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A COMMUNITY-BASED STUDY OF INJURY IN BAHIR-DAR ZURIA WOREDA, WEST-GOJJAM ADMINISTRATIVE ZONE NORTH-WEST ETHIOPIA

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A Community-Based Study of Injury

in Bahir-Dar Zuria Woreda, West-Gojjam Administrative Zone

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ABSTRACT

A cross-sectional, community-based study of injury was conducted in Bahir-Dar Zuria Woreda between October and December 1993. A study population of 13,286 was surveyed in five randomly selected kebeles, three of which were rural and two urban. A four-week recall period was used to estimate an incidence of injury of 550 per 1000 per year.

The most common injuries were due to cutting and piercing objects or other mechanical injury (61.2%), animal injury (11.2%) and falls (10%). The home and its immediate environment were the main sites of occurrence of injury (52.7%), followed by roads or paths (21%) and farms (16.4%). Lower and upper extremities were the body parts affected in 48% and 29% of cases respectively. Over 81% of injuries in adults were occupational.

Age and sex were found to be risk factors for injury, with males at higher risk of injuries than females (ratio of 1.8:1). Injury incidence increased significantly with increasing age. Children under five were at greater risk of falls and burn injuries. Urban residents, farmers, those who reported alcohol intoxication in the last month, and those owning no animals were also at significantly increased risk of injury.

Treatment was obtained for 33% of injuries, of which 38% were treated at home, 26% treated in out-patient health facilities, and five percent admitted to hospital. The average expenditure for medical care, including transport, of injured persons was 16 birr ($US 2.58). Over 35% of injuries resulted in one or more days of restricted activity, with an average duration of disability of 10 days. Based on the discounted healthy years of life (DHLYs) lost due to injury mortality and disability in the study population, it is estimated that annual national losses for treatment and lost productivity are in excess of EtB one billion (US$171 million). The ratio of indirect to direct costs of injury was 11:1.

Initial strategies for prevention and control of this neglected public health problem are recommended based on the study findings. A comprehensive national injury control program will require multisectoral approaches and intervention from the national to the community level.

INTRODUCTION

Global Public Health Importance of Injury

Injury is the fifth leading cause of death globally, accounting for 5.2% of the total mortality (1). One of every four to nine persons suffers a disabling injury each year in developing countries; and injury-related disability is estimated to affect at least 2% of the world's population (2). Because of the lack of basic safety measures and injury prevention programs, populations in developing countries suffer a higher rate of injury. Once an injury has occurred, the case-fatality ratio is higher in the developing world due to lack of access to appropriate medical and surgical care. Many deaths are due to preventable complications of minor injuries such as bleeding and infection (3).

However, in developing countries, injury is frequently viewed as an inevitable consequence of technological change and economic development(4). The economically and socially disadvantaged populations in developing countries live with a risk of injury which would be considered unacceptable in the industrialized world. As emphasized in the recently adopted *Manifesto for Safe Communities* (5), this "inequality in the safety status of an individual in the developing and developed countries is of concern to all countries".

The annual medical and social costs of injury are estimated to exceed US $ 500 billion worldwide (5). Injuries are responsible for up to one third of all hospital admissions (5).

Other "direct" costs of injury include those incurred for continuing medical care, rehabilitation, as well as any property damage during the injury event.

Even more important, however, are the tremendous "indirect" costs of lost productivity due to injury death and disability (6). In many industrialised countries, because of its high toll among the younger age groups, injury is the major cause of years of potential life lost (YPLL). In the USA, for example, injury accounts for 40.8% of YPLL and losses of $75 - $100 billion per year for both fatal and non-fatal injuries(7). In many developing countries which have not yet begun to invest in injury prevention programs, the relative public health importance of injury is even greater. In Egypt, for example, injury incidence accounts for 78% of YPLL and 10-30% of all hospital admissions (8). In Thailand, Malaysia, and Singapore, deaths from motor vehicle crashes alone account for more premature loss of life than do tuberculosis and malaria combined (9). Yet, these figures fail to reflect the even greater social impact of lost productivity due to temporary and permanent disability after non-fatal injuries (6).

In developing countries, health information systems are generally very poor and the direct costs of injury are not well documented, so that the impact on the health budget is unknown. In one study of both direct and indirect costs in Brazil, injury accounted for 11.8% of all direct costs and 25.5% of total costs (6). In Ethiopia, there are no data regarding these direct or indirect costs of injury.

Risk Factors for Injury

Exploration of the risk factors for injury is a prerequisite for the identification of priorities for injury prevention. However, since risk factors vary from country to country and by type of injury, locally appropriate preventive programs must be based on data specific to the cultural and occupational setting.

Age and sex are important risk factors for many injuries. For example, preschool children are at increased risk of burn injuries, motor vehicle crashes and drowning (10). Elementary school-age children are at increased risk of pedestrian injury by motor vehicles, while adolescents are at higher risk of motor vehicle injury (both as occupants and pedestrians), and injuries by firearms (10). For most injuries, males are at higher risk than females (10), although adult women are at higher risk of burn injury in domestic settings (3).

Socioeconomic status is also a risk factor for injury, with the poor suffering disproportionately from homicide, assault, pedestrian fatality, and burn injury fatality (6). In the USA, for example, the death rate from unintentional injuries is twice as high in poor areas as high income areas(6). Socio-economic status also often alters the case fatality ratio once the injury occurs, due in part to variation in access to appropriate medical and surgical care (6).

Alcohol use has been an important risk factor for adults in many developing countries (3). In Papua New Guinea, one third to over half of fatally injured drivers have been found to be legally intoxicated, while 69% to 90% of fatalities among pedestrians were found to have blood alcohol levels above 80 mg per 100 ml(6). Few studies in Africa have demonstrated a link between alcohol and risk of injury, although the high prevalence of alcoholism in countries like Kenya (6) suggests that more studies of alcohol as a risk factor are warranted. No studies have documented the importance of alcohol as a risk factor in Ethiopia.

The physical environment also plays important role in determining the risk of injury. Home was the site of occurrence of 37% of childhood injuries in Chile and 57% in Brazil (11). In a study of childhood injuries in Adamitulu in Ethiopia(12), 53% of injuries occurred at

home, followed by home yard and road or paths. Among older children, the most frequent locations of injury are often institutions (such as schools) and public places (13).

