganda did embrace evidence-led injury prevention and control, progress towards a unified and comprehensive policy and programme response is slow. The reasons for the slow progress are not clear, though lack of technical capacity for (injury and violence prevention) policy formulation and programme development, lack of governmental commitment, a skewed health policy favouring communicable diseases, limited evidence to support prevention programming and budgetary challenges could be plausible explanations.

Research in Uganda has, over the past decades, provided vital data on the extent, determinants and nature of injuries, thus providing basic evidence to ground local prevention and control efforts. The significance of these studies notwithstanding, important gaps remain in the research. Many of those studies were limited in geopolitical scope; others were biased towards severe adulthood injuries in specific care settings (Kobusingye et al., 2001, 2002; Lett, et al., 2006; Mutto et al., 2010). A multi-regional understanding of the local childhood and young adulthood injury burden is, thus, wanting. Secondly, many of the studies employed uni-level analytical methods, consequently precluding the multi-level causality perspective of injuries propounded by the main theoretical frameworks (Gordon, 1948; Bronfenbrenner, 1979). Moreover, many of those studies utilised cross-sectional designs and conventional statistical methods which may not be appropriate for handling the time and contextual dependencies of injury and violence events (Kobusingye et al., 2002; Lett et al., 2006). While cross-sectional designs allow for prevalence estimation at given times, their utility in the assessment of the intensity with which specific (childhood and young adulthood) injury hazards operate in particular locations, sub-populations or communities is limited. Yet, this is crucial for the understanding and ultimate control of the mechanisms leading to the occurrence and recurrence of particular types of childhood and young adulthood injuries and injury pandemics.

The adaptation of relatively novel and more robust statistical methods (e.g. multi-level and survival analysis) to (childhood and young adulthood) injury research provides good promise for filling in some of the glaring gaps in the research. The use of aggregated (survival) experiences and hazard rates could illumine the true nature of the local injury and violation hazards, especially those relating to childhood and young adulthood as well as some of the (previously

hypothesised) contextual protective factors (Bernard et al., 1991). The reference to multiple data sources offers hope for a more comprehensive view of the Ugandan problem.

Another gap in the research concerns community perceptions of the epidemiology of childhood and young adulthood injuries in Uganda. The majority of the published works have leant towards definitions developed by researchers, which may not be congruent with community understanding of injury and violent events, especially those among children and young adults. Consequently, the local childhood and young adulthood (injury) prevention initiatives may not be as successful owing to the above discrepancies. Thus, an understanding of stakeholder views and perceptions is paramount if they are to be integrated in an inclusive, coherent and comprehensive national response. The current thesis attempts to fill in some of these gaps in the research.

In summary, this thesis explores the epidemiology of childhood and young adulthood injuries in Uganda using multiple data sources, study designs, and analysis techniques including descriptive, survival and multi-level modelling techniques to elucidate the extent, nature and determinants of the local childhood and young adulthood injury and violence occurrence, severity and intensity. The study also sheds light on stakeholder perspectives regarding the local childhood and young adulthood injury problem with the view that such perspectives could be integrated into public policy and prevention programmes. The specific focus on domestic and school-related risks is premised on the fact that children spend most of their active lives in them; in Uganda, children spend up to 75percent of their time at school (MoH, 2001).

## 2. BACKGROUND

### 2.1 Definition and Classification

#### 2.1.1 *Injuries and Violence*

By definition, injuries are ‘organic level lesions resulting from acute (i) exposures to (mechanical, thermal, electrical, chemical or radiant) energy in excess of physiological tolerance thresholds, or (ii) insufficiency of vital elements as may be the case in drowning, strangulation, and freezing (Baker et al., 1992). Injuries are often dichotomised as unintentional if inadvertent (e.g. those resulting from burns, poisoning, falls and traffic injuries) or intentional, if deliberate (e.g. those due to interpersonal violence and suicides). Some researchers have criticised this dichotomisation (i.e. intentional versus. unintentional) on logistical (for dividing injury prevention resources) and technical grounds (for the fact that both categories often share incident mechanisms) (Cohen et al., 2003). For example, mechanisms such as gunshots, cuts and blunt trauma could occasion both injury types. This notwithstanding, it remains unclear if intentional and unintentional injury hazards differ fundamentally to warrant a segregated approach to their study, prevention, and control.

The definitions of injuries and their causes may vary among researchers and general community members. For instance, community members in Bangladesh view childhood burn injuries as the result of parental failures and limitations, including ignorance, negligence, and carelessness. They prescribe intensive parental supervision and household environmental modifications (Mashreky et al., 2009). Reconciling researchers’ and community understanding of injuries through community stakeholder perception studies and follow-up sensitisation is thus paramount as a first step towards an inclusive prevention approach. In this thesis, we attempt to understand, among others, community perceptions about childhood and young adulthood injuries in Uganda.

Violence, on the other hand, refers to the intentional use of force or power, actual or threatened, against another person, self, or group, resulting in or with a high likelihood of resulting in injury, death, deprivation, and mal-development (Krug et al., 2002). Although positively broad and inclusive, the addition of power and psychological outcomes introduces a number of ontological and epistemological challenges (Cohen et al., 2003) including those emanating from contextual variations in definition and measurement of power. This could pose serious challenges for international comparative analyses. Moreover, not all forceful injuries and deaths are intentional or premeditated.

#### 2.1.2 *Childhood and Young Adulthood Injuries*

Apart from the challenges regarding the definition and classification of injuries outlined above, others, more specific to childhood and young adulthood injuries, arise from variations in the conceptualisation of youth, young people, and childhood (Peden et al., 2008). The United Nations (UN) Convention on the Rights of the Child defines childhood as the period below 18 years (UN, 1989) and youth as the period between 15 and 24 years. The United Nations Fund for Population Awareness (UNFPA) views 10-24 year olds as ‘young people’ (UNFPA, 2009) while the World Health Organisation (WHO) categorises those between 13 and 24 years as youth

(Krug, 2000). The UN Program of Action for Youth to Year 2000 and beyond defines youth as those between 15 and 24 years of age (UNGA, 1999).

In Uganda, the national policy defines youth as those between the ages of 12-30 years (MGLSD-GoU, 2001), while the policy on child survival, growth and development defines those between one and 17 as children (MoH, 2001). This conceptual 'disharmony' also poses ontological (i.e. with regard to who a child is) and epistemological (i.e. in relation to how his/her specific injury issues are interrogated) challenges regarding the comparative analysis, interpretation and application of existing research findings. In Uganda, the effect of this disharmony is perhaps most obvious in the legal parameters related to childhood sexual and labour violation and criminal responsibility (currently, their age thresholds are set at 18, 12 and 16 years respectively (GoU constitution, 1995; Penal Code, 1997)). This could have implications for the visibility and measurement of specific injuries and violations. The age sensitivity of the existing triage protocols could further compound the problem. For example, children below 13 years may not access injury care at general accident and emergency units where the existing trauma registries are located on account of their age. In addition, cases like poisoning may be triaged to more specialised sections thus increasing their chances of exclusion from the registries. Differences in community perceptions of age could add to the dilemma. In Uganda, for instance, some ethnic groups view adulthood in terms of social roles (like marriage and child bearing) instead of biological age (Annan et al., 2006; Weeks, 1973).

Uganda's age pyramid is such that individuals below 18 years constitute the 'bulk' (55.3%) of the population currently estimated at 32 million people, while 18-24-year-olds constitute 12.5percent (UBOS). Basing on this proportion, we adopt the classification of 1-17 years as the age band for childhood and 18-23 as the band for young adulthood, in line with the national policy on child survival, growth and development (MoH, 2001) and tangent to other definitions regarding young adulthood (UNFPA, 2009; UNGA, 1999). To the extent that the particular injuries and violations involve them, the terms 'childhood and young adulthood injuries and violence' are applied. The implications of the above age parameters for comparative analysis and interpretation of findings from different contexts are acknowledged as the case for better conceptual harmony in childhood and young adulthood injury research is advanced.

## 2.2 Global Overview

### 2.2.1 Epidemiology of Childhood and Young Adulthood Injuries

#### 2.2.1.1 Extent

Injuries are a major cause of childhood and adolescent mortality worldwide (Peden et al., 2008), translating into an approximated 950,000 annual global childhood and adolescent deaths. The bulk of the burden rests on poor countries: WHO estimates the childhood injury death rate in developing countries at 3.4 times the rate in developed countries. Approximately 90 percent of the deaths are attributed to unintentional causes, 95percent of them in least developed countries (WHO, Global Burden of Disease 2004 Update; Peden et al., 2008). Approximately 20percent of the deaths are among school children. In China, the rate of injury among students ranges between 5-50/100 students / per year with gender differences (Yang et al., 1998; Li et al., 2003; Overpeck et al., 1995; King et al., 1996; Soriano et al., 2004).

In Africa, approximately 13percent of total mortality is injury-related (Nordberg, 1994). The continent's youth-related homicides double the global average of 9.2/100 000 and are in excess of the rate in high-income Europe, parts of Asia and the Pacific by over 20 times (Krug, 2002). In addition, the continent's prevalence of childhood and adolescent violation is thought to range between 38.6percent and 71.5percent (Burrows et al., 2001; WHO, 2005) with play, daily life activities, travel, sexual assaults, gang activities, bullying, physical fighting, labour exploitation, corporal punishment, and armed violence as key injury-time activities (Ramphele, 1999; Erulkar, 2004; SCF, 2006; UNOCHA, 2004; UNHCR, 2002; Tomozyk et al., 2004; Shumba, 2001; Swart et al., 2002; UNICEF, 2003). Many of the above childhood and young adulthood violations are perpetrated by parents and teachers (Youssef et al., 1998; Halmet al., 2001; Brown et al., 2002; Ketsela et al., 1997). The prevalence and incidence of injuries may, however, differ depending on mechanism (e.g. burns, road traffic, violence etc.). Figure 1 below illustrates the global injury pattern by mechanism.

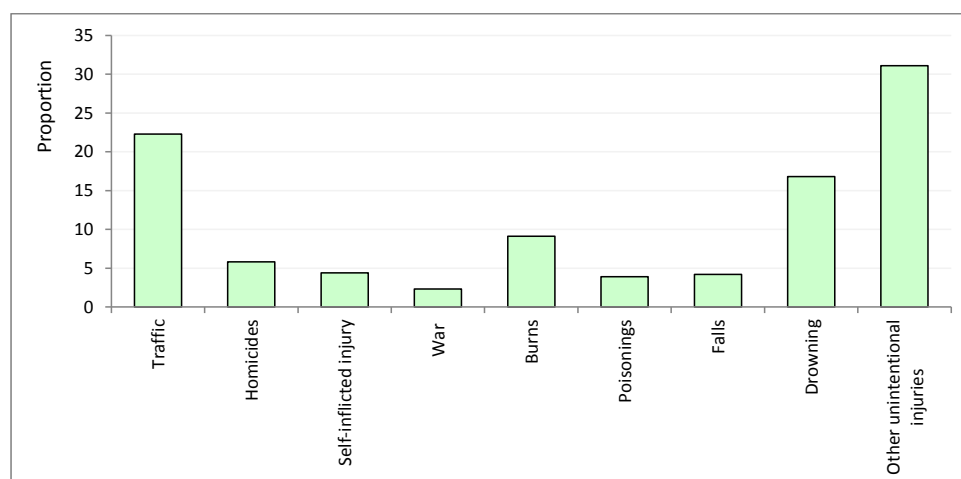


Figure 1: Global extent of childhood/young adulthood injuries by mechanism (Source: World Report, WHO)

In Uganda, child health indicators are generally bad and among the worst in the region. Neonatal mortality is approximately 33/1000 live births, infant mortality rate is 88/1000 live births and the under-five mortality rate is 152/1000 live births (MoH, 2001). Among the primary school-age children, the leading morbidity causes are malaria, injury, under-nutrition, skin rashes, dental conditions, worms and micro-nutrient deficiencies (MoH, 2001). In the general population, injuries rank among the top six mortality causes (MOH-CDC, 1996), the exact burden among children and young adults remains unclear. Between 79-87percent of the injury deaths are unintentional, and over 60percent of them occur in homes, streets and educational institutions. One-third of the serious intentional injuries in referral care involve youth, 28percent of them students, and 95percent are a result of assaults (Kobusingye et al., 2001; Lett et al., 2006; Kobusingye et al., 2002; Mutto et al., 2009). The leading injury mortality causes are drowning, traffic, blunt trauma, gunshots and burns (Kobusingye et al., 2001; Lett et al., 2006) with falls, traffic, burns, cuts/stabs, and falls as leading severe and recovered injury causes among under-ten-year-olds (Kobusingye et al., 2001).

Males are 2.4-2.8 times more likely to sustain intentional injuries from victimisation (Kobusingye et al., 2002) although the risk of sexual and gender-based violence was previously shown to be 3.9 times higher among females than males in all ages. The exact scenario among Ugandan children and young adults is not clear. In addition, the burden of care is often gender-biased, with females bearing the brunt of the burden of care in many of the childhood and young adulthood health conditions (Mutyaba et al., 2007; CSA, 2008). It is not clear if the gender differences in Ugandan childhood and young adulthood violations directly reflect underlying population trends in the local sex ratio. The most common (intentional) injury mechanisms are gunshots, blunt force, and stabs/cuts. Homes, streets and educational institutions account for over 60percent of the injury locations in Uganda (Kobusingye et al., 2001; Kobusingye et al., 2002, Mutto et al., 2010), yet children spend close to 75percent of their time in schools that are characteristically overcrowded, unhygienic, and with uneven play surfaces (MoH, 2001). Firearm ownership is also highly regulated in Uganda.

Despite the extent of the childhood injury problem described above, Uganda's policy and programmatic responses to the problem continue to trail. For example, the policy on child survival, growth and development does not explicitly include childhood injuries as a key focal area. The specifically prioritised areas are Integrated Management of Childhood Illnesses (IMCI), malaria control, immunisation, nutrition and school health (MoH, 2001). Moreover, what constitutes school health is not also clearly defined and inclusive of the common school-related childhood injuries. In addition, injuries are also excluded from the list of focal areas defined under the national health policy in spite of the 1995 constitutional and (1997) legal commitments to child protection, survival, growth and development. Although fairly recently, the UN also called for action (Krug et al., 2008; Pinnhero, 2006); however, there seems to be failure or reluctance to initiate appropriate injury prevention and control policy and programme actions in the African region, Uganda among them. This may have resulted in escalation of the problem as reflected by the persistent horrendous local media reports (Ranny, 2009; Mutabazi, 2009; Reuters, 2009; Agiro, 2009; Mutto et al., 2009). Whether this is a reflection of growth or enhanced visibility/acknowledgement of the problem or other societal phenomena remains elusive.

### 2.2.1.2 Risk

The concept 'risk' denotes the probability of an adverse outcome (WHO, 2002). As applied to injury epidemiology, it denotes the probability of the occurrence of an injury event or a specific level of severity in a given time, activity or device<sup>1</sup> use. Compared to a rate, which tends to indicate relative frequency of events from a historical perspective, risk indicates occurrence prospects in futuristic sense (Kelsey et al., 1986; Robertson, 1998). An understanding of health risks is key to success in the prevention and control of adverse outcomes. This requires a systematic approach, assessment and ultimately development- and application-of specific risk reduction measures (WHO, 2002). Survivor and hazard experiences are commonly used to describe risk profiles of populations; survivor function, to denote probability of surviving until specific times; and hazard function, instantaneous event rates at specific times conditional upon survival up to those times (Eloranta et al., 2010).

However, use of specific risk assessment methodologies and tools in childhood injury epidemiology is a recent addition to the research in this field. Such measures have their origin in pathological medicine (e.g. cancer prevention), with a specific focus on hazard identification, exposure assessment, dose response assessments and risk characterisation (WHO, 2002). Few risk analyses have been conducted in Uganda, especially in the field of injuries and violence. The previous Ugandan injury risk studies (Kobusingye et al., 2001; 2002; Lett et al., 2006; Mutto et al., 2009; Mutto et al., 2010) employed conventional methods (e.g. ordinary descriptive analyses and multiple linear and logistic regression modelling) and designs (e.g. cross-sectional designs) aimed at prevalence estimation and risk factor analysis. Though appropriate for their purpose, these methods are largely inappropriate for injury risk analysis because they preclude time and contextual dependencies that characterise injury and violence events. In this thesis, the injury and violence hazard and survival experiences of Ugandan school children during a typical school term are specifically reviewed, in addition to the conventional methods used for assessment of injury occurrence and predictors.

