

**STRENGTHENING THE INJURY SURVEILLANCE SYSTEM IN RURAL  
GHANA AS A MEASURE OF DEVELOPING APPROPRIATE INJURY  
PREVENTION STRATEGIES, A CASE STUDY OF THE EJURA -  
SEKYEREDUMASE DISTRICT IN THE ASHANTI REGION OF GHANA.**

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## ABSTRACT

The public health in rural Ghana is challenged severely with the occurrence of injuries and disabilities, yet little attention is given to injuries as compared with malaria and HIV/ AIDS. Accurate and reliable data on injury is needed to support efforts to develop, implement and evaluate policies and interventions on injury prevention and safety promotion in rural Ghana. The Ejura-Sekyedumase district has persistently recorded various forms of injuries such as machete wounds, road traffic crashes, pedestrian knockdowns and gunshots. Strengthening the injury surveillance system is necessary to provide accurate injury data to inform interventions to promote safety in the district. A cross-sectional survey involving 650 injury patients who have sustained injuries within the past 12 calendar months was conducted. The study was designed to establish the effect of education, economic status and type of settlement on injury reporting. It also tested the importance of staff training (intervention) on the output from an injury surveillance system. The study was organized in three phases; the household survey using structured questionnaire, discussions with stakeholders by using interview guides and training programme for data personnel using the Epi data and SPSS softwares. Information on injuries which were obtained from the interviews with injury patients and discussions with stakeholders were analyzed using both qualitative and quantitative methods. Frequency with percentage and cross tabulations and logistic regression using Epi data and the Statistical Package for Social Sciences (SPSS) softwares were used to analyze the data on injuries.

Primary determinants of injury reporting were the type of settlement, education and economic background of injury patients. Respondents with secondary and tertiary education reported injuries based on the knowledge on the relative injury management capacity of the orthodox medical practice. The odd of reporting injury conditions

among tertiary injury patients was 16.9 times than injury patients with basic education. Similarly, the likelihood of reporting injury condition among the high income injury patients was 7.8 times the odds of the low income-income earners. The ability to pay for orthodox medical care informed patients with good economic status to seek injury care at the orthodox medical centres. Comparatively, severe injuries such as compound fractures and heavy bleeding were much reported than minor injury conditions.

The difficulties involved in transporting injury conditions on bad roads and trust in the traditional herbal practice were the main reasons why some injury conditions were not documented. Institutional challenges facing injury reporting institutions were lack of knowledge on injury data management and the difficulty in transforming injury data into safety. The outcome of an intervention in the form of staff training showed a significant improvement in the staff capacity to manage injury data in conformity with the World Health Organization's standard. Injury surveillance system in least resourced settlements could be improved through public health education on the role of injury data in injury prevention and staff training on injury data management. Finally, this study has established strategies to improve injury reporting as well as transforming injury data into injury prevention and safety promotion in rural settlements.

The study recommends the establishment of a Community-based Injury Reporting Desk which will register all injuries free of charge irrespective of the source of care. Intensive public health education is necessary to educate the people to take absolute control of their health needs and to make appropriate decisions on choice of injury care.

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## LIST OF ACRONYMS

BRI	Building and Road Research Institute
C-Bird	Community-Based Injury Reporting Desk
CDSV	Community Disease Surveillance Volunteers
CHAG	Christian Health Association of Ghana
CID	Criminal Investigations Department
CSIR	Council for Scientific and Industrial Research
CT- Scan	Computerized Tomography - Scan
DALYs	Disability Adjusted Life Years
DHA	District Health Administration
DHMT	District Health Management Team
EM	Emergency Room

ESD	Ejura-Sekyedumase District
ESDA	Ejura-Sekyedumase District Assembly
FVS	Fire Volunteer Squad
GTMPA	Ghana National Traditional Medical Practitioner Association
GPS	Ghana Police Service
ICD	International Classification of Disease
ICU	Intensive Care Unit
ILO	International Labour Organization
ISS	Injury Surveillance System
KATH	Komfo Anokye Teaching Hospital
KVIP	Kumasi Improved Ventilated Pit
MLGRD	Ministry of Local Government and Rural Development
MRI	Magnetic Resonance Imaging
MTTU	Motor Transport and Traffic Unit
MVC	Motor Vehicle Crash
NGO	Non Governmental Organization
OPD	Out Patient Department
PHC	Population and Housing Census
PHIs	Private Health Institutions
PPR	Police - Population Ratio
UN	United Nations
WHO	World Health Organization

## DEDICATION

I dedicate this work to all victims of injury in rural Ghana.

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## CHAPTER ONE

### 1.0 GENERAL INTRODUCTION

#### 1.1 Background

Injury is recognized as a major health problem as well as a leading cause of death and disability globally (Peden et al., 2004, Peden et al., 2009). The associated morbidity, disability, socio-economic and Gross National Product (GNP) losses have been documented by several studies (Baker et al., 1992). Injury is a serious public health problem in the developing countries than the advanced world since injury related deaths are often higher in least developed nations than the industrialized nations and in most cases the death toll keeps increasing: World Bank Report, 1993). Again, for every injury-related death, several other people are left with temporary or permanent disability (Elechi and Etawo, 1990).