Causes of Injury

The severity and case-fatality ratio of injuries depend largely up on their cause. Specific external causes of injury vary widely among countries by level of industrialization, and by occupational and cultural practices (6). Generally, however, fatal injuries in the developing world most often result from motor-vehicle collisions, burns, poisonings, drowning and falls (1,14). Common causes of non-fatal injuries are cutting or piercing objects and animal related injuries (6).

Motor Vehicle Injury: In many developing countries, motor vehicle collisions are important causes of injury. This is clearly seen in some oil producing countries and countries with rapidly expanding numbers of vehicles and roads (6). In the Gulf region, for example, motor vehicle-related mortality ranks among the ten leading causes of death throughout the region (4). In Kuwait, motor-vehicle crashes are the single leading cause of death for the population as a whole (4). Road safety, in addition to traffic volume, is an important determinant of the risk of motor vehicle injury. For example, mortality rates calculated per vehicle in Ethiopia and

Nigeria in 1978 were 50 times higher than in the US or UK, despite overall lower numbers of vehicles per capita (6).

Burns: Burns and fires are a leading cause of death from injury in many countries. Rates of injury due to burns and fires are generally highest among the very young, women of reproductive age, and the very old (3). In a study of rural villages in India, burns were found to be the leading cause of death (3). Open flames used for cooking and lighting in many developing countries are the most important source of burns (3). The case-fatality ratio for burn injury in the developing world is often over one-third, accounting for 15% to 45% of all deaths in persons hospitalized for trauma (3).

Poisonings: Poisoning is a major cause of injury mortality in developing countries (6). Although available data are largely limited to hospital-based case reports, it is evident that children are at particular risk of poisoning in developing countries. For example, poisonings frequently occur among children in developing countries because they ingest kerosene which has been inappropriately stored in soft-drink bottles (15).

Drowning: Drowning is second only to motor vehicle trauma as a cause of death from injury among children and young adults (16). One study comparing rates of unintentional injuries in children in different regions

of the world found drowning to be the leading causes of death from injury among boys aged 1 to 4 years in Latin America, Asia, and Oceania (16). In many developing countries, unfenced ponds and wells are found in a vast number of villages, and appear to be a significant environmental hazard especially for toddlers.

Falls: Falls are a major cause of minor and severe injuries in both industrialized and developing countries (3). In some rural areas of developing countries, falls from trees are the leading cause of death. Young boys and young adult males are at highest risk (17), although in countries with larger populations of elderly, this group is also at increased risk of injury due to falls. In studies in Latin America (11), falls accounted for 47% of all injuries in Venezuela and 62% in Chile.

Cutting and Piercing/Other Mechanical Injury: Cutting and piercing instruments, such as knives and hand tools, were the leading cause of non-fatal injury in the community-based study in Punjab, India. Cutting and piercing injury accounted for 22% of all injuries, with a rate of 44 per 1000 persons per year (3). In developing countries, especially in rural areas, small children are often left alone playing with sharp objects, and are therefore at risk of disabling injury.

Chopping wood, which is a daily practice in many rural villages, is an important cause of blinding or

other disabling injury (3). Mechanical injury due to being struck by an object was the 2nd most frequent cause of injury in Chile and Cuba, and the 3rd and 4th most important causes of all injury in Venezuela and Brazil, respectively (11).

Animal-Related Injury: In many developing countries, animal-related injury is an important public health problem, with dog bite the commonest such injury. In a survey of rural health centres in Ivory Coast, the incidence of animal bites was 11 per 1000 population per year (3). In the 1990-91 Ethiopian MOH report(18), animal bite was the most commonly reported unintentional injury, while the Adamitulu study (12) documented that 5% of childhood injuries were due to animal bites.

Intentional Injury: In many parts of the world criminal homicide accounts for a significant proportion of injury deaths. In one Latin American study, homicide rates of 8.2 per 100,000 population were observed (19), while comparable figures in Caribbean, North Africa and the Middle East and Asia are 6.7, 4.7 and 2.3 per 100,000, respectively (19). In the national Ministry of Health report for Ethiopia in 1990-1991 (18), intentional injury accounted for 33% of all injuries which reach hospitals. Fire arms are the mechanism in 5% of intentional injuries in Ethiopia (18).

Intervention and Control Programs

Few developing countries have established injury prevention and control programs. Many interventions for the prevention of injury which have been proven effective in industrialized countries have yet to be implemented in the developing world. The increased case-fatality ratio observed after injury in developing countries (8) provides some evidence that improved clinical management could further help to avert injury death and disability.

Deaths due to injury can be immediate (within one hour), early (1-3 hrs), or late (days to weeks after the injury event)(20). In the USA, more than half of injury deaths occur immediately, while 30% are early deaths (6). In developing countries, on the other hand, many more deaths occur in the early and late periods due to bleeding and infection. Such a pattern also suggests that considerable death and disability might be prevented through improving the quality of care and transport.

Ethiopian Data

There have been a few health facility-based studies of injury (21-26) and studies of occupational injury (27-29) in Ethiopia. However, particularly in Ethiopia, where access to health care is limited, such facility-based data fail to reflect the epidemiology of injury at the community level.

Sources of community-based data on injury in Ethiopia include the Central Statistical Authority (CSA) Rural Health Survey (30) and the Adamitulu study of the epidemiology of childhood injury (12). The CSA Rural Health Survey, which was completed in 1982-83, documented a 14-day prevalence of 235 and 227 per 10,000 population in two surveys, while the Adamitulu study reported an injury incidence rate of 700 per 1000 population among children under 15 years of age. Although the CSA rural health survey was conducted in 12 of the 14 regions of the country, it collected only descriptive data, so offers no insight into the risk factors or costs of injury. The Adamitulu study, which used a two-month recall period, is further limited in that it included only children.

The most recent available facility-based data are from the Ministry of Health statistics for 1990/91 (31). According to these data, "all other accidental causes (unidentified)" were the 8th and 7th causes of admission to hospitals among males and females, respectively.

The Bahir-Dar Zuria Woreda Health Department report of 1991/92 (1984 e.c) (32), indicates that "homicide and injuries purposely inflicted by other persons" were the 3rd most important cause of admission, while "all other accidental causes (unidentified)" were the 7th most frequent cause of admission. In the same year,

accidental poisoning, "all other accidental causes", and "homicide and injuries purposely inflicted by other persons" were the 6th, 7th, and 8th most frequent causes of death in Felege Hiwot Hospital, Bahir-Dar (32).