### 2.2.1.3 Determinants

#### A. Theoretical models

As compared to risk, determinants (risk factors) are factors that increase the probability or severity of a particular health outcome or risk (Robertson, 1998). Such factors are known to reflect the physical, social and emotional environmental contexts of particular populations (Zwi A., 1996). Indeed, Byass et al., (2010) did also observe that the mortality in specific populations tended cluster in space and time for reasons of geography, socio-economics, environment and demographics, among others (Byass et al., 2010). The specific factors may include hazardous activities, personal factors, equipment factors, environmental factors and temporal factors (Barss et al., 1998), some of which make direct contributions to the incidence or severity of injuries, while others may be correlates of the real causes with no meaningful role in incidence and severity (Roberts, 1998). Several models have been used in injury risk factor analyses.

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<sup>1</sup> Devices refer to tools, instruments, or objects that are in routine and ordinary daily-life application or use: their use carry inherent elements of injury risk that may be obvious or subtle.



*(i) Epidemiological, Haddon's and ecological models*

The epidemiological model (Gordon, 1948; Rivara et al., 2001; Robertson, 1998) focuses on interactions between agent (energy type), host (the injured person), and the vector/vehicle that delivers the energy within the specific environmental context. It posits injury risks as residing in environmental conditions or particular high-risk groups, linking disease occurrence to factors like seasons, economic status, and water sources (Buck et al., 1988). Haddon's matrix structures injury risks around personal, agent, and environmental attributes within a temporal (before, during and after) framework (Haddon, 1972, 1980; Christoffel et al., 2006); it focuses on energy transfer processes in time and space, seeking to isolate specific intervention points. The ecological model, widely used in violence research, views injury and violence risks as embedded within concentric layers of social realities including family, community and society (Bronfenbrenner, 1979).

*(ii) Behavioural perspectives*

Four theories have dominated behavioural approaches to violence research:

(a) Social learning which views violence as a learnt or modelled behavioural outcome (Bandura, 1997; Woodward, 1982; Bandura, 1989), with young people observing and modelling what they see. It views perceptions and attitudes towards the environment as significant influences on behaviour.

(b) The attribution theory (Woodward, 1982) views violence as an outcome of faulty attribution (in social perception) (Williams, 2005; Weiner, 1995). It assumes that people act on the basis of their beliefs, whether valid or not.

(c) The resilience theory, which posits the existence of protective (environmental) factors that insulate children from contextual violence (Bernard, 1991). It is based on the observation that not all children raised in impoverished and violent neighbourhoods turn out to be violent. Protective factors are thought to include: involvement in productive and meaningful activities, the presence of one or more supportive adults, and higher expectations of the people around the child.

(d) The developmental theory, which focuses on interpersonal and socio-cognitive developmental processes (Chicchetti, 1998).

*(iii) Patho-physiological perspective*

Violence may also be seen as rooted in (human) aggression, functional and brain-mediated (Embry, 1997; Perry, 1996; Natarajan, 2009). Two neuro-pathways are involved: the first pathway is responsible for threat detection and response, and harm avoidance: the second mediates rewards and social cooperation. Several neurotransmitters (including norepinephrine, serotonin, endorphins, steroids, and dopamine) are involved (Carlson, 1998; Kreme, 1993). Their blood concentrations are balanced to give greater cortical and sub-cortical control (over the more 'primitive excitatory' structures). This is maturational, emerging within the context of normal motor, sensory, emotional, cognitive and social development (Patterson, 1997). Brain

'insults' could affect cortical modulation or exaggerate aggressive responses; those that increase (brain) stem activity or reactivity or reduce limbic or cortical control could increase aggressiveness, impulsivity and capabilities for violence (Kreme, 1993). Examples include negative experiences, developmental neglect, and traumatic childhoods which have the capacity to 'sensitise' brainstem systems, dysregulate brain (stem) functioning, and disorganise limbic and cortical neurophysiology, as well as the development of critical functions like empathy and problem-solving (Patterson, 1997).

*(iv) Psychological perspectives*

Psychological perspectives portray human behaviour as a process outcome (Gross, 2005). Although lifelong, the processes presenting the greatest safety challenges are those between two and 19 years of life. To the psychodynamic theory, those processes are underpinned by the sexual pleasure drive, with experiences of the first five years of life largely determining a child's adulthood (Gross, 2005). Eric Ericson recognises the importance of interactions between biological programming, the mind, and culture (Atherton, 2009). Schaffer argues that these interactions provide contexts within which children's psychological functions develop (Schaffer, 1998, 2004).

Jean Piaget focuses on the cognitive change processes across life, positing them as phased. Accordingly, by the end of the sensory-motor phase (from birth-2 years), children learn to differentiate self from objects, recognise self as action agents, begin intentional action and achieve object permanency; by the end of the pre-operational stage (from 2-7 years), children learn language (i.e. words and images) and classify objects by a single feature; however, they remain egocentric in thought; by the end of the concrete operational stage (from 7-11 years), children learn to think logically about objects and events, achieve conservation of numbers, mass and weight, classify objects according to several features and order them in series along a single dimension such as size; and by the end of the formal operational stage (from 11 years and beyond), children think logically about abstract propositions, systematically testing hypotheses, and becoming concerned about the hypothetical, future and ideological problems (Atherton, 2009)

A lot of the learning in (early) childhood is experiential and exploratory, being backed by specific developments in the brain, physique, gross and fine motor skills and the sensory system. By middle childhood, physical growth slows down as intellectual development gathers pace in preparation for adolescence. Key socio-developmental outcomes of adolescence include the development of a life philosophy and of one's own identity separate from others, including family, community or society. Peer groups become the most important relationships which could 'distil' into meaningful companionships. If the process is successful, children experience deep intimacy; otherwise, they experience isolation and/or superiority or inferiority. Because of lack of experience, young people may substitute ideals for experience, thinking more in conflict-free ideal terms, rather than realistically. They may experience role confusion and upheaval, which may get them into trouble with peers, parents, teachers and authorities or result in strong devotion to peers, friends and/or causes (Artheton, 2009).

### *B. Research Findings*

Based on the above multi-layered causality frameworks, the known individual-level risk factors include age and gender (Barss et al., 1998). Indeed, certain injury types tend to be associated with particular ages and genders. For example, Simon et al. reported a relationship between risk and type of burn injury and developmental stage, with under-two-year-olds demonstrating a greater risk of severe burns. Agran et al. specifically attributed the burn risk differences in childhood to developmental stage. A Chinese review also found time spent indoors to be a predictor burn injury among under-three-year-olds. Khambalia et al. 2006 found setting (day-care versus home), in addition to age and sex, to be a risk factor for childhood falls (Simon et al., 1994; Agran, et al., 2003; Lv Kai-Yang et al., 2008; Kambalia et al., 2006). Certain individual risk factors, such as those related to developmental level, contribute substantially to the risk of childhood traffic injury (Katherine et al., 2002). WHO also observed that most road environments tend to be inconsiderate to children's needs as pedestrians, cyclists and passengers, more so because some of them actually work, play or live on roads (WHO, 2008). This is a developmental viewpoint on traffic injury risk. Plumert (1995) found that children in early elementary school overestimated their own abilities more often than did adults.

In cases such as drowning, mortality rates may vary, not only because of proximity to unprotected water bodies, but also developmental limitations including general physical instability, curiosity and inexperience (Zimicki et al., 1985). In such situations, the observed incident rates may actually reflect underlying socio-cultural effects; for example, the higher drowning rates among Papua New Guinea adult males were attributed to underlying clan hostilities and in-fighting (Barss, 1991). Age and gender differences may have implications for what people do, how they behave and their specific injury thresholds (Barss, 1998). The injury mortality rates of males have been shown to be approximately seven times higher than the ones of females (Barss et al., 1998).

Personality traits, developmental deficits, childhood disobedience, truancy, substance abuse, previous violence, low academic achievement, alienation, previous abuse, traumatic childhoods, deprivation, impulsivity, post-traumatic stress disorder (PTSD), education level, and depression are also associated with childhood injuries and violations. For example, higher frequencies of violation of other people's rights, verbal and physical aggression, cruelty (towards people and pets), destructive behaviour, lying, truancy, vandalism, and stealing are common among children who have conduct disorders (Loeber et al., 1998). Such children may not only inflict serious physical and psychological harm on others, but may also be at greater risk of incarceration, injury, depression, substance abuse, and death by homicide and suicide. Violent careers have also been traced to minor acts of antisocial or delinquent behaviours that keep growing in frequency, seriousness, and variety (Elliott, 1994, 1998; Moffitt, 1993; Tolan et al., 1998). Serious multiple young offending may progress from less grievous forms (Loeber, 1996; Elliott, 1994, 2000a).

Approximately 5percent of children experience serious conduct problems (impulsiveness, over-activeness, aggressiveness and engaging in delinquent behaviour); and the causes include genetic factors, ineffective parenting, and violent neighbourhoods. Eight of ten cases of juvenile delinquency involve males, although female delinquency is currently also on the rise (Tong, 2010). The causes include heredity, identity problems, community influences, and family experiences.

Family-level determinants include domestic violence during pregnancy, marital status, family discord, parity, income, occupation, residence, intimate-partner violence, housing conditions, supervision quality, domestic energy type, maternal age, divorce, parenting quality, bullying, peer influence and teenage pregnancy. In the US, homes account for over five million direct annual childhood exposures to physical abuse or violence (Perry, 1996). Many of the incidents are perpetrated by caregivers including teachers (Erulkar, 2004; SCF, 2006; UNOCHA, 2004; UNHCR, 2002, Tomczyk et al., 2004; Shumba, 2001) in the form of bullying, physical fighting, verbal harassment, intimidation, corporal punishment, and physical sexual abuse. In South Africa, between 50-70percent of youth get such exposure (Van der Merwe et al., 2000; Swart et al., 2002).

Exposure to domestic and intimate-partner abuse also has adverse long-term emotional, behavioural, physiological, cognitive and social well-being consequences (Fagan et al., 1994; Widom, 1989; Jouriles et al., 1998). At least ten million American children get such direct pathological exposures annually (Jaffe et al., 1990; McFarlane et al., 2003). Such children tend to exhibit internalising, externalising and total behaviour problems more than unexposed children. Externalising behaviours include attention problems, aggressive behaviour and rule-breaking; internalising behaviours include anxiety, withdrawal and depression- and all of these are known risk factors for suicide. Violent domestic exposure symptoms in infants and toddlers include poor weight gain, poor sleeping habits, irritability and regression; those in pre-schoolers include fearfulness and anxiety. Exposed boys show more aggressiveness than girls, with higher abuse levels causing more severe dysfunction (Jouriles et al., 1998; Kolbo, et al., 1996, Levendosky et al., 1998) and symptoms persisting into adulthood. The effects of physical abuse tend to be more grievous than those of verbal abuse. Children exposed to both intimate-partner violence and maltreatment have worse symptoms (Kernic et al., 2003; Fantuzzo et al., 1991; Jaffe et al., 1986a 1996b; O'keefe, et al., 1994; Roseman et al., 1991). Serious mid-teenage violent offending also does have childhood roots. Between 20-45percent of males with a serious track record of violent offending by 16 or 17 belong to this category (D'Unger et al., 1998; Elliott et al., 1986; Huizinga et al., 1995; Nagin et al., 1999; Patterson, 1997; Loeber et al., 1998) with an even higher percentage (45-69 %) among girls (McFarlane et al., 2003) . Youths who persist in serious violent acts beyond adolescence often begin violating others during childhood (Tolan, 1987; Loeber et al., 1998).

Community-level factors include sports, income, poverty, gangs and peer influence. Gangs tend to engage in organised, petty, random and/or gratuitous crimes (Mokwena , 1991; Laflamme et al., 2000). They may tout drugs or weapons, and involve themselves in organised robbery and banditry (Aligbe, 2002). In Nigeria, they reportedly trade in narcotics and guns (Best al., 2005;

Florquin et al., 2004). In Ghana, they smuggle and hijack, sometimes for political reasons (UNOCHA, 2004). In Guinea, they intimidate and threaten communities for gang interests (Anderson et al., 1998; Bettencourt et al., 1997; Carlson et al., 1990; Kolvin et al., 1990; McCord, 1991; Guerra et al., 1995; Spencer et al., 1988; Bettencourt et al., 1996; Carlson et al., 1988; Booth et al., 1994; Parke et al., 1972; Potts et al., 1995; Pulkkinen et al., 1995; Junger et al., 1995; Lett et al., 2002; Mutto et al., 2010; Mutto et al., 2010; Mutto et al., 2010; Starkunivieni et al., 2005; Williams et al., 1996; Salmon et al., 1998; Kumpulainen et al., 1998; Kaltiala-Heino et al., 1999; Rigby et al., 1998; Forero et al., 1999; Due et al., 1999; Bettencourt A, et al., 2006; Bayard, 2008; Phuong, 2004; Kernic et al., 2003; Karamaji et al., 2003; Kaye et al., 2006; Atuyambe et al., 2005; Black et al., 1988; Nathorst-Westfelt, 1982; Husband, 1972; Roberts et al., 1992).

Societal factors include rural-urban differences, guns and drugs, and quality of (social) integration, national laws, policies, ideologies, social conditions, rapid changes that lower real wages and weaken labour protection, infrastructure and access to social services; governance quality and cultural influences are also included (Krug, 2002; Laflamme et al., 2000). In Uganda, documented determinants of poor childhood health include birth injuries, domestic accidents and violence, poor child-bearing practices, household authority, female circumcision, sexuality, food preparation, divorce and marital instability, poor education, inadequate household income and a limited national budget - translating into poor services, poor distribution of human and other resources, weak management systems, high numbers of orphans and other vulnerable children, lack of services, environmental factors, health-seeking behaviour, domestic violence and child abuse, parenting quality, organised violence and gender inequality (MoH, 2001).

Armed violence is particularly problematic for childhood, adolescence and young adulthood. Apart from heightening injury and infection risks, and other psychosocial and physical problems, it draws them into atrocious actions that are known to have long-term negative psychosocial effects (Magambo et al., 2004; Derluyn et al., 2004; De Silva et al., 2001). By disrupting productivity, service delivery, and social order, wars also create conditions that promote childhood and youth violence. Moreover, PTSD and depression are common among displaced communities and PTSD is associated with violent conflict resolution (Vinck et al., 2007). Sub-Saharan Africa has been prone to war. In the 1980s and early 1990s alone, 35 countries in Africa were at war, (directly or indirectly) affecting over 550 million people, causing approximately five million excess deaths, and at least US \$13 billion in annual economic losses. Up to 70 percent of health networks in the affected countries were destroyed, further compromising health-response capacities and worsening the risks of malnutrition and deficiencies (Windom, 1989; Loretto, 1996; Loretto et al., 1996). Uganda's post-independence history has been dogged by socio-political strife which led to thousands of deaths and major disruptions of social services and livelihoods. The prolonged exposure to war entrenched violence as normative in some of the affected communities (Lett et al., 2006; Mutto et al., 2010).

The majority of the previous Ugandan injury studies were facility-based; although informative, such studies tend to underestimate the actual burden for several reasons, including selection bias. The facility-based studies were also biased towards severe adulthood injuries in care. The majority missed the childhood injury cases directly seen at the specialised paediatric units on account of their location at the main accident and emergency units and inefficiencies in triage

system and protocols, which may have occasioned specific under-reporting of poisoning and drowning. Besides, routine data are known for completeness and coverage errors. The limited community studies undertaken in Uganda were mainly located in the more affluent parts of the country. Follow-up studies and multi-level analytical methods have not been commonly applied in Ugandan injury research. As a result, the full extent and nature of the injury hazard is not fully understood. Consequently, gaps still exist with regard to the actual extent, nature, risk and determinants of the childhood and young adulthood injury and violation problem in Uganda. If left to persist, they could misguide national and local prevention policy and programme development.