Various injury mechanisms contribute significantly to the occurrence of injuries. These include Road Traffic Accidents (RTA) and pedestrian knockdowns, agricultural and occupational injuries, domestic and industrial burns and drowning.

Road traffic injuries represent a significant fraction of the total waste of human and societal resources from road injuries. Based on the World Health Organization's report, it is estimated that between 20 and 50 million people are injured or disabled each year in road traffic crashes and the reason for the wide range of this estimate being the considerable known underreporting of casualties (Murray and Lopez, 2000).

There exist disparities in the occurrence and distribution of traffic related injuries among the developed and developing regions. In most low-income and middle income countries, severe injury conditions contribute immensely to hospitalization and

intensive care utilization among patients. Injury conditions subsequently contributes to larger proportion of health care budget (Moini et al., 2000).

While a decrease in deaths due to road traffic crashes of some 30% is forecast in highincome countries, current and projected trends in low-income and middle-income countries foreshadow a huge escalation in global road crash mortality between 2000 and 2020. Furthermore, on current trends, by 2020, road crash injury is likely to be the third leading cause of disability-adjusted life years lost in the low and middle income countries (Murray and Lopez, 1996). According to Eurostat statistics on the causes of death, the number of people in the European Union (EU) who died as a result of transport accidents (covering all transport modes) fell by 37 % between 1999 and 2009. Transport accidents remain the largest single cause of death among people aged 15 to 29 years. The annual number of road fatalities in Europe is falling, despite growth (prior to the financial and economic crisis) in passenger and freight transport. Indeed, the number of road fatalities in Europe fell sharply during the decade between 1999 and 2009, from 57 691 deaths to an estimated 34 500 deaths (down 40.2 % overall). Nevertheless, the number of people killed on Europe's roads still accounted for almost nine out of every ten deaths resulting from transport accidents in 2009. The reduction in road fatalities may be attributed to improved road design and construction, stricter enforcement of drinking and driving legislation, improved vehicle safety standards, the introduction of speed limits, stricter rules on lorry and bus driving times and reduced lorry overloads.

In Africa, Kenya alone recorded more than 75% of road traffic casualties among economically productive young adults. Similarly studies on injuries in Nigeria and Tanzania revealed injury incidence of 100.0 and 32.7 per 1,000 per year respectively (Omoniyi and Owoaje, 2007, Moshiro et al., 2005). Road traffic related injuries drain developing

economies between 1% to% of gross domestic product (about \$100 billion) each year, or twice the total development aid received worldwide by developing countries (Goosen et al., 2003b).

In low-income countries and regions like Africa, Asia, the Caribbean and Latin America, the most affected populace of traffic crashes are vulnerable road users such as pedestrians, cyclists, users of motorized two-wheeled vehicles. However, occupants of buses and minibuses contribute significantly to this public health burden (Nantulya and Reich, 2002).

The vast differences in the regional and national incidence of road traffic deaths could again be explained based on the limitations found with various injury data management protocols which may include the procedure for data collection, analysis, interpretation, dissemination and presentation of injury data (Jacobs et al., 2000). Despite the large social and economic costs emanating from road traffic crashes, there has been a relative small amount of investment in road safety research and development, compared with other types of health loss in Africa (Krug et al., 2000). The causes of road traffic accidents are multi-factorial. These factors can be divided broadly into driver factors, vehicle factors and roadway factors. Accidents can be caused by each of these factors or combination of these factors. Driver factors solely contribute to about 57 per cent of road traffic accidents and 93 per cent either alone or in combination with other factors (Lum and Reagan, 1995).

Related to road traffic accident is Vehicular-pedestrian collisions. Crashes between vehicles and pedestrians are responsible for more than a third of all traffic-related deaths and injuries worldwide (Crandall et al., 2002). Comparing pedestrian knockdowns with vehicle occupant casualties, it has been established that, pedestrians sustain more

multiple injuries, with higher injury severity scores and higher mortality rates than other related victims of vehicle related injuries (Brainard et al., 1989).

In many low-income and middle-income countries, buses and trucks are the major source of injury through impact on pedestrians, bicyclists and motorized two-wheeler riders. In Ghana, car-to-pedestrian impacts are the leading cause of pedestrian death and injury, followed by collisions of buses or minibuses with pedestrians (Afukaar et al., 2003). Pedestrian fatality rate is comparatively higher in Africa than the advanced countries. The reason is due to low or absence of pedestrian safety measures along major roads and urban centres in some settled places in Africa (Damsere-Derry et al., 2008). Pedestrian injury and fatality rates are considerably higher in developing countries than in developed economies. As an example, pedestrian fatality rates were 65% in Nairobi, Kenya (Khayesi, 1997) and 54% in Latin America (Donroe et al., 2008) and 60% among urban regions in Ghana (Afukaar et al., 2003) as compared with 11% in the United State of America, (NHTSA, 2004). The high pedestrian knock-down rates in the world's developing countries pose a challenge to vulnerable road users. This situation may be attributed to the fact that, pedestrian safety is not a high priority in most developing countries (Khayesi, 1997). According to (Zhu, 2008) and (Mutto et al., 2002), 82% Mexican and 78% Ugandan urban dwellers felt unsafe while using public transportation system as well as walking in the street. The risk facing vulnerable road users in the developing countries calls for appropriate interventions to ensure the safety of pedestrians.