In view of this lack of comprehensive community-based data, a study was designed to determine the public health importance and risk factors for injuries in Bahir-Dar Zuria Woreda. The specific objectives of the study were: 1) to estimate the incidence of injuries, 2) to identify risk factors for injuries, and 3) to determine the economic importance of disability due to injury.

METHODS

Study Design

A descriptive, cross-sectional, community-based study was designed to achieve the specified objectives. The study protocol was scientifically and ethically reviewed and approved by the Research and Publications Committee of Faculty of Medicine, Addis Ababa University. An official letter was written to the woreda council to obtain permission for the study.

Incidence of injury was assessed through four-week recall of any injury and of injury resulting in lost productivity or restriction of activity. The cost of treatment of injury and the point prevalence of disability due to past injury were assessed as further measures of the social and public health importance of injury. Injured individuals were compared to uninjured persons with regard to socio-demographic and behavioral risk factors.

Study Population

An estimated 40% of the 303,671 people of Bahir-Dar Zuria Woreda live in urban areas. The Woreda includes 60 Kebeles, of which 17 are urban and 43 rural. The sample size was calculated to ensure that the incidence of injuries would be ascertained within a confidence

interval width of 0.02% at the 99% significance level. Based on the CSA Rural Health Survey, it was expected that the survey would detect two injuries per 1000 population for the one month recall period (i.e., 24 injuries per 1000 per year).

To obtain the calculated sample size of 13,286, two urban and three rural kebeles were randomly selected to reflect the actual urban- rural ratio of the woreda population. The entire population of each of the sampled kebeles was surveyed until the required sample was obtained.

Data Collection

Three supervisors and 15 interviewers were recruited and trained for three days. The questionnaire (in Amharic) was pr\e-tested in both rural and urban kebeles. The instrument was then revised based on insights gained during the pre-test.

Data were collected from October through December, 1993 in interviews of 13,286 participants during domiciliary visits. Respondents from each household were interviewed regarding socio-demographic and behavioral risk factors. At the household level, data were obtained regarding religion, ethnicity, number and type of animals, and radio ownership. At the individual level, data were collected for each participant regarding their age, sex, occupation (for adults), educational level

(ability to read and last grade completed), marital status (for adults), and any history of alcohol intoxication in the last month (for adults).

Data were collected for all participants regarding each of the dependent variables, including any injury within the past four weeks, whether that injury resulted in loss of productivity or other restriction of activity for 24 hours or more, any death due to injury within the household in the last year, and any current disability (defined as any restriction of activity relative to that considered normal) due to past injury. Injury was operationally defined as any hurt, loss, or damage resulting from exposure to physical or chemical agents in the last four weeks (33).

For each participant with injury or injury disability, additional in-depth information was obtained using a categorization adapted from the International Classification of Diseases (ICD, revision 10) guidelines regarding the cause of injury, part of the body affected, site of occurrence of injury, and activity of the injured person at the time of the injury event.

To aid in quantifying the economic impact of injury, information was also obtained regarding any treatment given, the place of treatment, the amount of money paid for treatment (including transport), and the number of days lost productivity.

Persons found admitted to hospital and those with restricted activity due to injury at the time of interview were revisited to obtain data regarding the length of restricted activity and the cost of any treatment.

Data analysis

The data were entered and analyzed using Epi Info (34) and SAS (35) software packages. The four-week recall data were extrapolated into annual incidence figures by simply multiplying by 12. Risk ratios (RR) and confidence intervals (CI) were computed using the logistic regression function of the SAS software package and the findings presented in tabular format. The discounted healthy life years (DHLYs) lost and cost of injury were calculated for disabling injuries and injury deaths using 55 years as the age of retirement and the 1992 Ethiopian GNP of US $120 (36).

RESULTS

Data were obtained from 13,286 participants, of whom 38% were residents of urban kebeles and 62% of rural kebeles. The male-to- female ratio was 1:1.03. Over 46% of the population was less than 15 years of age and 14% were children under five. Those 55 years of age and older accounted for only four percent of the population.

Deaths Due to Injury

There were 20 deaths due to injury within the year prior to the survey, yielding an injury-specific mortality rate of 1.51 per 1000 population per year. Of these deaths, 12 occurred among males and 8 in females. Drowning was the cause of death in 6 cases, assault in 5, burn in 3, and motor vehicle injury in 3 cases. Poisoning, falls, and animal injury accounted for one death each. As indicated in table 1, most of the deaths occurred among those aged five to 24.

As summarised in table 1, the number of years to retirement was calculated for each age group by subtracting the mean age for that age group from 55. DHLYs lost per death in each age group were calculated using the generally accepted discount rate of four percent (4). Based on data from other studies (37), productive work was assumed to begin at age ten. The total years lost due to injury death for each age group

was calculated and the total cost computed based on a GNP per capita of US$120, yielding an average year of 15.5 years or cost per injury death of US$1857 (EtB 11,512).

Table 1: Age-specific distribution of deaths due to injury and DHLYs lost due to injury mortality.

Age at death	No.of deaths(%)	Mean years to retirement	DHLYs per death	Total DHLYs lost.	Total cost(US$)du to injury death ineac age group
0 - 4	*1*	*52.5*	*15*	*15*	*1,800*
5 - 14	*6*	*45*	*21*	*126*	*15,120*
15 - 24	*5*	*35*	*19*	*95*	*11,400*
25 - 44	*3*	*20*	*14*	*42*	*5,040*
45 - 54	*4*	*5*	*4*	*16*	*1,920*
*55+**	*1*	-	-	-	-
Total	*20*			*294*	*35,280*

** 55 years is the "official" retirement age in Ethiopia.*

Incidence of Non-Fatal Injury

A total of 614 non-fatal injuries were detected in 609 individuals for the four-week recall period. However, for those five individuals who suffered two injuries during the four week recall period, only the more severe injury was included in the analysis. The total incidence of non-fatal injury was calculated, therefore, to be 550 per 1000 population per year. These data suggest that over 50% of the population are likely

to sustain non-fatal injury in a one year period. Of those injured, 215 (35%) had one or more days of restricted activity, indicating an incidence of disabling injury of 194 per 1000 per year. There was no significant difference in the crude rate of injury in rural and urban populations. Males sustained 64% of injuries and females 36%. The over all male-to-female ratio was 1.77:1 (crude RR = 1.9, CI = 1.6-2.2). The maximum difference in injury incidence by gender was among children 5 to 14 years of age (M:F ratio 2.21:1, crude RR = 2.29 CI = 1.67-3.14) and the minimum difference was among those aged 15 to 24 years (M:F ratio = 1.33:1, crude RR = 1.51 CI = 1.04-2.20). Only two injuries occurred among infants, both of whom were males.