## **2.2.2 Prevention and Control**

### *2.2.2.1 Theoretical Models*

Three approaches dominate current injury and violence prevention and control (education, enforcement and engineering). Education is premised on the assumption that the appropriate knowledge, attitudes and skills are able to empower individuals to act safe. It is critical for effective policy analysis and action (McKee et al., 2000), more so given that the true scales of public health problems are often hidden from the key policy level actors (Baker et al., 1992). In addition, education is beneficial in transmitting lifelong safety skills, safety promotion in situations where other strategies are lacking, altering public opinion, and promoting policy change (Christoffel et al., 2006; Committee on Trauma Research, 1985). It is also useful in areas of new knowledge and in situations where no other preventive approaches exist. Some behaviours are, however, better modified through product and environmental reforms (Committee on Trauma Research, 1985; Robertson et al., 1983; Kane, 1985; Kraus et al., 1992; Thompson et al., 2001).

Public education has been particularly successfully applied in the global advocacy for injury prevention and control (Peden et al., 2008). Notable outcomes include the *1996 World Health Assembly Resolution (WHA) 49.25* (Krug et al., 2000) which declared violence a global public health problem; the *2003 WHA Resolution 56.24* on implementation of the recommendations of the *World Report on Violence and Health*, and the *2004 Resolution A/RES/58/289 on Global Road Safety (2004)*; the UN Declaration on Human Rights (UN, 1948) calls of the: (i) the 1994 Conference on Population and Development (Shaw et al., 2003); (ii) the 1995 Conference on Women (UN Habitat, 2008); (iii) the 1996, 2002 and 2006 World Injury Prevention and Control Conferences; and (iv) the 1995 Summit on Social Development. Others are the Millennium Development Goals (MDGs) (UN, 2009) and EFA goals. A major challenge is to translate this growing global awareness into tangible reductions in injury rates, especially in least developed countries.

Enforcement focuses on safety through administrative or legal mechanisms. It requires relevant instruments and appropriate enforcement mechanisms and capabilities. Engineering, on the other hand, focuses on product design on the premise that most hazards can be controlled given that many of them are also man-made (Christoffel, 2006; Robertson, 1983). Engineered strategies recognise children's developmental limitations in managing potentially injurious environments, pursuing environmental modification instead of blaming children or caregivers for

their injury avoidance inadequacies (Kane, 1985). Engineering tends to be expensive, a point that is often advanced by many resource-constrained countries as justification for inaction on injuries.

Whereas some developed countries successfully reduced their childhood and youth-hood injury burdens by applying the above strategies in contexts of general improvements in living conditions, public health, acute care and rehabilitation (Rivara et al., 2001; Trunkey, 1983; Trunkey, 1996), the debate regarding the effectiveness and applicability of the three strategies across cultures continues. Core arguments revolve around ethical issues (e.g. the prerogative of autonomy for acting safe and whether this should be vested in individuals or systems or environments and if so by volition or force of law or engineering). The fact that the success of educational strategies tends to depend on the beliefs, efforts and actions of the audience has been advanced as a major limitation of education (Christoffel et al., 2006), while the fact that injurious environments tend to be more fluid, private and diverse was also advanced as a major challenge to engineering and legislated actions (Schelp, 1997).

The limitations of typically engineered and top-bottom legislative approaches to injury and violence prevention has since motivated the emergence of a community-based model currently being popularised globally by the Safe Communities and SafeKids movements (Schelp, 1997; Spinks et al., 2004). Safe Communities is a global movement founded on the tenets of safety as a universal concern and responsibility. A 'Safe Community' may be: a municipality; a county; a city or a district of a city working with safety promotion, injury-, violence- and suicide-prevention and the prevention of consequences (human injuries) of natural disasters, covering all age groups, genders and areas and is a part of an international network of accredited programmes (KI/WHO, 2011). The Safe Communities approach encourages equity, collaboration, partnerships, local input, involvement and other resources of social capital for sustainable safety programming in communities (Mollar, 1991). The approach integrates emic stakeholder perspectives in the definition and resolution of local injury and violence problems. It is growing fast and delivering results in different settings across the world.

#### *2.2.2.2 On-going International and Local Public Health Interventions*

At the global front, Uganda has ratified a number of covenants and resolutions including: the UN Charter which upholds the right to life, liberty and security of person, the right not to be held in slavery or servitude and to prohibit slavery and slave trade, and the right not to be subjected to torture or cruel, inhuman or degrading treatment or punishment; the call of the 1995 World Summit on Social Development regarding the protection of all human rights and the pursuit of gender parity; and the (1989 UN) and 1990 African Charters on the Rights of the Child (OAU, 1999). Article 19 of the Convention on the Rights of the Child specifically commits states parties to the establishment and observance of appropriate legislative, administrative, social and educational measures for the protection of children from all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation, including sexual abuse (UN, 1989). Further, it recommends the establishment of social programmes for the provision of necessary support for children and those who have them and for the identification, reporting, referral, investigation, treatment and follow-up of maltreatment cases (UN, 1989). Uganda domesticated the covenant on the rights of the child through a (specific children's) statute (GoU, 1996).

Ugandan researchers and activists also participated in the calls of the 1995 Beijing World Conference on Women regarding the elimination of all forms of violence against women and girls; the 1996 Melbourne World Injury Prevention and Control Conference regarding the implementation of programmes to reduce intentional injuries; the 2002 Montreal World Injury Prevention and Control Conference regarding the declaration of safety as a fundamental human right;

Nationally, the (1995) constitution and (1997) local government act provides for the protection, survival, growth and development of Ugandan children. This constitutional commitment has been operationalised through a number of policy and programme interventions including the policy on child survival, growth and development, whose components include Integrated Management of Childhood Illnesses (IMCI), malaria control, immunisation, nutrition and school health (MoH, 2007). Other broader-ranging interventions include the establishment of special children's courts within Uganda's High Court, the universalisation of access to basic education, the Expanded Programme for Immunisation (EPI) programmes, the introduction of the IMCI strategy and the intensification of childhood HIV mitigation (Tulloch, 1999). A major gap in the above initiatives regards their weak focus on childhood injuries. It is not clear if occasioned upon the weak evidence basis to justify their inclusion or limited capacity for policy and programme development and implementation. In the meantime, horrific accounts of traffic crashes, falls, fires, construction and natural disasters, abductions, ritual murders, physical fights, bullying, drug abuse, gang activities, criminality, truancy, and sexual violence involving children and young adults continue to pervade the local media (Ranny, 2009; Mutabazi, 2009; Reuters, 2009; Agiro, 2009; Mutto et al., 2009).

### **2.2.3 Stakeholders' Views and Perceptions regarding Childhood/Young Adulthood Injury Epidemiology (i.e. Extent, Risk Factors, Prevention)**

Perceptions regarding the causes of disease and other health outcomes are important success factors in public health practice (van der Pligt, 1996; Gonya et al., 2000; Butchart et al., 1998; Balicer et al., 2006). They influence management practices as well as intervention readiness (Harris, 1994; van der Pligt, 1996; Butchart et al., 2000; Astrom, 2006). Their importance relates to the fact that they set broad psychosocial parameters within which stakeholders interpret injury and violent events and define their own response options and strategies (Simons, 1991). Although known to be crucial in the prevention and control of infectious and lifestyle diseases, few studies have previously reviewed the role of injury-specific beliefs and attitudes in definitions of injury causes and outcomes (Becker et al., 1977; Heggenhougen, 1991; Kegeles, 1981; King, 1983; Simons, 1991). At a more corporate level, attitudes and perceptions may influence policy designs and responsiveness and the extent of required actions. Stakeholder perceptions should, therefore, be established and integrated into all action-oriented research and the findings should be integrated into policy and programme actions. This, in part, could be the reason for the current emphasis on community participation and involvement in health care as a key primary health care strategy already adopted by the 1978 Alma Ata Declaration (MoH, 1999). In Uganda, this has been embraced and integrated into the National Health Policy which emphasises the empowerment of individuals and communities for active participation in health services (MoH, 1999). Unfortunately, the policy does not include specific targets for injury prevention and control.



## 2.3 Child Health in Uganda: Contextualising Childhood Injuries and Violence

### 2.3.1 *Current Policy*

Uganda introduced a number of social reforms as part of its post-war recovery plan. In the health sector, the entire ministry was restructured, service delivery decentralised, and sector financing and regulation reforms were introduced, giving more prominence to private providers (Sewanyana et al., 2004). The role of the central government was trimmed to policy formulation and technical guidance as public (health) expenditure was confined to health promotion and disease prevention on the assumption that individuals and charities would cater for their own health. This assumption was predicated upon a hypothesized growth in household health purchasing capacities consequent upon a predicted economic boom (World Bank, 1993). A 'National Minimum Health Care Package (UNMHCP)' was introduced. Its technical programmes included control of communicable diseases, integrated management of childhood illnesses, sexual and reproductive health and rights, immunisation, environmental health, health education and promotion, school health, epidemic and disaster prevention, preparedness and responses and improved nutrition. Those that were excluded but deemed to have potential for cost-effective investments included cardiovascular diseases and trauma/accidents (MoH, 2000). It is not, however, clear how prepared, competent and willing local governments and private sector actors were to finance and drive an aggressive injury prevention and safety promotion agenda in Uganda. In addition, the central government's capacity for injury and violence prevention policy formulation, leadership, and programme implementation and design was limited. For example, an injury focal health officer was not designated until the late 1990s.

Uganda continued to promote the minimum health care package within its community level primary health care focus (MoH, 2000), setting up village health teams to provide health information, mobilise communities and provide linkages with local health services (MoH, 2005). Unfortunately, their training was biased towards the better-funded and globally well promoted communicable diseases such as HIV/AIDS, TB, malaria, upper respiratory tract infections (URTI) and meningitis. None of the common childhood injuries were included in their training programmes and disseminated information parks. Moreover, the readiness of community actors to embrace injuries as an important public health problem was not known and the very attitudes that may have underpinned their reactions to local childhood injuries were not also clear. This was worsened by the fact that the hypothesised health benefits of the projected economic growth did not happen or, at the least, trickle down to the majority of households. While economic growth was sustained at 7percent and inflation at 5percent, Uganda failed to realise a functional health system. Physical access through private providers did increase, but economic barriers denied full realisation, worsening existing equity, efficiency, and quality and dependency challenges (Okunzi, 2004). Besides, some of the injury-specific services remained inaccessible in most parts of the country on account of human and technological limitations.

The conflict-affected areas were worst hit as most of their planning and productivity was replaced with relief (Okunzi, 2004). The squalid habitations and living conditions in the conflict areas promoted and gave more visibility to the epidemic-prone diseases at the expense of the less dramatic health problems such as injuries. The 'verticalised' service delivery framework stifled

flexibility in health priority setting as donor ‘conditionalities’ locked out local perspectives and innovations: two decades later, the beneficial impact of these legal instruments, especially among the rural poor, remain to be seen. Also ‘locked out’ were the prospects for contextualised human capacity development, including the training of local injury prevention specialists. With regard to the policy on child survival, growth and development, case management, household and community participation, child feeding and nutrition, conducive environments and research were identified as key focal areas (MoH, 2007), further constraining public resource allocation to childhood injury and violence prevention.

In 1997, the Ugandan government launched the national Poverty Eradication Action Plan (PEAP- MoFPED, 1997). The plan emphasised basic services to the poor. Other launched generic government interventions included the 2002 Prosperity for All Programme, the 1997 *Entandikwa* Scheme (MoFPED, 2001), and the current National Development Plan (NDP- MoFPED, 2010). While such programmes are partly credited for their role in the marked reduction in childhood injury rates in some of the developed countries, no similar effects have been observed in Uganda. Besides, the national policy on child survival, growth and development is not explicit on injury prevention. However, a number of NGO-led school and community-based traffic safety and violence prevention programmes, including pre-hospital care training for first responders, were established: their aggregated effect on the local injury and violence burden, however, remains dismal.

### *2.3.2 Existing Research on Injury-Specific Initiatives in Uganda*

Some of the early injury and violence studies in Uganda were conducted by the Ministry of Health with support from CDC (MoH-CDC, 1996) using Health Management Information Systems (HMIS) data. Those studies did identify injuries as a major health problem in Uganda, ranking them among the top six national mortality causes. Unfortunately, those findings were not immediately translated into specific policy and programme actions as the integration of injuries into the national priority diseases framework tarried.

More recent studies described injury patterns and distribution in Uganda and were used to launch formal injury prevention and control activities in the country. Many of those studies were facility-based, limited in (geographical) scope and biased towards severe adulthood injuries in referral care in south-central Uganda. The registries used for injury data collection had been located at the surgical sections of main accident an emergency units, possibly missing many of the childhood injuries that report directly to the specialised paediatric emergency units. In addition, poison injuries which were usually triaged to medical sections may have been underreported. Although informative, such routine data sources are known to have completeness and coverage challenges: a 2000 evaluation found the sensitivity of the existing injury surveillance system to range between 28-78percent. Other gaps could emanate from the consensus building processes in clinical care where multiple clinical opinions are harnessed into specific diagnosis and care options: the procedures for handling those opinions in epidemiological research are not well established (Byass et al., 2011); this could result in specific biases towards the dominant views. In addition, the two main community studies that informed much of the injury prevention programmes in Uganda were also based in the more developed and affluent south-central region of Uganda. Yet existing anecdotes continue to suggest growth in the local burden; paucity of data remains a major obstacle to effective prevention.

### *2.3.3 How do the Policies and Programmes Prioritise Childhood Injuries?*

Based on the previous research, traffic, violence, falls, and burns were identified as key priorities for policy and programme action in Uganda. Homes, roads and schools were also identified as key injury locations. The actual nature and extent of the injury risk in those locations were not, however, well studied. As a result, opportunities for synergistic intervention by stakeholders may have been missed. Given the limited technological and human capacity for injury prevention and control in Uganda, there is need for more efficient use of the existing resources to maximise impact.

In summary, injuries among children and young adults pose a major health threat in Uganda. The previous reforms aimed at generic improvements in health and living conditions did not deliver the hypothesised health benefits, especially in the area of (childhood and young adulthood) injuries and violence. While a number of epidemiological investigations were conducted, and prevention and control priorities and entry points were defined, the motivating evidence was largely biased towards more severe incidents among adults in tertiary care. In this thesis, we specifically explore the epidemiology of injuries among children and young adults, and stakeholder perceptions regarding their extent, risk, determinants, prevention and control.

## **2. 4 Rationale of Thesis**

The literature on childhood and young adulthood injuries in Uganda has evidenced major gaps in the local injury knowledge base, as well as policy and programme response. The current study specifically attempts to describe patterns of intentional and unintentional injuries among Ugandan children and young adults as a way of improving the local understanding of the problem and also highlighting it as a major public health concern worth a national response. The use of multiple data sources and analytic methods adds to the internal and external validity of the conclusions.

Although known, from previous studies, as key locations of childhood injury and violation in Uganda, the actual extent and nature of the domestic, school-, and road-related childhood and young adulthood injury and violation risk is not known. The current study attempts to ‘unpack’ the risk in those locations using superior analytical methods as a way of quantifying and elucidating the risk and identifying potential prevention entry points and directions for Ugandan communities.

Currently generic interventions are being promoted among Ugandan communities. Although such programmes were partly credited for the remarkable reductions in childhood injuries in some of the developed countries, the local field anecdotes evidence escalation of childhood injuries. Our study adds to the case for contextualised response based on the specific risk profiles identified across childhood. It also elucidates stakeholder perspectives with the aim of providing for their inclusion in comprehensive national policy and programme ‘platforms’.

While government attempted several policy interventions, the frameworks remain ‘blunt’ and unresponsive to childhood injuries and violations. The present study identifies specific focal

areas for policy action, especially in the community focus. Areas for specific policy focus could include the integration of injury prevention and management into current community health worker training programmes and the dissemination of simple checklists for safer homes and school environments on the basis of identified risk profiles as part of the health education and promotion initiatives of the health ministry.

Previously, discussions regarding the segregated approach to prevention and control of intentional and unintentional injuries were inconclusive; the current study contributes specific quantitative evidence regarding possible conceptual differences between the two classifications as bases for a segregated approach to their research, prevention and control.

## **2.5 Significance**

The current findings could greatly increase the visibility of the local childhood and young adulthood injury and violence problem and instigate major policy and programme reforms and responses. Some of the specific actions that could accrue may include the development and adoption of simple child-sensitive domestic, school and road safety guidelines and standards; contextualised community-led interventions; more targeted policy action from government and other stakeholders; the integration of injury prevention into current community health workers' training; the development and dissemination of specific safety checklists for homes and schools on the basis of the described risk profiles; and a more effective and segregated approach to intentional and unintentional injury prevention and control. It also suggests ways of integrating specific stakeholder perspectives into national and local policy.