Agriculture's contribution to the world's burden of injury is quite significant.

According to United States statistics, agriculture has an annual mortality rate of 52/100000 agricultural workers. In the year 2002 alone, 730 deaths and 150,000 disabling injuries occurred

among farmers in the United States of America. This mortality rate is comparatively higher than the mortality rate of other occupations, such as mining and construction (National Safety Council, 2002).

Leading causes of agriculture related deaths and injuries in the industrialized nations include machinery, motor vehicles, electrocution, environmental hazards and falling objects. Among all agricultural machines, tractors are the leading cause of death in agriculture (New York Center for Agricultural Medicine & Health, 2004). An average of 110 American farm workers died by tractor rollovers annually. Majority of farm tractors in use do not have a certified Rollover Protective Structure (ROPS) with a seatbelt (US National Safety Council. Fact Sheet & Resources and Current Agricultural and Farming, 2003). Non-mechanized agricultural tools such as augers and hand-operated tools come next in terms of causing injuries. Fall is also one of the common causes of agriculture injury, which includes fall from tree; fall in the well, fall on uneven and muddy land. Poor ergonomic design was seen as a factor for tractor injuries.

There exist vast differences in agricultural hazards between the developed and developing countries as agricultural activities in the later are basically manual labour. Although the lack of heavy farm machinery may likely lessen the risk of farm injuries in the developing countries, however injury rates among farmers in developing countries are high (In the least developed countries where non-mechanized farming is practiced, lacerations are common types of injuries. A study in Ghana found about 67% of rural lacerations occurred among crop farmers. The study further showed that, about 70% of the lacerations were caused by machetes and hoes. Vegetative materials such as sharp sticks contribute smaller fractions to rural lacerations (Mock et al.,

1999a). A participatory rural appraisal (PRA), conducted with farmers in the Brong Ahafo region in Ghana, suggested that accidents, injuries and illnesses as a result of agricultural activities are not uncommon. In particular, musculoskeletal disorders were identified as a problem with a majority of farmers complaining of lower back pain. Injuries from hand tools were common, farmers claiming that lacerations from slashing the bush with cutlasses or weeding with hoes were a regular hazard (Marc and O'neill., 1998). Other occupational disorders that farmers claimed to suffer from included thorn pricks from weeds such as Acheampong (*Chromolaena Odorata*) and Speargrass (*Imperata Cylindrica*). Occupational disorders from post-harvest agro processing activities, which are mostly carried out by women, were also found to be common. These activities usually involve much drudgery, with repetitive upper body motions like stirring and kneading.

Agrochemical products expose many farmers to poisonous conditions worldwide. Farm workers are at high risk of occupational injuries due to exposure to pesticides resulting from inadequate education, training and safety systems (ILO, 2002). Farmers and farm workers in the developed countries comprise only 3% of the agricultural workforce, but they account for as much as 8% of all work-related accidents (Médécins Sans Frontières [MSF], 2005). Developing countries are known to consume less than 20% of the world production of agrochemicals, which are responsible for as much as 1.1 million (70%) of the total cases of acute poisoning in the working population (United States Environmental Protection Agency (US EPA, 2005).

In Zimbabwe, a biological monitoring process estimated the prevalence of agrochemical poisoning among farmers were as high as 30% (National Social Security

Authority of Zimbabwe, 2002). Similarly, a survey on the extent of pesticide symptoms among farmers working on irrigation projects in Ghana revealed that about 36% of the farmers had experienced negative side effects after applying pesticides (Clarke et al., 1997).

In Ghana and many other developing countries, official statistics on agricultural-related injuries such as lacerations and poisons are lacking hence the basis of planning effectively to address farming injuries depend on limited published reports (FAO, 2007). In regions where such data exist, under reporting is common phenomena hence the exact volume of injuries may not be known therefore the data may not be perfectly reliable (ILO, 2002).

The absence of reliable injury surveillance system implies that stakeholders lack reliable data to assess the effectiveness of various injury interventions in the developing world (London et al., 2002). Although epidemiological studies have been conducted in some low and middle-income countries, however much attention is given to traffic-related injuries and those occurring in urban settings. Injury Prevention Practitioners and other professionals from different disciplines have conducted limited studies in rural communities in various continents, including Africa (Odero et al., 2007); (Mock et al., 1999b, Kobusingye et al., 2001); (Moshiro et al., 2005). In Asia, recent injury investigations include (Fatmi et al., 2007) and (Rahman et al., 2000).