Examination of the temporal pattern of injury occurrence revealed that 21% of injuries occurred on Tuesday, of which 47% were due to cutting/piercing objects and 16% were animal-related injuries. The remaining six days had a more uniform distribution of injuries. Half (50%) of intentional and 28% of unintentional injuries occurred on weekend days (Saturday and Sunday).

Morning (7AM to 12 noon) and afternoon (Noon to 6PM) had an equal distribution of injury incidence, accounting for 44% of injuries each, while the remaining 12% of injuries occurred during the evening and night hours (7PM

to 6AM). In contrast, over 34% of intentional injuries occurred during the evening and night hours. Table 2 summarizes the injuries by cause, demonstrating that cutting and piercing objects and other mechanical injury are the most important causes. The most common specific agents included axes, sickles, knives, and broken glass. Specific causes of animal injuries were primarily cow or ox horn injury and dog or other animal bites. Falls from trees, from the backs of animals, and from beds were the third most common type of injury. Motor vehicle injuries, mostly to pedestrians, accounted for less than 2% of all injuries in this predominantly rural population. The other unintentional injuries were primarily due to accidental discharge of firearms and injury to the foot due to poorly fitting shoes. Intentional injury accounted for only 5% of all injuries, most (72%) of which were due to assault, while the rest (28%) were classified as "abuse". Non-fatal poisoning and attempted suicide were not reported in the study.

Table 2. Cause-specific incidence of non-fatal injury.

CAUSES	No(%)	INCIDENCE (PE 1000POPULATIO PER YEAR)
Unintentional injury.	577(94.7)	521.2
Cutting and piercing objects	372(61.2)	336.0
Animal injuries	68(11.2)	61.0
Falls	60(9.9)	54.2
Burns	33(5.4)	29.8
Foreign body	12(2.0)	10.8
Motor vehicle injury	10(1.6)	9.0
Drowning	2(0.3)	1.8
Others/unintentional	20(3.3)	18.1
Intentional injury.	**32(5.3)**	**28.9**
Assault	23(3.8)	20.8
Abuse	9(1.5)	8.1
Total	609(100)	550.1

The cause-specific incidence of injuries by age and sex is presented in Table 3. The overall incidence of non-fatal injuries increases with age, with the highest incidence among persons aged 55 and older (660 per 1000 per year) and the lowest among children under five (405 per 1000 per year).

Among males, the highest incidence was in the 25 to 44 year age group and among females, in those over 55 years of age.

A higher incidence of burns was detected among children under five and among females over 15 years of age. The median age for burn injuries was 8 years. Falls also showed a bimodal distribution, with increased incidence among children under five and those older than 55 years (though the increased incidence in the latter group was not statistically significant), with a median age of 7 years.

Motor vehicle injuries had a higher incidence among females than males, with the highest risk among school age children (5 to 14 years of age). Young adults had a significantly higher incidence of assault, with a mean age of 19.6 years at the time of injury.

Table 3. Cause-specific incidence (per 1000 population per year) of injuries by age and sex.

Cause of injury	0 - 4			5 - 14			15 - 24			25 - 44			45 - 54			+
N =	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	
	1897	985	912	4264	2132	2132	2918	1380	1538	2949	1320	1629	712	384	328	58
Unintentional injury	399	500	303	535	732	338	477	565	398	596	809	427	523	594	439	6
Cutting and piercing objects	146	183	105	321	405	236	350	461	250	464	636	324	287	375	183	8
Falls	120	110	132	76	124	28	12	9	16	16	18	15	51	63	37	8
Animal injury	38	49	26	56	90	23	41	70	16	81	109	59	118	156	73	13
Burns	89	134	40	20	28	11	33	9	55	4	-	7	51	-	110	-
Foreign bodies	-	-	-	8	11	6	16	9	23	12	27	-	-	-	-	4
Motor vehicle injury	-	-	-	17	23	11	12	-	23	-	-	-	17	-	37	
Drowning	-	-	-	-	-	-	4	9	-	4	9	-	-	-	-	
Others/unintentional	6	12	-	37	51	23	8	-	16	16	9	22	-	-	-	--
Intentional injury	6	12	-	37	56	17	41	61	24	33	73	-	-	-	-	
Assault	-	-	-	22	33	11	37	61	16	24	55	-	-	-	-	5
Abuse	6	12	-	14	23	6	4	-	8	8	18	-	-	-	-	3
Total	405	512	303	571	788	355	518	626	421	630	882	427	523	594	439	6

N = Study population in each age group and sex

Lower and upper extremities were the most commonly affected by injury. Home and home yard, roads or paths and farms were the most important sites of injury events. Data regarding the type of activity reported by injured adults at the time of the injury event document that most injuries are occupational. Table 4 summarizes the findings regarding the part of the body affected, the place of occurrence of injuries, and the reported activities at the time of the injury event.

One third (33%) of injured persons report seeking treatment for their injury, 38% were treated at home, 26% in out patient health facilities, 23% in private drug vendor/clinics and traditional healers and 5% admitted to hospital. The other place of treatment (8%) includes community health agents and neighbour health workers. The data regarding the site of treatment of reported injuries are summarized in table 5. Approximately 60% of treated persons paid for medical care for their injury. Table 6 documents the price paid for care received, including medication, diagnostic procedures, and transportation. The average amount of money spent for medical care and transportation was Birr 16.00 (US$2.58) per injury.

Table 4. Body regions affected, place of occurrence of injuries and activities of injured person (15 years or older) at the time of injury and incidence per 1000 population per year.

Part of the body	No(%)	Incidence (per 1000 per year)
Lower extremities	292(47.9)	263.7
Upper extremities	176(28.9)	159.0
Head and neck	92(15.1)	83.1
Pelvis and lower back	8(1.3)	7.2
Thorax and upper back	6(1.0)	5.4
Abdomen	4(0.7)	3.6
Multiple body regions	31(5.1)	28.0
Total	609(100)	550.1
Place of occurrence		
Home and around home	321(52.7)	290.0
Roads/paths	128(21.0)	115.6
Farms	100(16.4)	90.3
Public areas	34(5.6)	30.7
Trade and services area	13(2.1)	11.7
Sports and athletics area	3(0.5)	2.7
Others	10(1.6)	9.0
Total	609(100)	550.1
Activities		
Working for income	175(51.3)	295.4
Working at home	105(30.8)	177.3
Leisure/play	18(5.3)	30.4
Others	43(12.6)	72.6
Total	341(100)	575.7

Table 5. Place of most recent treatment of injury.