### **3. AIMS AND OBJECTIVES**

#### **3.1 Main Objective**

The main objective of this thesis is to examine the epidemiology of childhood and young adulthood injuries in Uganda and stakeholder perceptions regarding their extent, determinants, prevention and control.

#### **3.2 Specific Objectives**

3.2.1 To determine the patterns, distribution, risk and determinants of domestic and school-related (unintentional and intentional) childhood and adolescence injuries in Kampala slums, at the national referral paediatric unit, and in rural elementary schools in north-western Uganda (sub-studies 1, 2 and 4).

3.2.2 To establish the extent, distribution, characteristics and outcomes of youth-related intentional injuries in referral care in five geopolitical regions of Uganda (sub-study 3).

3.2.3 To establish rural stakeholder views and perceptions regarding the extent, risk, determinants, prevention and management of unintentional and intentional childhood and young adulthood injuries (Sub-study 5).

## 4. METHODS AND MATERIALS

### 4.1 Setting

This thesis is based on Ugandan childhood and young adulthood injury studies. Uganda is a low-income tropical African country with a total population of approximately 38 million (UBOS, 2005). At present, Uganda is zoned into six geopolitical regions (north-western, northern, eastern, central, south-western, and western). Despite a generous natural endowment (with fertile soils, regular rainfall, and minerals like copper, cobalt, crude oil and natural gas) (GoU, 2000), Uganda remains one of the poorest countries worldwide (UNDP, 2008), with subsistence agriculture as the mainstay of the economy, employing over 80percent of the population (Okidi et al., 2004), half of whom are under 15 years, 13percent of the population is urban. The country's main language groups are Bantu, Nilotic, and Nilo-Hamitic. Uganda's GDP per capita is approximately half of the sub-Saharan African average (of 600 dollars). Only 6.7percent of its 45,000-kilometre road network is paved: Uganda also has an estimated 1,350 kilometres of (largely dysfunctional) rail and social, cultural and economic linkages with Rwanda, Burundi, the Democratic Republic of Congo (DRC) and south Sudan.

The average life expectancy of Ugandan males and females is approximately 49 and 50 years respectively (UBOS, 2005). The country's child-health indices are among the worst regionally, with neonatal conditions, HIV/AIDS, diarrhoeal diseases, measles, malaria, pneumonia, injuries/trauma, ARI, intestinal worms, LRI, skin diseases, eye diseases, anaemia and ear infections being leading under-five mortality and morbidity causes (Lee, 2003). Injury and violence are also major public health problems. Much of Uganda's post-independence history has been marred by socio-political strife.

Sub-study 1 (the household survey) was specifically set in a peri-urban slum near the national referral hospital in Kampala City. This area has a largely low-income, multi-ethnic population of over 73,000 people. The area is deprived and characterised by poor housing and other bad general living conditions.

Sub-study 2 was set in the Kampala-based 1200 bed national referral hospital. Sub-study 3 employed data from five regional referral hospitals including Mulago, one of the two Kampala-based national referral hospitals; the others being Lacor, Mbarara, Fort Portal and Mbale. Lacor, the northern site, is a mission hospital 315 kilometres north of Kampala. Its catchment population was internally displaced by 20 years of armed rebellion. Mbarara, the south-western site, is 266 kilometres from Kampala along the main road link to Rwanda, Burundi, south-eastern DRC and north-western Tanzania. The area is home to ethnic Banyankole cattle herders. Fort Portal, the western site, is approximately 300 kilometres from Kampala. Its projected 2009 catchment population of 441,747 subsists on agriculture and animal husbandry. Mbale, the eastern site, is home to the ethnic Bamasaba whose primary economic activity is agriculture. The projected 2009 population of the area was 400, 276. Mulago, the south-central site, is one of the two national referral hospitals in Kampala: 60percent of Kampala city residents are Luganda speakers. Kampala had a projected 2008 population of 1,420,200.



## 4.2 Study Design

The current objectives were studied using both qualitative and quantitative methods. Sub-study 1 employed a cross-sectional design, Sub-studies 2, 3 and 4 employed facility (hospital and elementary school)-based prospective designs. The use of injury surveillance for the monitoring of injury trends and targeting prevention efforts has been previously described and hospital records are important sources of data on severe, non-fatal injuries (Robertson, 1992). Sub-study 5 was a qualitative analysis of cross-sectional information regarding stakeholder views and perceptions regarding childhood injuries and violence.

The above designs were necessitated by the specific research questions and their logistical and practical implications. The facility-based surveillance and household surveys were specifically used to establish childhood injury patterns, distribution, determinants, and risk in Ugandan referral facilities and peri-urban neighbourhoods, while focus group discussions (FGDs) and key informant interviews (KIIs) established stakeholder perspectives regarding causes, prevention and control of childhood and young adulthood injuries and violence. Methodological duality allowed for a more comprehensive assessment of the problem, something which had not been previously done on childhood and young adulthood injuries in Uganda.

## 4.3 Population

The target population was Ugandan children and young adults between 1-23 years of age.

- Sub-study 1 specifically targeted unintentionally injured 1-5-year-olds living in peri-urban Ugandan slums and the accessible population was that currently residing in Kamwokya, Kampala.
- Sub-study 2 targeted intentionally injured 9-23-year-olds accessing referral care in Uganda and the accessible population was that receiving intentional injury care at the sampled regional sites (northern, eastern, western, south-western and south-central regions) and whose records had been captured in the existing trauma registry.
- Sub-study 3 targeted unintentionally injured 1-12-year-olds accessing referral care and the accessible population was that seeking injury care at the national referral paediatric emergency unit in Kampala, Uganda.
- Sub-study 4 targeted school-going grade-fives in Uganda; the accessible population was that currently attending sampled primary schools in Yumbe, north-western Uganda.
- Sub-study 5 targeted Ugandan stakeholders, particularly elementary school teachers and children and the accessible population was that from the schools that had participated in the cohort study (Sub-study 4).

## 4.4 Sample and Sampling

The sample for Sub-study 1 comprised under-fives in Kampala slums. All households with under-five-year-olds and consenting adult caretakers were enrolled. The households were identified by the local community health workers. Community health workers are health volunteers established by the Ministry of Health to provide extension services. Kamwokya slum



was selected because of its proximity to Makerere University Medical School and the fact that no formalised injury and violence prevention and control programmes had been previously conducted in the area.

Sub-study 2 sample comprised 13-23-year-olds receiving injury care at five regional referral facilities and whose injury details had been captured in a computerised surveillance system. The data had been prospectively collected (between July 2004 and June 2005) from all patients accessing injury care. Trauma registries were earlier established and managed by the Injury Control Centre-Uganda (ICC-U) to provide comprehensive data on all injuries seen at the accident and emergency units of the participating hospitals. The surveillance was expanded to the five regional referral hospitals after a 2002 review to increase its national geopolitical representativeness. The review had shown a limited sensitivity of 28-78 percent. Referral facilities had been selected to host the registries because of their capacity for major trauma care. The registry forms distinguish self-inflicted injuries from assaults. They collect WHO-recommended minimal data sets for injuries (Holder et al., 2001).

The Sub-study 3 sample consisted of under-13-year-olds receiving injury care at the specialised national referral paediatric emergency unit in Kampala. All injured children below 13 years accessing injury care at the national paediatric emergency unit during the study period, and whose parents consented to participation, were included. The national referral hospital was selected because of its previous experience in hosting a similar registry at the main accident and emergency unit. Comparisons could be made between the estimates from the paediatric emergency unit and those from the main accident and emergency unit.

The Sub-study 4 sample included grade five children from Yumbe primary schools in north-western Uganda. The participating schools were sampled by the local district authorities using predefined inclusion and exclusion criteria. Grade five children were selected because of their command of the English language and availability for follow-up injury and violence prevention activities within the same schools. The sample size was calculated with a variance inflation adjustment based on an Intra Class Correlation (ICC) of 0.04 and average cluster size of 50 established from an earlier northern Ugandan study (Mutto et al., 2009).

Childhood and young adulthood were specifically targeted because of their glaring injury information gaps. The policy and programme response to their injury and violence problem was also thought to be most inadequate. The domestic, school and hospital focus was necessitated by the high prospects of finding the targeted sub-populations in them. Logistical technicalities also influenced choice of the specific settings within the broad study location categories.

#### **4.5 Data Sources**

Multiple data sources were used: primary household data for Sub-study 1, and facility-based surveillance data for sub-studies 2-4. Sub-study 5 employed qualitative data from focus group and key informant discussions. The multiple data sources were expected to provide a more comprehensive and holistic picture of the local childhood and young adulthood injury and violation problem.

Sub-study 2 used secondary data from an existing injury surveillance system that was already running in the five regional referral hospitals of Uganda. The registries were located at the main accident and emergency units of the five referral facilities. The surveillance forms were completed by specifically trained casualty unit staff.

Sub-study 3 established a specific trauma registry at the national paediatric emergency unit in Kampala to pilot a new childhood injury surveillance instrument (Sub-study 3). The new instrument was developed by Hyder et al. (18). All under-13-year-olds accessing injury care at the unit and whose adult attendants consented to participation were included.

Other registries were also set up at 13 elementary schools in Yumbe, in north-western Uganda, to capture all injury and violence incidents occurring to grade five children at school, at home and on their way to and from school. Trained class teachers filled the registry forms (one for each reported case of injury and violation). The applied instrument had been adapted from ones previously used in a South African school surveillance and northern Ugandan schools (Mutto et al., 2009).

#### **4.6 Data Collection**

Specifically developed questionnaires were used to conduct interviews in the sampled households while standardised injury surveillance formats were used to collect injury data in hospitals and schools (see appendices i-iii). Interview guides were used for FGDs and KIIs (see appendix iv).

Specifically trained research assistants conducted the household interviews while emergency care staff filled the trauma registry forms. The completed forms were field-edited by the respective departmental supervisors before entry into a computerised central data base. The school based injury surveillance forms were completed by class teachers with supervisory support from head teachers.

Qualitative data were collected using an interview guide. The discussion guide questions were generated by the researcher and reviewed by a team of three assistants. The questions were then translated into the local language (Akinga) before back-translation into the English language by an independent assistant. The interviews were taped and field notes were taken during the discussions. Each FGD lasted, on average, 1 hour and 20 minutes. No repeat interviews were necessitated and the transcripts were not returned for comment or correction mainly because of logistical reasons. Discussion themes included extent, risk, risk factors, causes, prevention and control and management practices.

#### **4.7 Measures**

The main outcome measure for Sub-study 1 was unintentional domestic childhood injury, for Sub-study 2 was intentional youth-hood injury, for Sub-study 3 were unintentional injuries among 1-13-year-olds; and for Sub-study 4 were school-related injuries among grade five children. Other recorded individual-level covariates included age and sex. Contextual variables included school, location, and institutional religious affiliation. Tracked injury characteristics were time, place, activity at time, intent, social behaviour, and physical action, injury mechanism,

severity, nature, affected body part, and outcomes.

The focus group and key informant discussion themes included injury and violence causes, risk factors, prevention and management practices.

#### 4.8 Data Analysis

The quantitative data for Sub-study 1 were analysed using Epi\_Info 6.4; measures of location and spread were used to describe domestic injury patterns and distribution among under-fives. Odds ratios were used to assess and quantify the associations between specific injury outcomes and a number of potential risk factors (Sub-study 1). The hospital-based surveillance data for Sub-studies 2 and 3 were analysed using Stata 8. Incident characteristics were disaggregated by age, location and cause, and summarised using proportions. The total number of captured injuries constituted the total injury burden at the five sites and was used to estimate injury odds by type. Odds of occurrence were computed by age, cause and location and were then compared for differences across childhood and youth-hood. Proportional incidence rates were also calculated by age, location, and cause and used to establish risk trends across childhood and youth-hood (Sub-study 2 and 3).

Survival analysis and multi-level modelling techniques were used for analysing Sub-study 4 data on account of the time and contextual dependencies of injury and violent events. Injury rates and survival and hazard experiences were computed and compared across ages, genders, schools, locations and institutional religious affiliations. The time and contextual effects of injury risk were evaluated using the Poisson and Cox proportional hazard models. The school-related hazard and survival experiences were modelled on the bases of the hazard and survival expressions (a and b respectively) below (Breslow et al., 1987; Breslow et al, 1983) . While Dickman et al., (2006) did point out the key limitations of survival experiences, they remain pertinent measures for informing secondary prevention from a process view point (Dickman et al., 2006).

$$(a) \quad \lambda(t) dt = \Pr(t \leq T < t + dt | T \geq t) = \frac{f(t) dt}{S(t)} = -\frac{S'(t) dt}{S(t)}.$$

$$(b)^2 \quad S(t) = \Pr(T > t) = 1 - F(t)$$

The hazard function was used to demonstrate how school-related injury risk varied with time and intent. The log-rank and scaled Schoenfeld residual tests were used to evaluate the integrity of the proportional hazards assumption. Assumption violations and ties were addressed through stratification and Efron techniques (Grambsch et al., 1994; Hosmer et al., 2008).

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<sup>2</sup> Where  $t$  is some time,  $T$  is a random variable denoting time of event, and survival, 'Pr' denotes the probability that the injury event is later than time  $t$ ; it assumes values between zero and 1, while for hazard it ranges between zero and positive infinity.

Multi-level logistic regression techniques (Snijders et al., 1999; Leyland et al., 2003; Goldstein et al., 2002) were then used to explore the effects of contextual covariates, specifically institutional religious affiliation, location and school, on the basis of expression (c) below. Where  $\mu$  is the average score for the entire population of children,  $U_i$  is the school-specific random effect, measuring differences between the average score at school  $i$  and the average score in the entire community, and  $W_{ij}$  is the individual-specific error or deviation of the  $j$ th pupil's score from the average for the  $i$ th school (Christensen, 2002). MLA techniques allow for the inclusion of contextual effects in the analysis of individual-level injury and violation risk. All models were assessed for appropriateness using likelihood ratio tests and the most appropriate model was used to address current study objectives:

$$(C) \quad Y_{ij} = \mu + U_i + W_{ij},$$

Qualitative data were transcribed and subjected to content and thematic analysis using standard guidelines for the analysis of qualitative data. Interviews were transcribed by an assistant. The transcriptions were checked by the lead researcher; the content was then manually grouped by theme and comparisons made across and within focus groups.

#### 4.9 Ethical Considerations

Clearances for the different sub-studies were obtained from Mulago Hospital, Makerere University Medical School, the Gulu University Medical School Ethics Committee, and the Uganda National Council of Science and Technology. Since the study population included minors, every effort was made to obtain valid informed consent from their parents or legal guardians or their representatives (PTA). Each child was given a translated version of the informed consent form to take to his/her parent or legal guardian and the parent or legal guardian was required to express his/her unwillingness to permit participation by signing and returning the informed consent form within two days. The children were also given the opportunity to assent to participation. Voluntary participation was emphasised at all times. The data generated were kept under lock and key in the Principal Investigator's office in Kampala and were used only for the purposes of the study. Personal identifies were confidently managed and used only for tracking responses. The project was approved by the Uganda National Council of Science and Technology (UNST).

## 5. SUMMARY OF FINDINGS

The summary of key findings presented in this section relate to the main study questions as presented in Table 1 below.

*Table 1: Key Research Questions*

Paper	Research Question
Main	What is the epidemiology of childhood and young adulthood injuries in Uganda and stakeholder perceptions regarding their extent, determinants, and prevention and control?
I	What are the patterns, distribution, and factors associated with unintentional domestic childhood injuries in Kamwokya, Kampala?
II	What are the magnitude, characteristics, and outcomes of intentional youth-related injuries in Uganda?
III	What are the patterns, odds, and outcomes of unintentional childhood injuries at the national paediatric emergency unit in Kampala, Uganda?
IV	What are the: extent, risk and factors associated with childhood injuries in elementary schools in north-western Uganda?
V	What are the views and perceptions of north-western Ugandan community stakeholders regarding the extent, risk, determinants, prevention and control of childhood and adolescence injuries and violence?