It should however be noted that the limited studies conducted in rural settlements in the world confirm that much attention should be given to injuries in rural communities in order to ensure effective control and management of injuries in the rural communities in the sub-Saharan Africa and other developing countries. As an example, ocular injuries are very

common health problem in rural Ghana. This type of injury is largely a preventable cause of monocular visual impairment and blindness in rural settlements. A hospital-based study showed that 5% to 16% of all ophthalmic admissions to eye hospitals/units are related to ocular injuries (Gyasi et al., 2007).

The injury situation in the sub-Saharan Africa and other developing countries warrants a study on injury surveillance system as a means of designing appropriate mechanism to address the injury problem in rural settlements in Ghana through geographical approach. The findings would contribute to the basis for injury documentation, investigations and prevention in rural Africa and other developing countries in the world.

## **1.2 Injury**

Injury occurs when there is physical damage to the human body as a result of sudden or brief exposure to intolerable levels of energy. It can be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e. air, water, warmth), as in drowning, strangulation or freezing. The time between exposure to the energy and the appearance of an injury is short (Krug et al., 2000).

The standard definition of an —injury‖ as used by WHO assumes that —Injuries are caused by acute exposure to physical agents such as mechanical energy, heat, electricity, chemicals, and ionizing radiation interacting with the body in amounts or at rates that exceed the threshold of human tolerance (Krug et al., 2000). In some cases for example, drowning and frostbite injuries result from the sudden lack of essential agents such as oxygen or heat (Baker et al., 1992). Whereas the above definition of an

injury includes drowning (lack of oxygen), hypothermia (lack of heat), strangulation (lack of oxygen), decompression sickness or —the bends (excess nitrogen compounds) and poisonings (by toxic substances), injury however does not include conditions that result from continual stress, such as carpal tunnel syndrome, chronic back pain and poisoning due to infections. The most common events causing injuries include interpersonal violence and sexual abuse, collective violence including wars, civil insurrections and riots; as well as traffic collisions and incidents at home, at work and while participating in sports and other recreational activities.

### **1.3 Surveillance**

The term, —surveillance, as used in the public health discipline refers to the ongoing and systematic collection, analysis, interpretation and dissemination of health information. Surveillance involves the keeping of records on individual cases, assembling information from those records, analysing and interpreting this information, and reporting to stakeholders such as health care practitioners, government officials, international agencies and the general public who may need health data for research, health services planning and policy formulation (Horan and Mallonee, 2003).

Surveillance is the first step in the public health model and one of the most critical elements of injury prevention and control initiatives (Sogolow et al., 2007). Again, surveillance is a primary function of public health practice. While national data are useful in monitoring nationwide trends and evaluating national regulation, legislation, and policies, they are not sufficient for identifying injury problems and patterns or for evaluating policies or prevention programmes at the state or local level (Bonnie et al., 2007).

Injury surveillance data helps in assessing the magnitude of injury morbidity, mortality and disability. It is again useful in determining specific injury problems and temporal trends as well as detecting changes in the prevalence of injury-related risk behaviours in a population, however the dearth of resources for public health activities in the developing countries has rendered surveillance problematic hence, very little is reliably known about causes of death in the developing world (Murray and Lopez, 1996).

In some underdeveloped countries in Africa and other regions, monitoring causes of death has been done by —verbal autopsy interviews of the deceased person’s relatives or associates. Trained volunteer workers sometimes conduct these interviews with further support from the clinicians through review and confirmation of the exact cause of death (Pacqué-Margolis et al., 1990). Reviewing the cause of death may be costly however, a study in Ghana and Tanzania comprising the use of computer algorithms in lieu of physician review to assign cause-of-death diagnoses demonstrated that this might be an effective but less expensive alternative (Quigley et al., 2000). Hospitalbased surveillance can provide data on injury morbidity, although it does not identify the vast majority of patients who do not seek formal medical care (Mock et al., 1997). For a true reflection of the full burden of injuries, surveillance system may expand to cater for both clinical and cases managed elsewhere such as home and traditional centres etc.

#### **1.4 Injury Surveillance System**

Injury surveillance system therefore is a public health practice which involve an ongoing and systematic collection, analysis and interpretation of injury data essential to the planning, implementation, and evaluation of injury prevention and safety promotion practice, closely integrated with the timely dissemination of injury data to

stakeholders who may need injury data for effective injury prevention and safety interventions (Klauke et al., 1998). The final link of the surveillance chain is in the application of injury data to prevention and control of injury. A surveillance system includes a functional capacity for data collection, analysis and dissemination linked to public health programs (Centre for Disease Control (CDC, 1988).