INSTITUTION	NUMBER	%
Home	77	38.0
Private drug vendor/clinic	28	14.0
Hospital(OPD)	28	14.0
Traditional healer	18	9.0
Health centre	15	7.0
Health stations	10	5.0
Hospital admitted	10	5.0
Others	17	8.0
Total	**203**	**100**

Table 6. Fees paid for treatment of injury.

Type of cost.	NO. of persons (N = 121)	Total cost	Average cost per injury.	Total cost per year
Physical Examination/ laboratory	87	558	6.4	6,696
Drug/medication	111	1159	10.4	13,908
Transport	23	174	7.6	2,088
Total	-	1891	16	22,692

Over 35% of injured persons reported one or more days of restricted activity due to the injury. The average duration of activity restriction was 10 days per injury. Nearly half (48%) of the disabling injuries

occurred in adults (15 years or older), as is reflected in table 7.

Cutting and piercing objects, assault and abuse, motor vehicle injury, falls, and burns represent the five most important causes of disability and lost productivity due to non fatal injury. However, with the exclusion of drowning, motor vehicle injury, assault and abuse, and falls result in the longest duration of disability per injury. Table 8 shows causes of restricted activity and lost productivity in order of importance. The average duration of disability due to non-fatal or near-drowning presented in table 8 is based on a single case with a prolonged period of disability.

Table 7. Days of restricted activity in adults (15 years or older).

Days	Number of injured persons (%)	Total number of days lost.
1 - 3	22 (21)	54
4 - 6	20 (19)	96
7 - 14	38 (37)	333
15+	24 (23)	555
Total	104 (100)	1038

Table 8. Number of DHLYs lost due to fatal and non-fatal injury by cause.

Cause of injury	No. of disabling injuries among adults (15-55 yrs)	Total no. of productive days lost	Average no. of days lost per injury	No. of years lost per annum due to injury	No. of deaths (<55 years)	DHLYs lo due to deaths
Drowning	1	45	45	1.5	6	105
Intentional injuries (assault/homicide and abuse)	17	246	15	8.1	4	562
Burn	8	65	8	2.1	3	442
Motor vehicle injury	4	122	31	4.0	3	370
Animal injury	6	41	7	1.3	1	216
Poisoning	-	-	-	-	1	190
Falls	7	86	12	2.8	1	146
Cutting and piercing objects	61	433	7	14.2	-	4
Total	104	1038	10	34	19	2940

Table 8 also summarizes the years lost due to both fatal and non-fatal injury, demonstrating that drowning, assault and abuse, burns, motor vehicle injury, and animal injury are the five important causes of DHLYs lost. The DHLYs lost due to 19 deaths and 104 disabling injuries (including only disability in adults) was 328 years. This total multiplied by the Ethiopian GNP (US$120) was used to calculate the total cost per annum due to lost productivity of US$39,360 (EtB 244,032). These rough calculations suggest that the indirect cost of injury in Ethiopia is eleven times the direct cost for treatment and transportation of injured individuals.

Risk Factors for Non-Fatal Injury

Persons who sustained non-fatal injuries in the four week recall period were compared to those did not sustain an injury in that period of time. Socio-demographic and behavioral factors were analyzed by crude logistic regression. Males, farmers, those who reported alcohol intoxication with in the last month, those who own no animals, married adults and those who had not completed elementary school were at significantly high risk than other groups. Crude and adjusted risk ratio for injury and 95% confidence intervals for these variables are summarized in table 9. A significant linear trend was observed by age group, with the risk of injury increasing

with increasing age (Chi square for linear trend (X^2 = 4.08 and p-value 0.02). However, when stratified by sex, females showed positive linear trend of injuries with increasing age (X^2 = 4.5, p-value = 0.03), while males showed no such significant trend (X^2 = 1.27, p-value =0.26).

The adjusted logistic regression analysis revealed that those living in an urban area, farmers, males, and those who had not completed elementary school were at higher risk of injury, as summarized in table 9. Age was not significantly associated with risk of injury in the adjusted analysis. Living in an urban area was significantly associated with risk of injury only in the adjusted analysis. Religion, ethnicity, and the number of rooms in the house were not significantly associated with risk of injury.

Crude analysis for some socio-demographic and behavioral risk factors for specific causes of injury revealed that males and farmers had significantly higher risk of injury due to cutting and piercing objects and assault. Males, children under five, and those not owning animals were at higher risk of falls than other groups. Children under five showed a significant increased risk of burns, as summarized in table 10.

Table 9. Factors associated with non-fatal injury.

Factors	Injured (%)	Total	RR (95% CI) (crude)	RR (95% CI) (Adjusted)
Age				
0 - 4	65 (3.4)	1897	1.0*	1.0*
5 - 14	202 (4.7)	4264	1.40(1.05-1.86)	1.26(0.93-1.66)
15 - 24	126 (4.3)	2918	1.27(0.94-1.73)	1.08(0.21-5.60)
25 - 44	155 (5.3)	2949	1.56(1.16-2.10)	1.24(0.24-6.50)
45 - 54	31 (4.4)	712	1.28(0.83-1.99)	0.93(0.17-5.01)
55+	30 (5.5)	546	1.64(1.05-2.55)	1.09(0.20-5.88)
Sex				
Male	389 (5.9)	6552	1.0*	1.0*
Female	220 (3.3)	6734	0.54(0.45-0.63)	0.67(0.55-0.81)
Animal ownership				
Owns none	313 (5.2)	6061	1.0*	Not done
Owns animals	296 (4.1)	7225	0.76(0.67-0.91)	
Educational level				
No school	422 (5.9)	7106	1.0*	1.0*
Elemen/school	104 (6.3)	1653	1.45(1.17-1.81)	1.36(1.04-1.78)
Secondary sch	80 (4.2)	1922	0.94(0.74-1.20)	1.00(0.73-1.37)
College	3 (2.0)	150	0.44(0.14-1.38)	0.42(0.13-1.36)
Residence				
Rural	366 (4.5)	8209	1.0*	1.0*
Urban	243 (4.8)	5077	1.08(0.91-1.27)	1.52(1.21-1.92)
Occupation.				
Farmers	144 (9.4)	1540	1.0*	1.0*
Others	197 (3.5)	5562	0.36(0.28-0.44)	0.38(0.28-0.50)
Marital status..				
Never married	90 (3.9)	2314	1.0*	1.0*
Married	215 (5.4)	4004	3.48(2.93-4.13)	1.12(0.83-1.51)
Others	37 (4.7)	790	1.10(0.27-4.57)	1.31(0.31-5.62)
Intoxication				
Intoxicated	36 (12.6)	285	1.0*	Not done
Not intoxi.	306 (4.5)	6819	0.32(0.22-0.47)	

* Reference group. RR= risk ratio.