## 5.1. Epidemiology

### 5.1.1 Extent, Pattern and Distribution

The extent, pattern and distribution of unintentional domestic childhood injuries in a Kampala slum, Uganda are summarised in Table 1. The majority of the respondents were mothers (67%) living in rented one-roomed shacks; 15percent were domestic female child-minders. The most prevalent injuries were falls (36.5%), cuts (14.6%), blunt trauma (14.1%), burns (7.8%) and scalds (4.7%). Under-five mortality during the previous three years was 6.3percent. The majority (85.9%) of households kept potential poisons out of children's reach. Storage practices regarding other potentially injurious items are summarised in Table 2 below. The common causes of death in the slum are sickness (78.5%), road traffic accidents (14.2) and fire (7.3) (Sub-study 1). Overall, falls, burns, cuts, blunt trauma and poisoning are the most frequent non-intentional injury mechanisms in urban homes (Sub-studies 1-4), while falls, burns, cuts, blunt trauma, and animal/insect bites are the most frequent non-intentional injury mechanisms in rural Uganda.

Regarding hospital-based studies, one-quarter (20.5 %) of all injuries in referral care are intentional, one-third of them involve youth, 74.8percent of who were male, and 69.8percent between 10-23 years of age. Students (27.6%), casual labourers (20.5%) and peasants (17.3%) are most commonly intentionally injured. Homes (34.1 %), roads/streets (31.7%) and public places (11.5%) constitute 86.3percent of intentional youth-hood injury locations. Blunt force (45.28), stabs/cuts (18.45%) and gunshots (12.02%) are the most common intentional youth-hood injury mechanisms. The majority (83%) of the injuries are minor (KTS<sup>3</sup>>8); while 13.9percent are moderate. Only 3percent are severe. Blunt force (34.0%), stabs/cuts (29.5%) and gunshots (13.6%) are the most prevalent incident mechanisms of severe intentional injuries. They account for 69percent of 'at two week' injury fatalities. Cuts/bites or open wounds (53.3%), bruises or superficial injuries (20%) and concussions (11.1%) are the most common injury types, with the head/neck and face (31.1%), bony pelvis and extremities (8.9%), and the abdomen/ pelvis and perineum (4.4%) being the body parts most frequently presented with serious injuries. Forty-three percent of intentional incidents require admission, with 77percent of the cases being discharged within two weeks. Four point one percent of the cases died while 17.2percent were still hospitalised after two weeks of admission (Sub-study 2).

Schools, homes, and roads are the leading school-related childhood injury locations. The most common types of school-related injuries and violations are: falls, burns, cuts, blunt trauma, animal and insect bites, corporal punishment, labour exploitation, deprivation, neglect, sexual violation, drug abuse and gang activities. Seasonal injury 'spurts', especially falls from (fruit) trees and on playgrounds, bites from animals and insects, and fist fights are thought to exist in rural Uganda. These 'spurts' are thought to be instigated by seasonal variations in staple food supply, as well as social and competitive sporting programmes and events. Whereas case fatality is low, suggesting the dominance of minor injuries, most school-related childhood and young adulthood injuries and violations receive first aid or definitive health facility care. The violent injuries among 13-23-year-olds constitute 7.3percent of the total injury burden in Ugandan referral care with a case fatality of 4percent.

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<sup>3</sup> KTS refers to the Kampala Trauma Score

Table 2: Household and domestic childhood injury characteristics

Category	Variable	Proportion (%) N=347
Dwelling type	Shack	73.5
	Flat	4.0
	Bungalow	12.7
	Other	9.8
Dwelling size	1 room	53.0
	2 rooms	29.4
	3 rooms	7.5
	More than 3 rooms	10.1
Accommodation status	Rented	81.8
	Free	2.6
	Owned	15.0
	Other	0.6
Cooking area	Separate from sitting area	76.4
	Separate from sleeping area	82.7
	Raised	36.3
Energy source	Wood	0.6
	Charcoal	94.2
	Electricity	32.0
	Paraffin	29.4
Injury type	Falls	36.5
	Cuts	14.6
	Blunt trauma	14.1
	Burns and scalds	7.8
	Punctures	4.7
	Foreign body in ear, nose and throat	4.3
	Others	18.0

### 5.1.2 Risk and Risk Trends

The odds and risk rates of intentional and unintentional domestic and school-related childhood injuries were calculated. They were generally high for the three leading unintentional domestic childhood injury causes, although with age- and gender-specific differences (see Figures 2 and 3). Below five years, the odds of domestic falls and burns were higher; those of traffic, fall and sports injuries only 'surpassed' those of burns after the fifth year of life (Sub-studies 1 and 3, Figures 1 and 2).

Approximately one-fifth (18%) of elementary school children in north-western Uganda experience at least one injury or violent event in a school term. Crude mean time to a school-related childhood injury event is 182.6 person days (72 person days, 95% CI= 64.3-79.9, for intentional and 192.9 person days-95% CI=187.9-197.8, for unintentional injuries,  $X^2=253$ ,  $p$ -value=0.0000). The gender-disaggregated survival experiences and hazard rates are presented in Figures 4 and 5 below. The gender differences in mean times to injury or violation are significant: the mean time for girls is 190.1 person days, 95% CI=182.8-197.4 person days and the mean for boys is 176.7 person days, 95% CI=169.9-183.6 person days;  $t=2.6125$ ,  $p$ -

value=0.0091. The log-rank test of equality between the two survival functions was significant ( $X^2=3.45$ , p-value= 0.06). The survival patterns suggest a superior experience for girls as compared to the boys. The gross cumulative prevalence of school-related childhood and adolescent injuries in north-western Uganda is 36.1% (the gender- disaggregated cumulative proportions are 39.7% and 31.4%, for males and females respectively,  $X^2=7.3336$ , p-value=0.007).

The crude rate of school-related childhood injuries in north-western Uganda is 11.6/1000 person days, with significant gender differences (11.3 and 12.2/1000 person days, for boys and girls respectively), giving a hazard ratio of 1.4 (95% CI= 1.1-1.73,  $z= 2.09$ , p-value= 0.014). The effect of gender on injury rate varied with levels of intent ( $X^2=95.35$ , p-value=0.000). Within the school, having controlled for location and institutional religious affiliation, boys have a 25 percent higher injury rate compared to girls (p-value= 0.037, 95% CI= 1.01-1.55 see Figures 4 and 5). There are also rate variations among schools: the Poisson model of gender, intent and school has acceptable fit ((1/df) Deviance=0.7 and (1/df) Pearson=1.2). There were no monthly variations in school-related childhood injury rates.

Travel, break-time and practical class activities, including gardening, are the most risky school-related activities, particularly walking, playing, and practical class (Sub-study 4). The most injurious physical acts are collisions (with objects), sports, and falls. The case fatality rate of non-intentional domestic childhood injuries is 1.1/100/year (Sub-study 1).

Regarding intentional youth-hood injuries, the risk is skewed towards older youth, peaking at 21 years. Males doubled the prevalence among females (Sub-study 2). Intentional injuries have a greater hazard function but lower prevalence as compared to unintentional injuries that had a higher prevalence. Overall, the survival experience of girls is superior to that of boys (Sub-study 4).



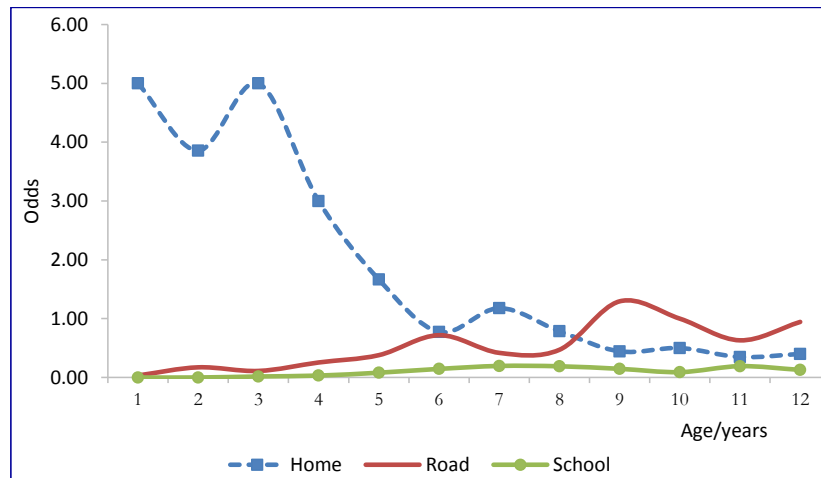


Fig. 2: Odds of childhood injury by place and age

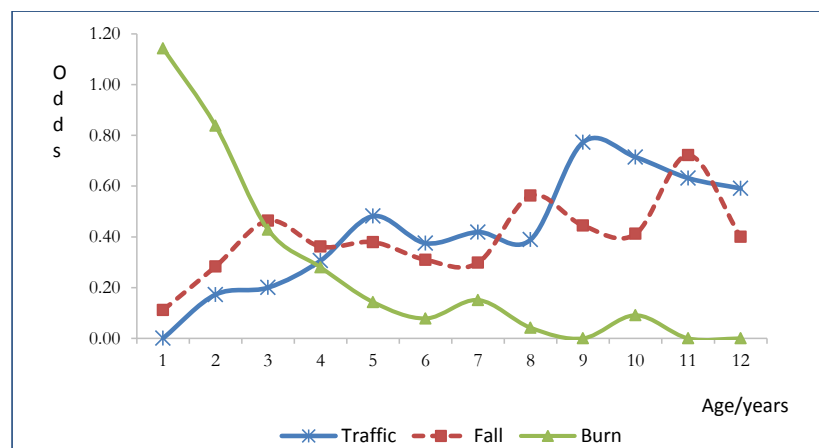
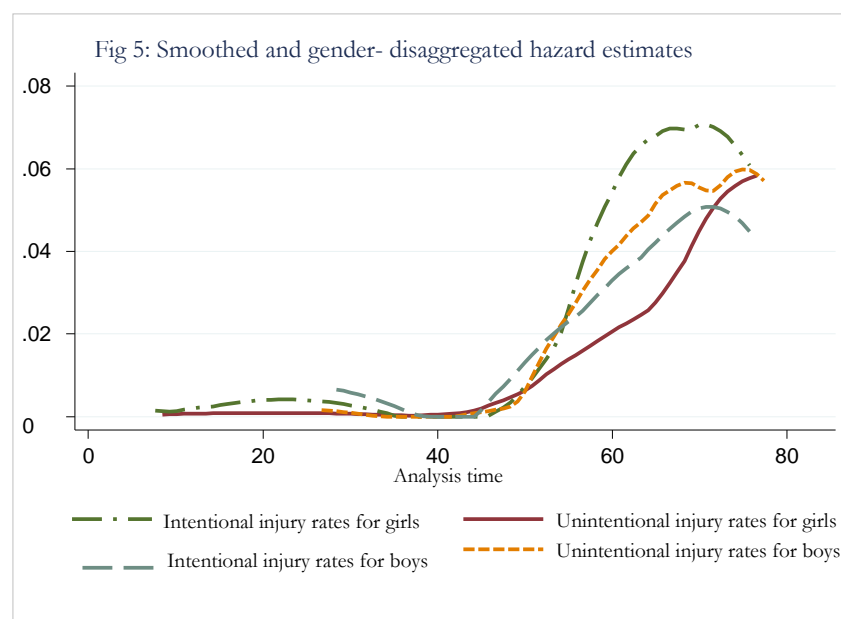
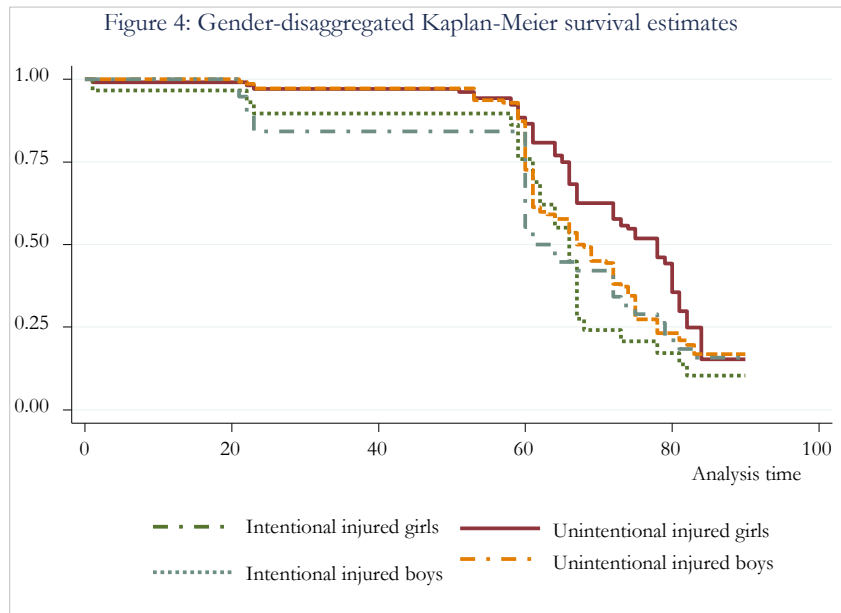


Fig. 3: Crude odds of injury by age and cause for top three childhood injury causes



### 5.1.3 Determinants

Key determinants of unintentional domestic childhood injuries in peri-urban Kampala, Uganda are: presence of play area in vicinity of home and regular play in it. Households with play area in the vicinity are twice as likely to report a fall during the previous month than those without nearby play areas (OR=2.05, 95% CI=1.27- 3.30). Presence of a raised cooking area had no effect on odds of an under-five burn injury (OR=1.38, 95% CI=0.68- 2.83): an association between the two had been anticipated. Stratified analysis was undertaken with the following variables: number of under-fives in the household, size of the dwelling, type of dwelling and whether cooking area was separate from sleeping area. The findings are presented in Table 3 below with a crude OR=1.38, 95% CI= 0.68- 2.83:

*Table 3: Determinants of childhood injuries*

Variable	OR	95% CI
Number of children in household	1.29	0.65-2.43
Size of dwelling	1.25	0.63-2.74
Cooking area separate from sleeping area	1.39	0.71-2.70

None of these variables confounded the relationship between cooking area being raised and occurrence of burns. There was no statistically significant association between reported occurrence of falls and gender (OR=0.74, 95% CI= 0.50- 1.08). However, falls were less frequent among boys than girls. Children whose mothers were 29 years and below were twice as likely to have experienced a fall as their counterparts whose mothers were 30 years and above. This association was statistically significant (OR= 2 .08, 95% CI=1.32- 3.30).

The individual level determinants of school-related childhood injuries and violations in north-western Uganda include age and gender (Sub-studies 1 and 4). Proximal relational factors include housing condition, supervision quality, domestic energy type, maternal age and HIV/AIDS, and community/societal factors include, school contexts (Sub-studies 1 and 4, see Table 2 below). The cumulated odds of unintentional injury triple at fourth year of life as odds of burns, falls and traffic injuries approximate parity. Odds of burns drops progressively from first to sixth year of life before levelling-off, as those of traffic and fall injuries surpass it (Sub-study 3).

Drivers of childhood injury spurts in rural north-western Uganda are thought to include staple food supply, major social events and competitive sporting events. Annual staple (food) shortages are specifically thought to occasion surges in childhood falls (from mango trees) and blunt trauma (from falling stones). The seasonality regarding major social events, competitive sports and grasshopper supply are also thought to occasion accidental falls, fist fighting and animal/insect bites. Speeding, over-loading and poor vehicle and road conditions are thought to be key causes of traffic injuries among school children, while unsupervised play in bushy areas was blamed for the rampant animal/insect bites. The adduced explanations regarding prevailing school-related childhood and adolescent injury and violation patterns in north-western Uganda are childhood (maturation), parenting, and situational factors.

Childhood factors are mainly maturational, including curiosity and urge to explore, ignorance of environmental risks, playfulness and inability to evaluate consequences of own actions. These factors are thought to manifest in inappropriate risk-taking, including escaping to night clubs, climbing mango trees when wet, venturing into bushes, and play-related fighting. The basic need for love, care, and food, especially during scarcity, were cited among contributing factors. Children usually harvest mangoes by physically climbing trees or throwing stones at the ripe fruits and in the process may fall from the trees or may be hit by falling stones. A second dimension of childhood factors regarded deviant behaviour; some children reportedly get injured during deviant activities like stealing food from neighbours, fist-fighting, sneaking to night clubs and speed-bicycling, disobedience, negative attitudes, and interpersonal differences.