### **1.5 The Relevance of Injury Surveillance System in Injury Control**

In the past, the occurrence of injuries was not given the appropriate attention as compared to other public health problems such as malaria. The basis of this neglect was due to the perception that injury occurrence is a natural phenomenon hence it is not preventable. The occurrence of injuries was generally described as accidental or random events. The advent of technology and empirical studies has shown that injury of any kind is preventable provided the appropriate precaution is taken to prevent its occurrence (Peden et al., 2004) and (Jones et al., 2005). Today, however, injuries are known to be preventable. Injury prevention methods such as fencing around water bodies, anti skid footwear, car seat belts, and booster seats for children, smoke detectors, flame-resistant clothing and safe ammunition storage strategies have contributed significantly in reducing injuries in countries where safety measures are strictly enforced (Hyder, 2002). Public education on safety together with early childhood education and family counseling to prevent violence have all proved to be effective measures for preventing injuries. To date, injury prevention has tended to be an issue only in wealthier countries. The highest rates of death and permanent disability due to injury are, however, currently found in the poorer nations. The World Health Organization (WHO, 2002), reports indicate that almost 90% of injury mortalities occur in low/middle-income countries, and this situation will continue to represent an important global health problem in the upcoming years (Bishai et al., 2003, Goosen et

al., 2003a). The low/middle income countries therefore have the most urgent need for prevention strategies that are appropriate, cost-efficient and efficient. In this context, —appropriatel means taking into account the complexities of the problem, the availability of resources and, furthermore, what strategies have been shown to be effective elsewhere.

To develop effective injury prevention strategies, stakeholders and the general public need better understanding about the occurrence of injury and the associated risk factors. In particular, countries need to know about the numbers and types of injuries that occur and about the circumstances within which injuries occur. Such information will indicate how serious the injury problem is, and where prevention measures are most urgently needed. An efficient injury surveillance system is a basic requirement for any attempt to establish and maintain injury prevention and safety promotion strategy (Vimpani, 1989).

Injury surveillance system is very important in guiding planning and decision making on injury prevention and safety promotion at all levels. Accurate data is essential for prioritizing public health issues, monitoring and assessing intervention programmes. The lack of injury data has been highlighted as a major barrier to injury prevention in the least and middle income countries (Hofman et al., 2005, Odera et al., 2007).

### **1.6 Problem statement and justification for the study**

Every day around the world 16000 people die from injuries. For every person who dies of injuries, several thousand injured persons survive and many are left with permanent disabling conditions with inevitable social and economic burden (Krug et al., 2000). Although injury contributes immensely to the global burden of disease yet, little attention is given to injury prevention. In high-income countries, research expenditures

for injury are comparatively smaller than funding for cancer and cardiovascular disease (Baker et al., 1992). The situation is more pronounced in less developed countries. External assistance to the health sector of less-developed countries was US\$2—3 per disability adjusted life year (DALY) lost to major infectious diseases such as HIV/AIDS and malaria, but only \$0.06 per DALY lost to injury (Michaud and Murray, 1994).

In Africa, majority of injuries are work related, especially primary occupation and agriculture which are the major occupation in rural settlements (ILO., 2002). Agriculture is ranked among the three most hazardous occupations in both industrialized and developing countries. According to estimates from the International Labour Office some 170,000 agricultural workers are killed each year. This means that workers in agriculture run at least twice the risk of dying on the job as compared with workers in other sectors (ILO, 1991). However due to poor documentation of injury events, the exact details on morbidity, mortality and disabilities associated with occupational injuries are very limited hence the inability to assess the full burden of injury in a locality (Boden and Galizzi, 1999).

Generally, Ghana is predominantly a rural country with different regional distribution of rural status ranging from 58 percent in Ashanti to 94 percent in the Upper West. In the northern part of the country, 80 to 90 percent of the populations are classified as rural. Greater Accra is the exception, with only 13 percent of its population classified as rural (GSS, 2002).

Among the common factors that contribute immensely to the burden of injury in rural Ghana is farming activities. A study in Ghana found that more than 70% of the rural injuries were suffered by farm workers (Mock et al., 1999d). Again, the study further

identified agricultural injuries as a single cause for the high rural injury-related disability days of 4697 disability days per 1000 person-years as compared with 2,671 disability days per 1000 person-years in urban sites.

Rural injuries hinder the maximum productivity in rural areas since many rural population suffer from musculoskeletal injuries from long work hours, repetitive motions, lifting and carrying heavy objects, and working in awkward positions for extended periods. Snake bites, insect bites and stings, exposure to poisonous plants and attacks by other forms of wildlife are other types of hazards (Amweelo, 2000, Regoeng, 2001).

Road traffic accidents and pedestrian knockdowns are common in many rural localities in Ghana (Afukaar et al., 2003). Injuries have consistently been ranked among the top ten causes of admissions over the past five years in a rural health institution in Ghana (Ejura-Sekyedumase District Directorate of Health Service Report 2007).

The Ejura-Sekyedumase district could conveniently be classified as a rural district. Based on the settlement criteria of the 2000 Population and Housing Census, 127 out of the 130 settlements meet the rural criteria. The rural communities accommodate more than 60% of the population in the district. The major occupation in the district is agriculture as the sector employs close to 70% of the workforce in the district (EjuraSekyedumase District Report, 2009).

The district has a fair distribution of primary health facilities as the average distance to a health facility in the district is 1.9km as compared to the National Planning Standard distance of 5km. This makes physical accessibility to health facilities easy as majority of the communities lie within the high access zone. Proximity to health facility is not

positively related to healthcare utilization as many public health cases including injuries are managed outside the health institutions. Patients often refer to inadequate facilities and health personnel as primary reasons of low patronage. Other reasons include comparatively high cost of care, poor attitude of staff and long waiting time at the various health centres. (Ejura-Sekyedumase District Directorate of Health Services Report, 2007).