Table 10. Factors associated with cause-specific non-fatal injuries.

Type of injury	Factors	Injured(%)	Total	Crude RR(95%CI)
Cutting/piercing objects				
	Males	169(2.6)	6552	1.69(1.31-2.18)
	Females	104(1.5)	6734	
	Farmers	76(4.9)	1540	2.75(2.01-3.75)
	Others	103(1.9)	5562	
	Intoxicated	18(6.3)	285	2.79(1.63-4.71)
	Not intoxicated	161(2.3)	6819	
Falls	< 5 children	19(1.0)	1897	2.73(1.53-4.84)
	Other ages	42(0.4)	11389	
	Not owned animals	40(0.7)	6061	2.28(1.31-4.00)
	Owned animals	21(0.3)	7225	
	Males	39(0.6)	6552	1.83(1.05-3.19)
	Females	22(0.3)	6734	
Burns	< 5 children	14(0.7)	1897	4.45(2.11-9.31)
	Other ages	19(0.2)	11389	
Assault	Males	19(0.3)	6552	4.89(1.57-16.97)
	Females	4(0.1)	6734	
	Farmers	11(0.7)	1540	10.00(2.95-37.20)
	Others	4(0.1)	5562	

Injury Disability

The survey detected 108 disabilities due to injury, indicating a point prevalence of injury disability of 8.1 per 1000 population. Males accounted for 66% of disabilities and females 34%. The most common disabilities were those of mobility or walking, followed by limitation of movement of the hands or arms, and complete or partial blindness. Specific frequencies of disability by type are presented in table 11. A summary of injury disabilities by severity is also presented in table 11. The most severely disabling of injuries were complete or partial blindness.

TABLE 11. Type of disability and percentage of normal activity

Type of disability	< 25% No(%)	25 - 49 % No(%)	50 - 74% No(%)	75 - 99% No(%)	Total No(%)
Disability of mobility or walking	5(12)	19(47)	16(40)	1	41(100)
Complete or partial blindness.	5(20)	10(40)	10(40)	-	25(100)
Complete or partial deafness.	1(17)	2(33)	3(50)	-	6(100)
Limitation of movement hands and trunk	4(14)	12(40)	14(46)	-	30(100)
Disability in memory or learning or understanding	1	-	-	-	1
Difficulty/in ability to speak	1	-			1
Others	2(50)	-		2(50)	4(100)
Total	19(17)	43(40)	43(40)	3(3)	108(100)

DISCUSSION

This study is the first comprehensive community-based study of injury in Ethiopia. The inclusion in the survey of all households within the selected kebeles ensures that the study findings are, at least, representative of those five kebeles. Because of the small number of kebeles included, there is some risk that the five selected kebeles are less than typical of the woreda under study. However, data from the Woreda Health Profile (32) suggest that these kebeles are quite homogenous with regard to health status and cultural and socioeconomic factors. In addition, the urban-rural distribution of the population in the selected kebeles reflected that of the woreda as a whole. Since the proportion of the population in the Bahir-Dar Zuria Woreda which is urban is greater than that of the country as a whole, however, the accuracy of extrapolations of figures from this survey to the national level may be questioned.

Strictly speaking, because the study was not conducted prospectively, the reported "incidence" figures might be reported as "four-week prevalence" data. However, only five individuals reported multiple injuries during the four week recall period. In addition, injuries are known to be highly memorable events, such that their report, in contrast to that for most causes of

morbidity and mortality, is likely reliable for periods of several weeks (38). In fact, because of the memorable nature of injury events, there is some risk that injury incidence may be over-reported in this study due to recall of injuries which antedated the four week recall period.

Although this study documented a higher rate of injury morbidity and mortality than that reported by Gordon (3), the Indian study used a more restrictive definition of injury, including only that resulting in disruption of normal activity. The higher rates of injury incidence documented in the Adamitulu study (12) may be ascribed to the restriction of the study population to children and to the more "liberal definition" of injury, including history of foreign body in any orifice even in the absence of harm or injury. The incidence of injury reported in this study is similar to that documented in the Rural Health Survey conducted by the Central Statistical Authority (30) in 1982-1983.

Extrapolation of the four-week incidence figures from this study to annual incidence figures fails to consider any seasonal variation in injury incidence. Global surveillance data, however, suggest that overall injury incidence figures are generally constant throughout the year. Findings from the CSA rural health surveys (30) suggest that there is little variation in

either overall injury incidence or cause-specific injury incidence between the rainy and dry seasons. It is more likely that the failure to account for seasonal variation results in inaccuracies in the estimates of cause-specific incidence, since specific occupational activities are likely to vary with seasons.

The excess of intentional injuries observed on weekends is consistent with that found in other studies in both developing and industrialized countries. Lifestyle differences on weekend days, including a shift from occupational activities and increased alcohol consumption, may help to explain the observed differences. The higher incidence of injury observed on Tuesdays during the study period can likely be ascribed to the fact that fewer holidays fell on Tuesday during the period of data collection.

Cutting and piercing objects were the most common cause of injury in this study, as was observed in Gordon's study in rural India (3). That "other causes of injury" were the most common in the CSA Rural Health Survey may be ascribed to the fact that the survey instrument did not specify cutting and piercing objects as a cause of injury. The higher rate of animal injuries in this study likely due to the close contact with farm and domestic animals in this rural community. Falls from trees, from the backs of animals, and from bed were

commonly seen in the study area. These injuries, along with cutting and piercing injury, animal injury, falls, and burn injury, account for 88% of all injuries in this study.

Motor vehicle injury accounted for 3 deaths and for less than two percent of all injuries, figures which are comparable to those found in other studies (3,11,12). In view of the predominately rural nature of the study population, such a low incidence of motor vehicle injury is not unexpected.