Table 4: Multi-level logistic regression modelling of factors associated with elementary school-related childhood and adolescence injuries in north-western Uganda

Variable	Model 1 OR (95 % CI)	Model 2 OR (95 % CI)	Model 3 OR (95 % CI)	Model 4 OR (95 % CI)
<b>Fixed effects:</b>				
<i>Individual- level</i>				
Age		0.96 (0.89/1.03)	1.04 (1.03-1.27)	1.04 (1.04-1.12)
Sex				
Girls		(Reference)	(Reference)	(Reference)
Boys		1.5 (1.15-2.07)	1.76(1.29-2.41)	2.27(1.45-7.47)
<i>Community level (School code)</i>				
S103 (Reference)			1.0	1.0
S109			4.56 (2.23-9.29)	
S107			15.12 (6.10-34.46)	3.52 (1.52-8.19)
S114			1.97 (1.14-4.42)	1.97 (1.14-4.42)
S104			1.59 (1.53-3.86)	1.51 (1.51-3.92)
S111			3.44 (1.61-7.35)	3.42 (1.60-7.33)
S118			4.27 (2.02-9.02)	
S112			2.13 (1.00-4.50)	2.13 (1.00-4.51)
Location				
Rural				(Reference)
Urban				4.08 (1.12/18.67)
Peri-urban				6.85 (1.42/33.15)
<b>Random effects:</b>				
Intercept	-0.57 (-0.69- -0.44)	-0.49 (-1.33-0.35)	-0.27 (/1.27-0.73)	-1.06(-2.29-0.17)
Community level variance (SE)	0.07	0.43	0.51	0.63
VPC (%)		11.6	13.4	16.1
Explained PCV (%)			13.4	16.8
<b>Abbreviations:</b>				
OR, Odds ratio; CI, confidence interval; SE, standard error; VPC, variance partition coefficient; PCV, proportional change in variance.				

Parental factors include quality of parenting and maternal estrangement. Absence of mother was particularly highlighted as an important risk factor for childhood injuries. Parenting quality issues included harsh treatment of children by parents and guardians, canning of children and failure to attend to children because of competing demands. Situational factors include overworking of

children by parents and teachers, unsafe working conditions including lack of protective devices such as insulators for carrying hot objects while children are engaged in cooking, and unsupervised entry into bushes, moreover without protective clothing.

## 5.2 Prevention and Control

Both formal and informal injury prevention and control practices coexist in Uganda. Cooking areas were raised in 36.3 percent; separated from sleeping in 82.7 percent and detached from living areas in 76.4 percent of peri-urban Kampala households. Manner of storage of potentially injurious items by households is summarised in Table 5 (Sub-study 1). Families bear the bulk of the responsibility (79.2%) of patient evacuation to hospital for definitive care. The use of previously proven interventions varies between zero and 34.5 percent.

*Table 5: Storage of potentially injurious items by households in peri-urban Kampala*

Item	Storage facility	Proportion
Storage for drugs	Cupboard	42.1
	Containers like tins and buckets	17.1
	Bags, boxes, suitcases	13.8
	Table	2.0
	Other	25.1
Storage for sharp instruments	Cupboard	39.2
	Basket	12.1
	Drawer/sideboard	11.0
	Box/basin	6.9
	Table	3.5
	Plate rack	2.6
	Other	24.8
Storage of paraffin	Lamp/stove	8.4
	Bottle	6.3
	Jerrycan	5.5
	Under bed, chair, table	4.3
	Cupboard/sideboard	3.2
	Corner	1.2
	Bedroom	0.6
	Don't use paraffin	70.6
Storage of insecticides	Cupboard	5.2
	Bedroom	2.9
	Box	2.0
	On top of shelves	1.7
	Under bed/table	1.2
	Don't use	87.0

The common causes of childhood, adolescent and young adulthood injury and violations are thought to include lack of guidance and counselling, hunger, intimate-partner violence (IPV), domestic violence, involvement in unsafe cooking and other household chores, idleness, poor

parental control, child maltreatment, corporal punishment, and unsafe storage of sharp objects. The importance attached to an injury depends on its cause: level of fatalism is also related to the perception of a cause.

Community education on the causes and consequences of violence and the values of peace was recommended by the rural community stakeholders. Other proposed interventions were: voluntary counselling and testing (VCT) for intimate partners and openness about HIV status.

Local treatments and remedies for injury also do exist: the commonly cited remedies included sugar, cold water, (dirty) bathroom sand, and urine for the management of burns; sticks, bandages, ropes, liniment and stretchers for the management of fractures and dislocations; and raw eggs, cooking oil and milk for the treatment of poisoning. Most of the childhood and young adulthood injuries are treated on public welfare. There are few NGOs addressing injuries and violence in rural Uganda; the existing health facilities also tend to provide only general care.

## 6. DISCUSSION

This thesis examines the epidemiology of childhood and young adulthood injuries in Uganda; specifically, the extent, risk, determinants and stakeholder views and perceptions regarding their prevention and control. This section discusses the main findings in the light of previous research, theoretical frameworks and prevention and control.

### 6.1 Epidemiology

#### *6.1.1 Extent, pattern and distribution*

Overall, intentional and non-intentional childhood and young adulthood injuries are common but underreported domestic, school and road related emergencies in Uganda (Sub-studies 1-5). This (observation) locates them within the broader context of the poor child-health indices in Uganda which continue to be among the region's worst (MoH, 2001). However, unlike other important child-health problems, injuries have not attracted sufficient policy and programme action from government, as evidenced by their absence from key policy focal areas, especially policy on child survival, growth and development and the Minimum Health Care Package (MoH, 2006).

The household and hospital data agreed on key childhood injury characteristics, especially incident location and injury-time activities. The two sources could therefore interchangeably describe those particular dimensions of childhood injury with comparable results. Noteworthy were stakeholder insights on the local injury patterns and causes in north-western Uganda, which also corroborated some of the quantitative evidence. This did not only serve as an internal validation mechanism but also assurance of a more comprehensive perspective on the local childhood and young adulthood injury problem.

We show elementary schools, homes, roads, and other public places to be leading locations of childhood and young adulthood injury in Uganda in consonance with previous findings from predominantly adult samples (Kobusingye et al., 2001; Kobusingye et al., 2002; Lett et al., 2006): the childhood injury-time activity patterns were also similar (Kobusingye et al., 2001; Kobusingye et al., 2002). However, the variants included the fact that falls were the leading cause of (unintentional) childhood injury ahead of traffic, burns and drowning (this was also at variance with the global pattern led by traffic injuries (WHO, 2008)); motorcycles being the leading traffic injury cause instead of private cars, and lack of safety in homes, roads, and schools being more perverse than previously thought. The study also demonstrates a more modest domestic youth-hood violation prevalence (of 43% compared to the previous estimate of 50-55%); male domination of domestic victimisation; a high proportion of teenage housewives among youth victims (which was not previously reported); and a higher prevalence of youth victimisation in south-central Uganda, which may reflect a genuine burden or better recognition and recording of the problem.

The most prevalent unintentional childhood and young adulthood injuries in our study are fall-, burn-, cut- and traffic-related, with important extent variations among ages, genders, intents and

settings (Sub-studies 1-4). This could affirm the previous observation regarding childhood injury occurrence as more than a proximity issue, but also logistical, socio-cultural and developmental issue. The experiences of Bangladesh and Papua New Guinea, where the risks of childhood and young adulthood drowning depended on contextual and developmental factors further support this view (Zimicki, 1985; Barss et al., 1998).

The most frequent domestic, road, and school-related childhood and young adulthood violations in rural and urban Uganda are corporal punishment, labour exploitation, deprivation, neglect, sexual violation, drug abuse and gang activities (Sub-studies, 2, 4 and 5). Although outlawed in Uganda, the use of hard labour and corporal punishment in schools and families for disciplinary purposes has persisted (Magambo et al., 2004; Mutto et al., 2009). While the perpetrators were not the focus of the current study, the bulk of the reported violations (except for gang activities) seemed to have been perpetrated by teachers and parents, given their location and associated activity patterns (Sub-studies 3, 4 and 5). This is also consistent with Rumanian, Korean, Egyptian and Ethiopian findings which indicated a significant number of childhood injuries to be caused by parental whippings, kicking, beatings, burnings, and denial of food (Youssef et al., 1998; Halm et al., 2001; Brown et al., 2002; Ketsela et al., 1997).

From the findings (of Sub-studies 1-4), we could conclude that the overall childhood and young adulthood injury mortality burden in Uganda (as indicated by case fatality) is low, while the direct medical costs could be high, given the fact that the majority of childhood injuries receive first aid and/or definitive health facility care. This is further supported by the fact that youth violation alone constituted over 7.3percent of the total injury burden in Ugandan referral care. It is such incidents that could translate into sustained direct financial, logistical and human resource costs at health units.

Several factors could account for the differences between the current and previous patterns: first, differences in the ages studied (the present study focuses on children and young adults); second, the use of multiple data sources; third, the use of multiple study designs; and forth, the use of more rigorous analysis techniques. The above strategies could ensure a more accurate and holistic view of the childhood and young adulthood injury problem in Uganda. Of particular interest was the effect of the triage systems on the visibility of particular childhood and young adulthood injuries and violations. Although not specifically reviewed in the present study, its influence via patient flow within the local health care system is perhaps obvious. For example, in Uganda, childhood poison injuries are usually managed at medical sections instead of surgical units where the existing trauma registries are located. This could occasion specific biases and under recording of poison injuries. This partly motivated the establishment of the current pilot (childhood injury surveillance system) at the national paediatric emergency unit in Kampala (Sub-study 3). Indeed, the number of childhood injuries recorded by the pilot (extrapolated over a year) could match the previous burden at the main registry (Kobusingye et al., 2001).

Regarding rural-urban differences in (childhood and young adulthood) injury patterns, plausible explanations could include differences in the physical and socio-cultural environments which may have played out in the local population characteristics, lifestyles and daily living activities. Indeed, in Cyprus, rural school children were also thought to have better access to play spaces



and freedoms, including play in gardens and neighbourhoods, than urban children, who may instead have better access to specialised play equipment and sites (Constantino et al., 2004). Such differences could structure the (childhood) injury risks in the two settings differently. While sectorial, service and demographic inter-connections do exist between rural and urban areas (Tacoli, 1998), they do not, in totality, equalise, the childhood and young adulthood injury patterns in the two locations. The rural terrain may have more sanctuaries for wild animals, insects and fruits that may occasion specific risks (including insect and animal assaults). Sub-study 5 further evidences this by showing that such injuries tend to be common during hunting seasons.

The violent treatment of children in Ugandan homes, schools and roads is specifically outlawed by the Convention on the Rights of the Child and other local statutes, including Uganda's Children Act and basic education policy (UN, 1989; Children Act, 1996; MoES, 2005). It is not clear why carers continue to administer corporal punishment in defiance of the law; a similar observation was made in Zimbabwe where teachers continued to violate children in defiance of the existing standing orders (Shumba, 2001). The presence of child labour and child abuse in Ugandan elementary schools and homes is inconsistent with the country's commitment to UN and African Charters on the Rights of the Child, which oblige all states parties to institute appropriate protective legislative, administrative and educational actions against the problem (UN, 1989; AU, 1999). While Uganda could boast of progress on the legal front, the practical benefits of those actions are yet to reach the bulk of the targeted children. It is not clear if the persistence of labour, sexual and corporal violation of Ugandan children and young adults is an attitude, knowledge or practice problem. The rampant violations could cast doubt on the country's commitment to and progress towards full implementation of the policy and programme prescriptions of the UN and African Charters on the Rights of the Child.

#### *6.1.2 Risk and Risk Trends*

Injury probabilities were quantified using odds and relative risk: injury risk profiles were then constructed across childhood using the risk/odds estimates. Overall, odds/risk of childhood and young adulthood injury and violation in Ugandan homes, schools and roads is high and age- and sex-dependent.

Intentional school related childhood injuries were found to have a higher propensity (as evidenced by their random hazard functions) compared to those of their unintentional counterparts (Sub-study 4). Their cumulative prevalence was, however, much lower than that of the unintentional injuries, suggesting a reciprocal relationship between the two and, perhaps, more fundamental differences. While the actual accounts of the above differences were not obvious, plausible explanations could include true differences or biased case reporting by the children, especially intentional incidents and possibly on account of social sensitivities around childhood violation. This could add to the case for a dichotomised approach to their research and prevention contrary to Cohen's proposition (Cohen et al., 2003). Cohen had criticised intent-based dichotomisation of injuries on grounds that both share incident mechanisms and prevention resources. Regarding the reciprocity between intentional and unintentional injury hazards and their prevalence measures, this may be a true difference or differences in efficacy of

existing interventions or incident reporting or other societal phenomena. Previously, resilience theory posited the existence of protective contextual factors that insulate children from contextual violence (Bernard, 1991). Whether such factors were at play in Uganda and directly contributing to the manifested prevalence of intentional injuries contrary to the expectation was not clear.

Generally, caregivers (parents and teachers) are conscious of and responsive to children's safety needs and may institute deliberate strategies to protect them as reflected in the current practices and views on prevention and control (Sub-studies 1, 3 & 5). They tended to store potential injurious substances and objects beyond children's reach. It is common practice that they often cause schools to institute specific rules, regulations and sanctions to guarantee children's safety while at school. The enforcement frameworks used to regulate child safety in the rural Ugandan communities might include those rooted in family, community and school values and norms. Unfortunately, this vigilance does not seem to have stretched to the non-intentional injury threats, possibly because of fatalism. In Uganda, corporal punishment is still part of the sanctions that continue to be illegally applied in schools.

From the findings, a risk analysis model could be constructed for childhood and young adulthood injuries. Figure 1 illustrates a three-phase model as a first step towards a comprehensive risk analysis model based on current (Ugandan) data. The three phases may have specific developmental and socio-cultural correlates that require further research. Phase one spans the period from birth to third year of life; phase two, from fourth to sixth year; and phase three from seventh to twenty-third year of life. Each phase captures age- and context-specific risk expectations.

Key injury risks of phase one are unintentional domestic burns and falls. In Uganda, 1-3-year-olds usually stay at home (Sub-study 1). Their burn and fall injury risks often emanate from their: (i) proximity to open fires during play and daily living activities (open fires are still the main domestic energy source in Uganda- Sub-study 1); (ii) inherent desire to explore; (iii) limited socio-cognitive and physical capabilities; (iv) inadequacy of adult supervision; and (v) rough physical environmental characteristics of homes and play areas, location of cooking areas, and domestic energy types (Sub-studies 1, 4 and 5). Simon et al. also previously linked risk and type of burn injuries to developmental stage (Simon et al., 1994); Agran et al. attributed the childhood burns risk differences to developmental stage (Agran et al., 2003). Lv Kai-Yang et al. showed proximity to matter in the risk of burns among under-three-year-old boys (Lv Kai-Yang et al., 2008), and Khambalia et al. showed setting (day-care versus home) to be an important determinant of incidence or severity of childhood falls (Khambalia et al., 2006).

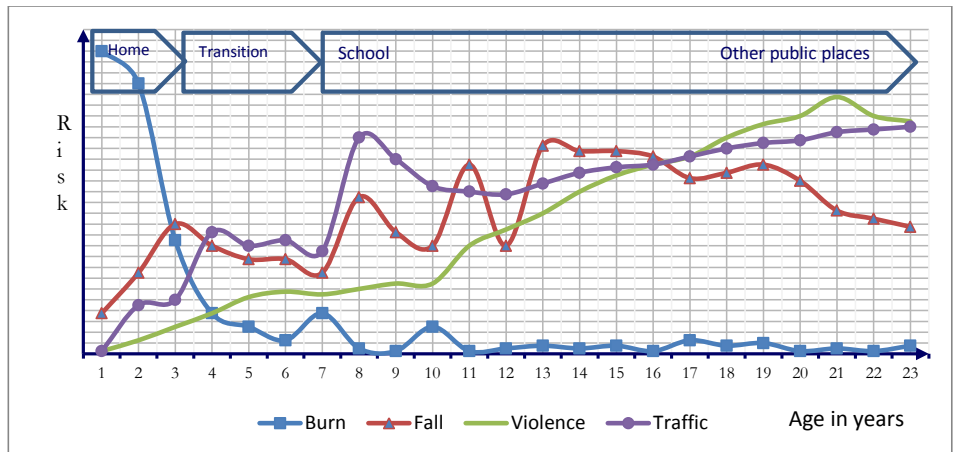
The above observations add to the credence of the age related risk profile and prospects of developmental and socio cultural correlates including learning. Indeed several behavioural theories do stress the role of learning in injurious behaviour (Bandura, 1997; Woodward, 1982; and Chicchetti, 1998); arguing that the bulk of the childhood learning, especially that in early childhood, is exploratory. Yet children usually lack the necessary experience, cognitive, social and physical competencies to safely 'navigate' through the associated risks. This may position them

within harm's length, which risk is usually worsened by proximity to the particular hazards. Incremental changes in age and competence may explain the declining trend in burn injury risk.