The availability of health services personnel in the district is woefully inadequate to cater for the injury burden in the district. The entire district has one district hospital with one general physician. The absence of traumathologists and Orthopedic surgeons and modern injury management equipment in the district hospital has necessitated frequent referral of numerous injury cases to the KATH, located more than 100 km south of Ejura. The Doctor/ Patient Ratio of 1: 35,350 in the district far exceed the national ratio of 1:13,000 and the WHO global standard pegged at 1:5000.

The inadequate provisions for injury care in the Ejura-Sekyedumase district is similar to the conditions in many rural health facilities in Ghana where large number of casualties including severe injury conditions are managed by general practitioners and nurses with no specific training in injury care (Quansah and Mock, 1999). Again, some of these hospitals lack common lifesaving apparatus such as chest tubes, airway apparatus and other vital equipment (Quansah et al., 2008).

In rural Ghana, the principal source of injury data is the orthodox medical centres where clinical history is mandatory in medical practice. The police and vital registration provide fractions of injury data in respect to their institutional mandate. Generally, the operations of these institutions are characterized with incomplete data and missing information which weakens absolute reliance on these institutions for meaningful

decisions on injury prevention and safety promotion. Studies in Ghana showed fewer than 10% of pedestrian injuries were reported to the Police and only 10% of injury deaths were accurately recorded by the vital registries (London et al., 2002).

The predominance of pluralistic healthcare provides a broader option to the injured to seek care at a centre of choice. According to UNDP (2007), Human Development Report, it is estimated that about 80% of the Ghanaian populace rely on herbal preparations for primary health care. The high patronage of traditional medicine is either because it is cheaper, more convenient or simply believed to be more effective (VOA News, 2006). The mass utilization of the traditional practice affects the injury care at the orthodox medical centres. A Ghanaian community based study found only 31% of fatal injuries received formal medical care (Mock et al., 1999d). Under the traditional medical practice, documentation of clinical procedures and data management is not routinely observed hence information on injury cases managed at such facilities are not reflected in the routine medical data in the district.

Effectiveness of injury research and prevention policies is dependent on the accuracy and completeness of available injury data (Mock, 2004). A better data collection system is therefore essential to provide insight into the incidence, patterns and distribution of injuries in rural Ghana. This study therefore aims at determining the appropriate strategies to integrate all injury data sources to establish a formidable injury surveillance system capable of providing injury data to reflect the true rural injury burden in Ghana.

## **1.7 Research Objectives**

### **1.7.1 General Objective**

The general objective of this study was to examine the extent to which background characteristics such as educational background, economic status and type of settlement affect injury reporting with the view of strengthening the injury surveillance system in the Ejura-Sekyedumase District.

### **1.7.2 Specific Objectives**

With respect to the injury surveillance system in the Ejura-Sekyedumase district, the specific objectives of the study are to:

1. Examine the spatial distribution of rural injuries.
2. Investigate the injury treatment options and determinants of choice of injury care
3. Examine injury data sources.
4. Determine appropriate methods of strengthening the injury surveillance system
5. Examine procedures involved in translating injury data into safety.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK**

#### **2.1 Introduction**

Primarily, this chapter is a review of works and studies on components and the process involved in strengthening injury surveillance system. This review is the yardstick of identifying the strength and weaknesses of the institutions under the existing injury surveillance systems in a rural environment.

The literature is reviewed under the following themes: Examining the occurrence of rural injuries, determinants of injury care, sources of injury data and the challenges facing the institutions contributing to the injury surveillance systems. Further review

was carried on methods of improving injury reporting and the processes of translating injury data into safety in rural communities.

Injury is one of the leading causes of death among the working-aged adults and children in almost every country in the world (Mock, 2004). There are more than five million injury-related deaths every year, as well as a tremendous burden of disability and economic loss associated with injuries (Krug et al., 2000, Murray and Lopez, 1996). The World Health Organization and the World Bank estimate that injury is currently responsible for 12% of the Disability Adjusted Life Years (DALYs) lost worldwide. In the absence of positive measures, this figure is anticipated to increase to 20% by the year 2020, with road traffic accidents alone being the third leading cause of DALY losses (Murray and Lopez, 1996). The injury burden is said to be acute in the Least and Middle Income Countries. This is especially the case in countries that have experienced recent increases in industrialization and the use of motor vehicles. According to a number of published information, it is estimated that nearly 90% of the 5 million annual injury cases in the world occur in the Least and Middle Income Countries (Hofman et al., 2005, Peden et al., 2002). Injury is fast eroding the energetic population in many African countries. Males in Ghana and other low- and middle-income countries of the world have the highest injury-related mortality rates (Nantulya and Reich, 2002, Zwi et al., 1999).