Drowning was the leading cause of death but an infrequent cause of morbidity because of its high case fatality ratio. The high death rate due to drowning in this area can be ascribed to its proximity to Lake-Tana and multiple rivers. Poisoning, which is a frequent cause of mortality and morbidity in other studies, accounted for one death and no non-fatal injury. This may be due to the low rate of usage of pesticides and other industrial chemicals in the study area.

Intentional injuries were the second commonest cause of death in this rural area, which has a high prevalence of firearm ownership. The proportion of injury which was intentional was one seventh of that reported by the MOH in 1990/1991 (18), but similar to that documented in the CSA rural health survey (30) (4.7 and 4.1% in the two surveys). However, the institution-based data reported

by the Ministry of Health might be expected to detect a disproportionate number of firearm-related injuries, due to their increased severity and, therefore, increased likelihood of presenting to a health facility.

The higher incidence of injury documented among males in this study is similar to that noted in the CSA Rural Health Survey (30). That the community-based study in India (3) showed an excess of non-fatal injuries in females may be ascribed to differences in cultural practices, such as wearing loose-fitting clothing, which place women at higher risk of injuries such as burns.

The overall incidence of injury in this study increases with age, as was found in the CSA Rural Health Survey (30). The higher incidence of falls among the very young and the elderly is analogous to that observed in studies in other settings, as is the excess of burn injuries among children under five and adult women (3, 12, 30). The fact that more than half of injured adults (over 15 years of age) were working for income at the time of injury indicates that occupational injuries, even in predominately rural areas, are an important public health problem.

The small proportion, 221 (33% of) injured persons who sought medical care for their injury in this study was considerably less than the 63% who sought care in the Adamitulu study (12).

Although parents may be more likely to seek care for their injured children than for themselves, it is likely that the increased proportion of injuries which received medical care in other studies is due, in part, to the greater access to health care services in urban areas such as Adamitulu. The failure to seek care for even severe injuries may also reflect the lack of health knowledge regarding potential complications of injuries, including infection and disability.

Approximately 60% of those who sought care for their injuries paid for diagnosis, treatment and/or transportation. The average expenditure of EtB 16 (US$2.58) is five times the per capita annual operating budget of the MOH for 1992/93. Even more important than these "direct" costs of injury, however, are the costs due to lost productivity.

Over 35% of those injured reported one or more days of restricted activity, although this figure is considerably lower than that reported in the CSA Rural Health Survey(30). Based on the discounted healthy years of life (DHLYs) lost due to injury mortality and disability in the study population, it is estimated that annual national losses due to injury amount to over EtB 973 million (US$ 157 million) in indirect costs due to lost productivity or 1.3 million years. The ratio of indirect to direct costs of injury of 11:1 was greater

than that documented in the Brazil study (6).

The increased risk of injury among those of lower socioeconomic status is reflected in the increased incidence among residents of urban areas, farmers, and those who have only elementary school education. The association of injury with a history of alcohol intoxication is similar to that documented in other studies (6). The increased frequency of positive history of alcohol intoxication among those injured by cutting and piercing objects suggests that alcohol deserved further study as a risk factor for occupational injury in these farming communities.

Conclusions

The results of this study are consistent with those of other studies in developing countries (3,11,12,30), though they contrast dramatically with patterns of injury epidemiology in industrialized countries. These differences underline the importance of designing specific prevention and control programmes based on local conditions.

The study indicates that over half of the population can be expected to suffer an injury in the course of each year. Cause-specific injury data indicate that programs to reduce disability and mortality due to cutting and piercing injury, animal injury, falls, and burns could

reduce the social burden of injury by up to 88%. Injury was strongly associated with males, farmers, those with a history of alcohol intoxication, and those with only elementary school education.

Over one-third of these injuries result in one or more days of disability. Conservative estimates of the annual national cost for treatment and lost productivity due to injury are in excess of EtB one billion (US$171 million).

Recommendations

In view of the public health impact of injury in Ethiopia, it is recommended that the Ministry of Health develop a National Injury Control Program. Interventions to strengthen prevention and case management of injury should include community education and mobilization efforts, including through schools, the workplace, and mass media. Improved training of health workers in the prevention and management of injury should be provided at every level, including for community health agents, health assistants, nurses, and physicians.

Programs to assess the effectiveness of simple and appropriate interventions for injury control should be implemented. Injury prevention measures which are likely to be effective include improved design of farming tools, such as through the addition of hand guards, and

promotion of the use of work gloves to prevent cutting and piercing injuries. Community programmes to control biting animals and the construction of separate structures for domestic animals may be assessed as strategies for reduction of animal injuries. Blunting of the horns of cows and oxen would also likely reduce the incidence of animal-related injury.

Education of parents in improved supervision of their children has been effective in other countries in reducing the incidence of injury due to fall. Enclosure of wells and construction of barriers around water sources should also be tested in efforts to reduce the incidence of drowning. Similar strategies, such as the protective enclosure of cooking areas or elevation of stoves, should be tested to reduce the incidence of burns among children. Motor vehicle injuries would undoubtedly be reduced through appropriate design or diversion of roads around pedestrian traffic areas.

Simple improvements in the primary care or "first aid" for injuries at the level of the household and the first-level facilities would also likely have an impact in the reduction of death and disability due to hemorrhagic and infectious complications of injuries. Improved systems for transport and referral may further decrease injury death and disability.

An inter-sectoral approach, designed in collaboration

with Ministries of Agriculture, Trade, Labour and Social Affairs, Education and Health will be required to ensure effective injury prevention and control. NGOs and community associations will also be instrumental in the design and implementation of programmes to successfully prevent and improve the care of injuries. Operational research in the context of program implementation is recommended to document the cost-effectiveness of specific intervention programs.

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Appendix 1

COMMUNITY-BASED STUDY OF INJURY QUESTIONNAIRE.