Phase two is transitional; children start leaving the relative safety of home, possibly for day-care or nursery school. However, they do so with limited experience and socio-cognitive and physical competencies to face new safety challenges. Moreover, adult supervision may be inadequate. Their activity contexts and environments change, as do their associated risks. During this stage the risk of domestic burns declines, possibly on account of the reduced exposure or proximity to open fires (because of school attendance) and improvements in physical and socio-cognitive competences. However, new risks emanating from school-related travel, competitive corporate games and sports and fruit harvesting (especially where nutritional needs are not fully met- Sub-study 5) emerge as evidenced by the findings of Sub-studies 4 and 5. Others are sports related violence and bullying. During the phase, the (declining) risk of burns and the growing risks of fall and traffic injuries approximate parity, constituting a 'triple injury' burden (Sub-study 3). Reasons for the heightening of injury risk during the stage could include changes in: adult supervision; changes in play contexts and environments; and changes in the actual safety threats. Lack of safety knowledge and/or safety consciousness among parents and teachers could worsen the stage-specific vulnerability. Stakeholders need to pay particular attention to children's safety needs as they adjust to the new out-of-home experience. Indeed, the current pattern of injury-time activities in Ugandan homes and schools could be further evidence of serious adult supervision lapses.

The third phase captures the period when children have fully integrated into formal school; they begin to experience specific school-related risks, particularly those associated with travel to and from school, interaction with peers, technical educational activities and general social and physical environments in school (Sub-studies 4 and 5). In addition to the usual stage-specific growth and maturational challenges, children begin to experience more structured lives and educational programmes, including timetabled classroom activities, competitive sports and other co-curricular activities that may present new safety challenges. The common injury risks of the phase include traffic, sports and agricultural falls and violence (Sub-studies 4 and 5). With regard to the traffic injury risk, WHO has argued that majority of road designs tend to be inconsiderate to children's needs as pedestrians, cyclists, motorcyclists and passengers, more of who actually work, play or live on the roads, which worsens their vulnerability (WHO). Developmental level is also known to influence children's risk of traffic injury (Christoffel et al., 2003), often manifesting in inappropriate judgements regarding road safety. Plumert (1995) found early elementary school children tending to overestimate their own traffic safety abilities more than did the adults. This attitude could set them up for irrational risk taking in traffic.

Fig 6: Proposed model for time variations of childhood injury and violation risk in Uganda



### 6.1.3 Determinants

The key determinants are described within the framework of the ecological model (Bronfenbrenner, 1979). Accordingly, individual-level determinants of childhood injuries include age, sex and unsupervised play in nearby play areas, as evidenced by the observed age and sex differences in risks/odds of domestic and school-related burns, falls, traffic and violent injuries (Sub-studies 1, 3 and 4). This is consistent with previous conclusions by Christoffel et al., that certain individual childhood traits such as age, race, gender, social status and community of residence do affect their risk of injuries (Christoffel et al., 2002). Simon et al. also showed developmental stage to be an important determinant of risk and type of childhood burns (Simon et al., 1994). Agran et al. specifically attributed burn risk differences in childhood to developmental stage (Agran et al., 2003), and in addition to age and sex, setting was shown to be a major determinant of childhood fall injuries (Khambalia et al., 2006).

Besides specific injury risks, there were gender differences in child supervision and (pre-hospital and definitive) hospital care. Those responsibilities disproportionately rested on females. Similar differences were reported in areas of reproductive health and HIV mitigation (Mutyaba et al., 2007; IPPFARO, 2008). Several factors could have explained the above gender differentials; previously traditional gender roles, fear of losing respect from peers, lack of communication skills, lack of knowledge and strong perceptions about masculinity were identified as key barriers to Men's participation in reproductive services (IPPFARO, 2008). Whether this was the case with childhood and young adulthood injury prevention remains to be studied. In the meantime active participation of men remains crucial to the success of (reproductive) health programmes and ultimately, in the empowerment of women (Sternberg et al., 2004). Previous studies did look at the role of masculinity in gender-based violence. Most Ugandan cultures tend to assign childcare responsibilities to women. This may explain their higher physical presence in homes

<sup>4</sup> The violence trend line f below the age of 9 years was based on projection, and the rest on empirical data from Sub-study 2.

during the household survey (Sub-study 1). No wonder falls in nearby play areas were more common than domestic poisonings and burns, even when household environments were clearly injurious. Differences in supervision levels at home and in nearby recreational areas may have accounted for the higher risk of childhood injury in nearby play areas as compared to the risk in homes. The safer poison storage practices in the slum may have been part of the safety vigilance of the resident female (child) minders as a cultural expectation. The burden of taking injured children for definitive care may have also been part of this expectation. The majority used public transport (including commercial motorcycles) for patient evacuation.

Male domination of domestic violation contradicts previous observations concerning what, for long, was considered a feminine problem (UNICEF, 2000). Noteworthy is the high prevalence of violation among teenage housewives, something that was not previously reported. It is not clear if this was an emerging trend; given the fact that sexual majority is legally regulated in Uganda or is culturally underpinned. The differences could also be due to improvements in the visibility of the problem occasioned by socio-cultural factors such as general desensitisation of the problem.

At proximal relational level, the key risk factors included having a less than 29-year-old mother and quality of adult supervision. The mediating mechanisms of maternal age on childhood injury risk were not also specifically reviewed, but could include differences (between younger and older mothers) in childcare experiences. This effect may also have been confounded by children's age since older mothers may generally have older children who might be less vulnerable to certain injury risks: this was not controlled for in the current study. Other factors included housing condition and level of caretaker education, which may have engendered differences in the nature and site of work. The majority of the resident female minders had not studied beyond basic education as compared to the absentee fathers, (84% of) who had had post-primary education. The 2000-2001 Uganda Demographic and Health Survey also approximated women's literacy at 40percent. Education has been associated with women's financial security and child survival; the gender disparities in education in Uganda may not change in the short and medium terms, given the high dropout rates among Ugandan primary school girls (Mutto et al., 2009). A Chinese review found that under-three-year-old boys who spent most of their time indoors have greater risk of burn injuries (Lv Kai-Yang et al., 2008).

Community-level risk factors included nearby play area, lack of supervision of play in those areas, as well as rural-urban and inter-school differences, in keeping with other previous findings (Christoffel, 2002).

Although not directly studied, the insignia of poverty was obvious in the observed household and school-related injury patterns and characteristics (Sub-study 1, 4 and 5). The unsafe living conditions including overcrowding, unsafe play compounds, unsafe energy sources, poorly educated mothers, and inadequate parental supervision are all symptomatic of poverty, a known risk factor for injuries and violence. Poverty is an established source of inequalities which is known to engender differential exposure and susceptibility to injuries and violence (Laflamme et al., 2000). Poverty also influences access to injury prevention and control strategies and care. Most optimal physical separation of hazards from children was not widely applied, possibly on

account of cost. In this regard, our findings could reflect the different dimensions of poverty (as it relates to ‘financing’, ‘knowledge’ and ‘visibility’ of the particular childhood and young adulthood injury and violent events), that has dogged the field of childhood and young adulthood injury prevention and control, especially in many of the resource-constrained settings.

Stakeholders tended to associate the rural childhood and young adulthood injury and violation patterns to contextual trends in staple food supply, organised leisure/sports, hunting and other social programmes. Such seasonality has been previously observed in natural disasters like floods and landslides (Barss et al., 1998; Buck et al., 1988). The specific seasonality in the current study included falls from fruit trees, blunt trauma from fist fights, and animal/insect bites. While the actual mechanisms mediating those injury effects were not directly investigated, possibilities could include local definitions of staple food which may have influenced local fruit growing and harvesting practices. This may have explained why the fruit harvest season was still viewed by rural stakeholders as a famine season. It is not clear if the injury effects of the contextual factors were comparable among intentional and unintentional childhood and young adulthood injury events. Of particular concern among rural stakeholders were animal/insect bites which did not feature prominently in the urban setting. Falls, burns, cuts, and blunt trauma cut across rural and urban settings (Sub-studies 1 and 4).

## **6.2 Prevention and Control**

The findings evidence the existence of basic safety thinking and resources in Ugandan communities. This was clearly manifested in the ways in which communities stored potentially injurious items in homes (Sub-study 1). Based on this observation, one could conclude that the limited use of previously proven strategies of childhood injury prevention may not have been an attitude problem but rather a knowledge or access problem. Often times, effective technologies and strategies are not available in less-resourced countries like Uganda. The presence of indigenous remedies may, therefore, be a reflection of community resilience or coping strategies in this area. They could evidence the fact that communities are not passive abettors of childhood and young adulthood injuries and violence, but rather active innovators of solutions to their local problems that are possibly grounded in indigenous and alternative beliefs and practices. Inclusive approaches based on partnerships with them (as promoted by Safe Communities and Safekids Worldwide) might therefore, be the way to go and they could hold greater promise for sustainable safety promotion in communities in Uganda.

Pre-hospital injury care in Ugandan domiciles was predominantly a feminine responsibility (Sub-studies 1 and 3), highlighting the lack of male participation in household childhood injury prevention and control. The majority of households depend on unspecialised patient evacuation methods at their own cost. The fact that Uganda lacks a functional ambulance system has been previously cited as an obstacle to injury care; the extent to which it affects patient transport preferences and evacuation strategies is not, however, clear. Although largely different from conventional Western injury management practices, specific studies may be needed to evaluate the beneficial efficacy of the existing community strategies. While fatalistic thinking does exist among rural stakeholders, the bigger proportion of them believed in preventability of childhood and young adulthood injuries and violence, thereby presenting a convenient and natural entry

point for engagement on prevention and control. A key challenge is to change those attitudes and practices that may turn out to be less beneficial or even harmful. The observed levels of safety consciousness and practices among Ugandan stakeholders could guide the integration of education, enforcement and engineering in Ugandan community safety programming.

### **6.3 Strengths and Limitation of the Current Study**

Key strengths of the current study could include the use of multiple study designs, data sources, study sites and more robust statistical methods which enhanced its methodological rigour, adding to the validity of the conclusions. The above multiplicities served as an in-built validation mechanism that further improved the quality of the collected data and subsequent conclusions. The national spread of study sites adds to the generalisability of the findings. On the basis of the above methodological strengths, we could conclude that the current study does make a comprehensive and holistic contribution of knowledge on the childhood and young adulthood injury and violations problem in Uganda.

However, key limitations include the fact that the sensitivity of the hospital- and school-based data collection systems was not assessed, which may have occasioned a selection bias because of the fact that the regional facilities are not exclusive service providers with clearly delineated mandates and catchments. Patients do have options and exercise choice regarding where to receive injury care within Uganda. The absence of clear source communities for different referral hospitals denies our study the appropriate denominators for calculating true risk rates.

Secondly, the school-based cohort was restricted to a narrow age band and followed up for one term instead of a full school year, which could have allowed for a more comprehensive assessment of age-related school injury risk and secular trends. The estimates and risk analysis model are therefore based on an artificial cohort; the true cohort could possibly generate a different picture from the current projection. The findings also underscore the cardinal limitation of sentinel surveillance in informing national injury priorities. While population-based evidence is more reliable, it may be economically unfeasible in poor countries like Uganda. Specific attempts should be made to ensure that routine data sources that are used to inform national priorities are able to provide key data elements on all applicable sub-populations.

Other limitations could include the differences in the age groups studied, which could limit the comparability and external validity of the current conclusions; the fact that the regions are diverse and may have inherent differences that could occasion specific childhood injury patterns and risks, and the fact that the results are based on a specific 'snapshot', could occasion differences with the long-term pattern and trends.

## 7. CONCLUSION

### *7.1 Extent, Pattern and Distribution*

Injuries (due to burns, falls, traffic and violence) are major but under-recognised childhood and young adulthood health emergencies in Ugandan homes, schools and roads. There are important rural and urban differences in the distribution and pattern of childhood and young adulthood injuries in Uganda: the rural patterns are thought to be linked to contextual cycles in staple food supply, hunting, competitive sports and other major leisure activities. There are similarities between specific aspects of the household and hospital based characterizations of childhood injuries, especially incident location and injury-time activities.

### *7.2 Risk and Risk Trends*

The risk of childhood and young adulthood injury and violation in Ugandan homes, schools and roads is high, varying with age, location and activity. This risk emanates from home, school and road environmental contexts. The most injurious activities are travel, practical class, break-time activities, sports, hunting and gardening. There are significant differences between the intentional and unintentional childhood injury hazard functions. The prevalence of intentional childhood injuries is lower than that of unintentional childhood injuries; the propensity of intentional injuries is higher. The youth-hood violation risk peaks in later youth-hood.

### *7.3 Determinants*

Key individual-level determinants of childhood and young adulthood injuries are age, gender and unsupervised play in nearby play areas; proximal relational factors encompass maternal age and quality of adult supervision of domestic and school-related activities, including play, technical classes and gardening; and community-level risk factors include rural-urban location and school-specific differences. Childhood injury and violation patterns are thought to be linked to contextual variations in staple food supply, major social events, and hunting calendars. The three are believed to interact with individual, parental, and situational factors to occasion childhood and young adulthood injuries and violations in rural Uganda.

### *7.4 Prevention and Control*

Basic safety consciousness and limited fatalistic thought regarding injuries exist in north-western Ugandan communities. Fatalism is graduated depending on the importance attached to the particular injury, its severity and preventability. Fatalistic thought largely manifests in unintentional injuries. Local prevention and control strategies do exist, although they are mostly based on the ineffective 'victim blame template'. Unevaluated injury-specific management strategies also exist in the communities. Injuries are ranked in importance, which ranks are also the bases of the graded fatalism. Fatalism is most evident in incidents such as traffic injuries that are also considered to be the most important.



## 8. IMPLICATIONS

### *8.1 Theoretical Implications*

The finding regarding differences between random hazard functions of intentional and unintentional injuries could add to the case for a segregated approach to their research, policy and programme development and may have human resource implications, as earlier observed by Cohen.

### *8.2 Programme Implications*

The high injury burden among Ugandan children is inconsistent with the national and global aspirations and could set back the country's efforts towards safer childhood. It raises questions about the safety standards of Ugandan homes, schools and roads as key locations of child upbringing and socialisation. It could also mean that the empirical specifications of the UN and African Conventions on the Rights of the Child have not effectively translated into local household, school and road safety targets. The fact that most school-related injuries happen during play, travel, break-time interactions and practical classes could point to serious lapses in the quality of adult supervision of those childhood activities. The persistence of homes, schools and roads as key childhood injury and violation locations questions the hypothesised effects of generic interventions on local injury burdens.

Other important programme questions regard the sensitivity of the current health policy and programme frameworks to childhood and young adulthood injuries; the extent to which community health workers are equipped with injury-specific knowledge, skills and attitudes for effective response to domestic, school- and road-related childhood and young adulthood injury risks and emergencies; and how the official information packs (from the Ministry of Health) address childhood injuries. They also show that generic interventions are not necessarily fit for all ages, genders, settings and communities. While Ugandan childhood injury prevention efforts could be in the right direction, they may be too miniature to make a significant national impact. They definitely need more evidence basis. It is also clear that the safety dividends of Uganda's commitment to the UN Convention on the Rights of the Child have not trickled down to schools, homes and roads, especially in rural areas where over 80percent of the population lives.

### *8.3 Research Implications*

The fact that there are unevaluated indigenous injury management practices and resources in rural communities could hamper local injury prevention efforts as this could lead to inadvertent sustenance and perpetration of repugnant and possibly harmful practices, given that the country's 'porous' health system permits formal, informal and alternative practices.