Some of the reasons why Ghana and other less-developed countries continue to register increasing number of injury cases annually is due to the limited applications of scientific methods of injury control (Krug et al., 2000). There is the need to strengthen the injury data in order to improve scientific investigations into the occurrence of injuries as well as development of interventions to address injuries. Generally, progress

can be made by applying some of the interventions that have been effective in high-income countries. However, there is an important role for new research to identify and explain injury risk factors and to rigorously assess the effectiveness of injury control policies in less-developed countries (Jones et al., 2005, Forjuoh, 2003). An essential element of the public health approach to injury prevention is placed on evidence-based planning and programming (Mercy et al., 1993). Data collection and analysis provide the core of this approach since continuous collation and analysis of information on injuries is expected to answer questions pertaining to the ‘who, what, where, when, and how’ of an injury occurrence in a locality. It is therefore imperative that information on injury is collected and analyzed on continuous basis in order to provide public health practitioners with sound understanding of the magnitude and characteristics of the public health problems associated with injury.

## **2.2 Spatial Distribution of Rural Injuries**

Injury has been identified as a common event associated with rural activities ranging from occupation, transportation to social and domestic activities. Examining the occurrence and distribution of rural injuries is very important in order to identify key mechanisms and circumstances of occurring and management options in order to support injury control initiatives and to develop safety interventions in rural environment. This section examines injury distribution in the context of rural geography.

Rural geography is mainly concerned with the spatial distribution of human activities such as agricultural, forestry, settlements, occupation and rural housing, transportation and services, recreation and tourism, land use and land management, as well as rural planning development. Rural geography is viewed as the study of people, places, and

environment in rural areas, with special reference to society, economy, politics and culture in the developed world, such study can be applied to the occurrence and distribution of injuries in a geographical space (Johnston, 1992). Rural geography deals with space and time dimensions with respect to economic activities and the health of the people in a rural environment.

Agriculture is a predominant economic activity in rural settlements in the world. This type of occupation is ranked among the three most hazardous occupations in the world (Murphy et al., 1996). About 170,000 farm workers are killed each year and millions more are either seriously injured in workplace accidents or poisoned with pesticides and other agrochemicals (ILO, 2002). The occupational hazards of agriculture in industrialized countries are well documented (United States National Safety Council. Injury facts, 2000), However there is very little information on agricultural injuries in the developing countries, especially Africa. It is likely that under-reporting of deaths, injuries and occupational diseases in agriculture is common and the real numbers are higher than indicated by official statistics. The situation could even be worse in Africa where data on occupational health and safety morbidity and mortality are mostly lacking (Hogstedt and Pieris, 2000).

Additional hazards in African agriculture include injuries from handling livestock, working in extreme temperatures, sunlight, humidity, noise, vibration and many occurrences of slips, falls, sprains and fractures (Amweelo, 2000, Regoeng, 2001). Agricultural workers also experience musculoskeletal injuries from long work hours, repetitive motions, lifting and carrying heavy objects, and working in awkward positions for extended periods. Snake bites, insect bites and stings, exposure to poisonous plants and attacks by other forms of wildlife are other types of hazards

(Amweelo, 2000). However, several studies on injury prevention and safety promotion are observational and not analytic.

In rural Africa, there are numerous avoidable injuries and disabilities arising from working with unprotected machinery and lack or ineffective personal protective equipment at the workplace, especially on farms (Amweelo, 2000). Farm related activities in the Guinea Savannah Zone in Ghana and other African countries are largely performed with domesticated animals and hand tools methods that expose farmer to risks of injuries (Hogstedt and Pieris, 2000). In Africa, most animal-drawn carts are not equipped with restraints, lighting and marking features which often create risks from collisions with motor vehicles and people fall off the carts. Farmers rarely use personal protective devices when engaging in farm work. Again, majority of farmers lack proper training on the techniques of agrichemical application. In low and middle-income countries, long-term disability following extremity injuries is more widespread in rural areas than in urban areas. Then again, head and spinal cord injuries predominate and contribute significantly to morbidity and mortality. Similarly, traffic injuries are not only a concern among urban people in many low income countries but also among rural dwellers (Fatmi et al., 2007). As motorized commuting is on the increase and rural industrialization has given the necessary support to boost rural development in Ghana, it is important to pay attention to safety measures especially among motorcycle users and operators of agricultural motorized equipment since these machines contribute immensely to the burden of injuries worldwide (Mock, 2004).

Fall from height, trees and slippery surfaces are common forms of injuries in rural settlements. In in most developing countries, boys and young adult males mostly suffer injuries due to fall (Bangdiwala and Anzola-Perez, 1990). Contrary to the findings of Bangdiwala, a study in Nigeria found 'fall' as the second leading cause of injury among

females (Omoniyi and Owoaje, 2007). The rampant occurrence of all reflects high risk of rural environments and poor safety measures observed either at work site or in homes. The trend in fall has different dimension in the technologically developed nations. Contrary to the situation in rural developing countries where young adults are mostly involved in fall, the elderly mostly suffer from fall in the technologically advanced nations (Fife et al., 1984). The occurrence of fall among the active working populations in rural developing countries demands attention and actions which will effectively address public health problems relating to fall.