Form A

1. Kebele:_____ 2. House #:_____
3. Is the roof: 1. straw [ ] 2. tin [ ] 3. other [ ]
4. No. of rooms in house:_____
5. Does household own any animals? 1. yes [ ] 2. no [ ]
6. If yes, how many? 1. cows/oxen___ 2. goats/sheep__
   3. horses/donkeys 4.other(specify):

7. What is the religion of the head of the household?
   1. [ ] Orthodox Christian 3. [ ] Catholic/Protestant
   2. [ ] Moslem 4. [ ] Other(specify):___
8. What is the ethnic group of the head of the household?
   1. [ ] Amhara 3. [ ] Tigraie
   2. [ ] Oromo 4. [ ] Other (specify):_____
9. Does the family own a radio? 1. [ ] yes 2. [ ] no

ALL ADULT (15 YEARS AND ABOVE) HOUSEHOLD MEMBERS

AGE (YRS)	SEX 1.M 2.F	MARITAL STATUS* 1.NM 2.M 3.D 4.W 5.S	READS NEWS PAPER 1.Y 2.N	LAST GRADE COMPLETED	OCCUPATION# 1.F 2.HW 3.TM 4.GE 5.HL 6.St 7.UE 8.OT	ANY INTOXICATION DUE TO ALCOHOL PAST MO 1.Y 2.N	ANY CURRENT DISABILITY 1.Y 2.N	ANY INJURY IN PAST MONTH 1.Y 2.N	ACTIVITY RESTRICTED >1 DAY IN PAST MONTH DUE TO INJURY 1.Y 2.N

Marital status*

1. Never married
2. Married
3. Divorced
4. Widowed
5. Separated

Occupation#

1. Farmer
2. Housewife
3. Trade and merchant
4. Government employee
5. Hired labour
6. Students
7. Unemployed
8. Others

ALL CHILDREN (0 TO 14 YEARS)

AGE IN MOS (<5)	AGE IN YRS (5-14)	SEX 1.M 2.F	LAST GRADE COMPL	ANY CURRENT DISABILITY 1.Y 2.N	ANY INJURY IN PAST MONTH 1.Y 2.N	ACTIVITY RESTRICTION OF >1 DAY IN PAST MONTH 1.Y 2.N

Has there been any death due to injury in this household within the last year? 1. [ ] Yes 2. [ ] No
If so, specify: age at death _____
sex _____
details regarding cause of death_____

IF THE ANSWER TO ANY QUESTION REGARDING DISABILITY, INJURY, OR RESTRICTED ACTIVITY DUE TO INJURY (FOR ANY MEMBER OF THE HOUSEHOLD) IS YES, ATTACH A COMPLETED FORM B (FOR EVERY INDIVIDUAL ANSWERING YES)

COMMUNITY-BASED STUDY OF INJURY QUESTIONNAIRE
Form B
DETAILED REPORT OF INJURY OR DISABILITY

1. Kebele:_____ 2. House #:_____
3. Name:_____ 4. Age:____ 5. Sex: 1. M[ ] 2. F[ ]
6. Is there any current disability? 1. yes [ ] 2. no [ ]
7. If yes, is the disability (of):
 1. [ ] mental (memory, understanding, learning)
 2. [ ] speech (difficulty or inability to speak)
 3. [ ] seeing (complete or partial blindness)
 4. [ ] mobility (walking)
 5. [ ] hearing (complete or partial deafness)
 6. [ ] other (limitation in hands, arms, trunk)
 7. [ ] chronic pain
 8. [ ] other disability (specify:_____)
8. Is that disability due to injury (including burn, fall, cut, insect/animal bite, poisoning)?
 1. yes [ ] 2. no [ ]
9. Date of onset of injury (DD/MM/YY):_____
 Cause of injury (code and details):_____
10. Estimate (with the help of the individual or caretaker) the percent of normal activity:
 1. [ ] <25% 3. [ ] 50-74%
 2. [ ] 25-49% 4. [ ] 75-100%

11. Was there any injury (poisoning, cut, burn, fall, motor vehicle inj, drowning, assault, abuse, animal/insect bite) within the past four weeks?
 1. yes [ ] 2. no [ ]

FOR RESPONDENTS WHOSE INJURY WAS WITHIN THE PAST FOUR WEEKS:

12. What day of the week did the injury occur?
 1. [ ] monday 2.[ ] tuesday 3.[ ] wednesday
 4. [ ] thursday 5.[ ] friday 6.[ ] saturday
7. [ ] sunday

13. What time of the day did the injury occur?
 1.[ ] morning (7am-12noon) 2. [ ] afternoon (Noon-6pm)
 3.[ ] evening/night (7pm-6am)

14. Specify cause of injury (check one):
 1. [ ] fall 7. [ ] motor vehicle injury
 2. [ ] burn/smoke 8. [ ] poisoning (incl.alcohol)
 3. [ ] drowning/submersion 9. [ ] assault/homicide
 4. [ ] animal injury 10. [ ] (Attempted)suicide
 5. [ ] animal/insect bite 12. [ ] foreign body
 6. [ ] cutting/piercing inj 13. [ ] other mechanical forces
 11. [ ] maltreatment/abuse 14.[ ] other:_____

15. Specify the body part(s) affected (check all that apply):

1. [ ] head	6. [ ] hand/wrist
2. [ ] eye/ear/nose/mouth	7. [ ] arm(s)
3. [ ] neck	8. [ ] foot/ankle
4. [ ] thorax/upper back	9. [ ] leg(s)
5. [ ] abdomen	10. [ ] pelvis/lower back

16. Specify the place of injury (check one):

1. [ ] home	6. [ ] road/highway
2. [ ] home yard/around home	7. [ ] trade/service area
3. [ ] public area	8. [ ] industrial area
4. [ ] sports/athletic area	9. [ ] construction site
5. [ ] farm/garden/fields	10. [ ] others (specify):__

17. Specify the activity during injury:

1. [ ] working for income	3. [ ] leisure/play
2. [ ] working at home	4. [ ] other (specify):

18. Other details of injury:_____

19. Was any treatment (including home) obtained for the injury:
1. [ ] yes 2. [ ] no

20. If yes, was the place of treatment:

1. [ ] home	3. [ ] health station
2. [ ] traditional healer	4. [ ] health centre (OPD)
5. [ ] hospital (OPD)	7. [ ] private clinic/pharmacy
6. [ ] admitted to hospital/health centre	
8. [ ] other (specify)_____	

21. Specify amount paid for: treatment:_____
medications/supplies:___ transportation:_____
total:_____

22. Was there any day (at least 24 hours) of restricted activity due to the injury? 1. [ ] yes 2. [ ] no

23. If yes, specify number of days: confined to bed:___
work days lost:___

Name of the interviewer.....Sig...Date.....
Name of the supervisor..... .Sig....Date.....

DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged.

Name: Asnakew Yigzaw, MD

Signature:.....

Place: Addis Ababa

Date of submission: 21/07/94

This thesis has been submitted for examination with my approval as University Advisor.

Dr. Sally K. Stansfield
Advisor