The fact that many childhood injuries were captured at the paediatric emergency unit during the current study could be indicative of the hypothesised underreporting of childhood injuries in previous studies on account of the previous location of the trauma registries (at the main accident and emergency units). If left to persist, this could lead to inaccuracies in the estimation

of the local childhood injury burden, and possibly, their erroneous exclusion from key national policy, programme and research platforms and processes.

The similarity of findings from hospitals and households could add to the case for interchangeable use of the two sources on the specific dimensions of their agreement. This could provide a solution to the technical challenge of accessing useable data fairly cheaply.

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# Appendices i: UGANDA TRAUMA REGISTRY (ICC-U)

Hospital code: \_\_\_\_\_

1. Hospital Outpatient No. \_\_\_\_\_//\_\_

2. First Name \_\_\_\_\_ Last Name \_\_\_\_\_

3. District of residence \_\_\_\_\_

4. Sex: ☐ Male ☐ Female

5. Age in years: \_\_\_\_\_ Yrs.

6. Systolic Blood Pressure on admission:

- ☐ >89 mm Hg (2)  
☐ 50 - 89 mm Hg (1)  
☐ 0 - 49 mm Hg (0)

7. Respiratory rate on admission:

- ☐ 10 - 29 / minute (2)  
☐ 30 + (1)  
☐ < or = 9 / minute (0)

8. Neurological status:

- ☐ Alert (3)  
☐ Responds to Verbal stimuli (2)  
☐ Responds to Painful stimuli (1)  
☐ Unresponsive (0)

9. Score for serious injuries: \_\_\_\_\_

- ☐ None(2) ☐ 1 serious injury (1) ☐ >1 serious injury (0)

10. KTS II Total \_\_\_\_\_

11. Occupation:

- ☐ Peasant farmer ☐ Housewife  
☐ Civil servant/Private employee ☐ Casual labourer  
☐ Driver / Conductor ☐ Large business owner  
☐ Small business owner ☐ Unemployed  
☐ Student / Pupil ☐ Child/baby  
☐ Other (specify) \_\_\_\_\_ ☐ Combatant

12. Cause of injury:

- ☐ Road Traffic  
**Counter parts involved**  
☐ Vehicle-vehicle ☐ Vehicle-Motorcycle ☐ Vehicle-Bicycle  
☐ Vehicle-Pedestrian ☐ Motorcycle-Motorcycle  
☐ Motorcycle-Bicycle ☐ Motorcycle-Pedestrian  
☐ Bicycle-Bicycle ☐ Bicycle-Pedestrian  
☐ Other.....

**Road user category:**

- ☐ Vehicle Driver ☐ Vehicle Passenger ☐ Pedestrian  
☐ Motorcyclist ☐ Motorcycle Passenger ☐ Bicyclist  
☐ Bicycle passenger ☐ Pedestrian

**Seat belt use at time of incident, if vehicle driver/ passenger**

- ☐ Yes ☐ No

**Helmet use, if motorcyclist, motorcycle passenger, bicyclist**

- ☐ Yes ☐ No  
☐ Fall ☐ Gunshot  
☐ Stab, Cut ☐ Blunt force  
☐ Poisoning ☐ Animal/snake bite  
☐ Chocking/Hanging ☐ Sexual assault  
☐ Drowning/Near drowning ☐ Landmine/Bomb blast  
☐ Burn  
☐ Flame/smoke ☐ Hot fluid ☐ Chemical  
☐ Other (specify) \_\_\_\_\_

13. Place where injury occurred:

- LCII \_\_\_\_\_ District \_\_\_\_\_  
☐ Home ☐ Farm  
☐ Industry/construction ☐ Sport/recreation  
☐ Road/street ☐ Public/commercial place  
☐ School ☐ River/lake/pool  
☐ Other \_\_\_\_\_ ☐ Unknown

14. Activity at time of injury

- ☐ Work ☐ Traveling ☐ Sport  
☐ Education ☐ Playing/Leisure ☐ Unknown  
☐ Other \_\_\_\_\_

15. Intent:

- ☐ Unintentional  
☐ Intentional  
☐ Self-inflicted=S ☐ Assault=A ☐ War/ insurrection=W  
☐ Undetermined

16. Time Sequences:

Injury Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_am/pm  
DD/MM/YY  
Pt. Arrival Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_am/pm  
DD/MM/YY  
Dr's Attendance Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Time: \_\_\_\_am/pm  
DD/MM/YY

17. Alcohol use

- ☐ Suspected/confirmed ☐ Unknown ☐ Nil

18. Nature of injury:

- ☐ Fracture ☐ Burns  
☐ Sprain, strain or dislocation ☐ Concussion  
☐ Cuts, bites or open wound ☐ Other  
☐ Bruise or superficial injury ☐ Unknown  
☐ Organ system injury (Internal Organ Injury)

19. Body area with serious injuries

- ☐ Nil ☐ Head/Neck/Face ☐ Chest  
☐ Spinal cord injury ☐ Abdomen/Pelvis/Perineum  
☐ Bony Pelvis & Extremities

20. Palpable Pulse on admission:

- ☐ Radial (2) ☐ Femoral (1)  
☐ Carotid (1) ☐ Undetectable (0)

21. Patient disposition:

- ☐ Treated and sent home ☐ Admitted - IP No. \_\_\_\_\_  
☐ Died in casualty department  
☐ Transferred to higher-level facility ☐ Dead On Arrival

22. Status at two weeks:

- ☐ Discharged ☐ Died ☐ Still in hospital  
☐ Run away ☐ Referred to another health facility

23. Mode of Arrival

- ☐ Foot ☐ Police  
☐ Bicycle/Motorcycle ☐ Private Vehicle  
☐ Ambulance ☐ Others \_\_\_\_\_

Form Filled by \_\_\_\_\_

(Write first name, last name)

Date Completed: \_\_\_\_/\_\_\_\_/\_\_\_\_ DD / MM /YY

## Appendix ii: Schools Injury & Violence surveillance form

1. School.....	2. Pupil's name.....
3. Grade.....	4. Gender <input type="checkbox"/> Boy <input type="checkbox"/> Girl
5. Age.....(years)	6. Date of incident.....
7. Name of person filling.....	

### 13 Period when incident happened

- ☐ Before School    ☐ Break time  
☐ Lunch time    ☐ General Class  
☐ Physical education ☐ Practical Class  
☐ After School    ☐ Other.....

### 14. Place where incident happened

- ☐ Play-ground    ☐ Road/street  
☐ Farm/garden    ☐ River/pond  
☐ Classroom    ☐ Laboratory  
☐ Unknown    ☐ Other.....

### 15. Activity at time of incident

- ☐ Classroom activity ☐ Sport  
☐ Walking    ☐ Fighting  
☐ Running (not in sport)  
☐ Other.....

### 16. Incident Intent

- ☐ Unintentional  
☐ Intentional  
                     ☐ Self-inflicted ☐ Assault  
☐ Undetermined

### 17. Drug/alcohol use

- Alcohol use    ☐ Yes    ☐ No  
 Drug use    ☐ Yes    ☐ No

### 18. Body areas with injuries

- ☐ None    ☐ Head    ☐ Neck    ☐ Face    ☐ Chest  
☐ Forearm    ☐ Arm & Shoulder    ☐ Spine  
☐ Wrist & Hand    ☐ Abdomen    ☐ Pelvis  
☐ Thigh    ☐ Leg    ☐ Foot    ☐ Other.....

### 19. Type of injury

- ☐ None    ☐ Cut    ☐ Crush    ☐ Fracture ☐ Bite  
☐ Penetrating wound ☐ Head injury    ☐ Bruise ☐  
 Sprain/strain    ☐ Unknown ☐  
 Other.....

### 20. Associated social behaviour

- ☐ Dodging class (truancy)    ☐ Theft  
☐ Late coming    ☐ Pornography  
☐ Intimidation    ☐ Class disruption  
☐ Other.....

### 21. Physical act

- ☐ Bullying    ☐ Fall  
☐ Physical fight/assault    ☐ Vandalism  
☐ Use of weapon    ☐ Sport related  
☐ Corporal punishment    ☐ Sting/bite  
☐ Collision with object.    ☐ Technical equipment related  
☐ Fire smoke inhalation    ☐ Not applicable  
☐ Other.....

### 22. Were the child's parents notified?

- ☐ Yes    ☐ No

### 23. What kind of treatment did the child get?

- ☐ None    ☐ School first Aid  
☐ Hospital/clinic    ☐ Resuscitation on site  
☐ Other.....

### 24. What was the outcome of the injury?

- ☐ Recovered    ☐ Died  
☐ Not-injured    ☐ Unknown  
☐ Other.....

### 25. How did incident affect child's schooling?

- ☐ No effect on school attendance  
☐ Missed schools for .....days  
☐ Dropped out of school  
☐ Changed school  
☐ Child was expelled  
☐ Other.....

26 Completed by.....Date.....

27. Supervisor.....Date.....



**Appendix iii: Instrument for Unintentional Childhood Injury Surveillance (IUCIS by Hyder et al.)**

1. Study Record # \_\_\_\_\_
2. Treatment Date and Time: \_\_\_\_/\_\_\_\_/\_\_\_\_ (M/D/Y) \_\_\_\_:\_\_\_\_ AM/PM
3. Time of injury \_\_\_\_:\_\_\_\_ AM/PM
4. Transportation vehicle to hospital
  - a) Private car
  - a) Public ambulance
  - b) Private ambulance
  - c) Motorcycle/Bicycle
  - d) Walking
  - e) Taxi
  - f) Other \_\_\_\_\_
  - g) Unknown
  - h) Refused to answer
5. Who brought injured child into Emergency Room?
  - a) Mother
  - b) Father
  - c) Other family member
  - d) Friend
  - e) Teacher
  - f) Other \_\_\_\_\_
6. Age of child
  - a) 0-12 months
  - b) 1-4 years
  - c) 5-11 years
  - d) Unknown
  - e) Other \_\_\_\_\_
7. Gender of child
  - a) Male
  - b) Female
8. Where did the injury occur?
  - a) Own home inside
  - b) Own home outside
  - c) Other home inside
  - d) Other home outside
  - e) Road/street/highway
  - f) Farm, excluding home
  - g) Market/Shopping centre
  - h) Industrial/Construction area
  - i) School/Education area
  - j) Other public building
  - k) Sports and play area

- l) Rural areas
- m) Unknown
- n) Other \_\_\_\_\_

9. What type of activity was the child doing at the time of injury?

- a) Sports
- b) Leisure/play
- c) Traveling
- d) Paid work (including traveling)
- e) Unpaid work
- f) Educational activity
- g) Activity of daily living (ie. Cooking or Bathing)
- h) Unknown
- i) Other \_\_\_\_\_

10. Mechanism of Injury

a. Mode of transport (if yes go to #11-12)

- a) Passenger car
- b) Motorized 3 wheeled vehicle
- c) Bus (10 or more people)
- d) Pickup/van/jeep/minibus (< 10 people)
- e) Truck/Heavy vehicle
- f) Train
- g) Motorcycle/moped
- h) Animal or animal drawn vehicle
- i) Bicycle
- j) Boat
- k) Walk/Run
- l) Other \_\_\_\_\_

b. Other 'accident'

- a) Fall (if yes, answer #13)
- b) Fire, flames or heat (if yes answer #14)
- c) Poisoning (if yes answer #15)
- d) Near drowning/ drowning
- e) Cut
- f) Struck/hit by object
- g) Choking on food
- h) Entrapment in closed space
- i) Dog bite
- j) Snake bite
- k) Other animal bite
- l) Fireworks explosion
- m) Exposure to excessive cold
- n) Exposure to excessive heat
- o) Machinery injury
- p) Unknown
- q) Other \_\_\_\_\_

11.What was the child doing in, on, or near the vehicle?

- a) Driver
- b) Pedestrian
- c) Passenger
- d) Person boarding
- e) Riding outside of the vehicle
- f) Unknown
- g) Other \_\_\_\_\_

12.What was the striking vehicle/object?

- a) Passenger car
- b) 3 wheeler
- c) Bus/Van
- d) Truck/Heavy vehicle
- e) Train
- f) Motorcycle
- g) Horse
- h) Bicycle
- i) Boat
- j) Animal or animal-drawn
- k) Fixed or stationary object
- l) Unknown
- m) Other \_\_\_\_\_

13.What type of fall was it?

- a) From bed, sofa, furniture
- b) Down Stairs/Steps/Ladder
- c) From attendants arms
- d) Off Playground equipment
- e) Off rooftops
- f) Out of windows/ off balconies
- g) From a tree
- h) Unknown
- i) Other \_\_\_\_\_

14.What type of burn was it?

- a) Fire/Flame
- b) Hot object
- c) Hot liquid
- d) Steam
- e) Smoke inhalation
- f) Chemical
- g) Electric
- h) Lightning
- i) Unknown
- j) Other \_\_\_\_\_

15. What type of poisoning was it?

- a) Medicine/ Pharmaceutical
- b) Kerosene or Paraffin
- c) Fertilizer or insecticide
- d) Household cleaning agents
- e) Unknown
- f) Other \_\_\_\_\_

16. What was the nature of the most severe injury?

- a) Fracture
- b) Sprain, strain or dislocation
- c) Cuts, bites or open wound
- d) Bruise or superficial injury
- e) Burn
- f) Concussion
- g) Organ system injury
- h) Other \_\_\_\_\_

Anatomic region	Injury (yes/no)	Severity (1-6)
1. General (i.e. burn, shock, coma, skin)		
2. Face		
3. Head and neck		
4. Chest		
5. Abdomen		
6. Extremities		

17. What was the Injury Severity Score?

Please grade the severity of the three most severe injuries according to anatomical site (if a region received no injury please answer no).

Severity codes:

1=minor injury; 2=moderate injury; 3=severe but not life threatening; 4= life threatening but survival likely; 5=critical with uncertain survival; 6=fatal

18. Length of Hospital Stay \_\_\_\_\_ (hours) or \_\_\_\_\_ (days)

19. Outcome

- a) Left before treatment completion
- b) Referred to other centre
- c) Treated and discharged home without disability
- d) Treated and discharged home with disability
- e) Admitted to ward
- f) Admitted to burn unit
- g) Admitted to ICU
- h) Sent to childcare agency
- i) Admitted for emergency surgery
- j) Died in emergency room
- k) Other \_\_\_\_\_

20. What would you estimate would be the long term effect of this injury?

- a) No significant disability
- b) Short term temporary disability (less than 6 weeks)
- c) Long term temporary disability (6 or more weeks)
- d) Permanent disability

21. Safety intervention in use by family in the past year

- a) Supervision while child bathing/swimming
- b) Safe storage of hazardous materials and medications
- c) Use of helmets
- d) Use of seatbelts
- e) Car air bags
- f) Use of child car seat
- g) Other \_\_\_\_\_

22. Health payment mechanism for this visit

- a) Social security
- b) Out of pocket
- c) Government welfare
- d) Private insurance
- e) Other \_\_\_\_\_

#### Appendix iv: Focus Group Discussion Guide

1. What are the commonest childhood and adolescent injuries on your community?  
*Angu diga diya, umiza, anjii pini uzũ ambaambaa la karile kituru ki ngoki?*
2. What are the commonest causes of those injuries?  
*Aduu la ambaambaa la umiza diki feni kaniku ajini?*
3. How common are acts of violence against children and adolescents in your community and  
*Ujoo ba umiza pi roti ga kaniku uratanga gariki ruide dia ngopi?*
4. What are their causes  
*Azila, ujoo leki ruide aduijosiya?*
5. Why do injuries happen to children and adolescents in your community?  
*Ujoo le umiza ru roti ga kaniku uratanga gariki ruide anjii piru nosku karile piru aduijosiya?*
6. how preventable are injuries and violence  
*Ujo umiza ruriki, baki ugaa ruide ngongoni?*
7. What are some of the ways people in Yumbe prevent injuries and violence?  
*Amadri Yumbre gadiya, ama ujoo leki ugaa ruide ngongoni?*
8. How do people in Yumbe communities treat injuries
  - burns
  - fractures
  - dislocations
  - sprains and strains
  - accidental poisoning

Yumbe gadiya, baki umiza vunga di kiga arwa ngo ki ayu?