Burn injuries constitute a major cause of mortality and morbidity in many parts of the world, especially in Africa and the low-income countries (Forjuoh, 2006). Various types of burns ranging from thermal, chemical to hot liquids, etc accounted for 238,000 deaths in 2000 globally. Burns again was ranked eighth commonest cause of mortality and over 95% of fatal fire-related burns occurred in low- and middle-income countries including Ghana (Peden et al., 2002).

Epidemiological studies on burn in Nigeria showed that, injury accounted for 4.8% of trauma deaths and 6.7% of surgically related deaths (Solagberu et al., 2003, Adesunkanmi et al., 2002). Similarly, in India close to 700,000 burns conditions are reported to various health institutions annually (Ahuja and Bhattacharya, 2004). It has been found that burns and scalds among children are the fourth commonest cause of trauma after road traffic accidents, accidental falls and bites in Nigeria (Solagberu, 2002). Various forms of burns constitute serious public health problem in rural settlements as it occur in both poor and rich households in both middle and high income countries (Courtright et al., 1993). Major cause of burns includes open cooking fires, use of paraffin for lantern and uncontrolled bush fires particularly during the season of the dry and dusty harmattan periods (Mabogunje et al., 1987).

Many households in rural settlements in Africa, Asia and Latin America depend on open fires for cooking. The use of open fire poses risk of domestic burns which is often compounded by factors such as unstable cooking appliances, kerosene stoves and coal pots. Other risk factors include the storage of flammable substances and fuels, flammable clothing worn by appliance users, and lack of exits. The use of kerosene (paraffin) stoves and lanterns, and open fires for cooking particularly at ground level are major risk factors for burn injuries (Nnabuko et al., 2009). Reliable data on burns is therefore necessary to guide decisions and policies to control rural burns.

The statistics on rural injuries do not provide the exact burden of injuries in rural areas since majority of farmers seldom report agriculture-related injuries or illnesses (Donham and Storm, 2002). Numerous evidence support that occupational health in agriculture is a major concern in developing countries and there is little quantitative information upon which safety and control programmes could be developed (Stromquist et al., 1997). An effort to create an injury surveillance system could help improve the data on rural injuries in order to provide stakeholders and individuals with accurate information to address the rural injury problem.

### **2.3 Treatment Options and Determinants of choice of care**

Treatment seeking behaviour among the injured has been explained by various theories such as the medical pluralism concept. Investigations on health care practices have demonstrated that Medical Pluralism or the existence and use of many different care alternatives is practiced worldwide (Babar and Hatcher, 2004). The Medical Pluralistic concept offers patients with a variety of treatment options ranging from physicians, pharmacists, and spiritualists to herbalists and many others. The injured may choose to utilize the various care either exclusively, successfully or simultaneously (Finkler, 1997).

The main treatment options for injury conditions in tropical Africa are the orthodox medical system and the traditional medical practice (Spangenberg and Mock, 2006, Ogunlusi et al., 2007). Due to various reasons, some injury conditions are taken care through blending the orthodox medicine with the traditional practice in various proportions. It has been found that up to 85% of injury patients combine traditional medicine with orthodox care (Omololu et al., 2008). Justification for plural medical care is based on the perception that wound healing is faster under the traditional practice. Conversely, the weaknesses associated with the traditional services are effectively addressed by the formal health care (Solagberu, 2005).

Upon the occurrence of injuries, various factors determine where to seek treatment and rehabilitation to address the injury condition. A patient's decision to utilize specific healthcare is based on a complex interaction of multiple factors including knowledge on the perceived health system, distance and accessibility in terms of convenience and availability of health services and cost of treatment, time and degree of severity etc (Fernandez-Olano et al., 2006). Again, the person's beliefs, values and experience in the health systems are very important factors in the decision about the selection and utilization of healthcare (Mock et al., 1997).

Distance decay refers to the decrease or loss of similarity between two observations as the distance between two geographical locations increases. A negative relationship between distance and similarity is implicit in several ecological and evolutionary phenomena (e.g., species turnover along an environmental gradient). Differences in the rate of distance decay could be attributed to landscape differences (such as a resistance to movement caused by size and isolation of habitats) and species dispersal abilities (Nekola and White., 1999).

Distance to care facility often determines an individual's ability to access health care. As distance to health centre increases, the level of health care utilization reduces (Arcury et al., 2005a). It has been documented in Ghana that, health services utilization dropped from 53% at distances of 0±3 miles to the nearest site of formal care to 32% when the distances were more than 3 miles (Mock, 1997). Greater distances have also been shown to deter utilization of health care services (Slifkin et al., 2002). Relating to distance, the source and mode of the transportation influence the type of care accessed and number of visits made to a health care provider (Arcury et al., 2005b). Improvement in the accessibility of health facilities through better road quality and better means of transport will have a positive effect on health care utilization.

Contrary to the distance decay concept, various conditions could cause the injured to travel longer distances in searching for cure. These include the socio-economic status of the injured, the extent of demand for quality care and the severity of the illness. As an example, a study in rural Nigeria found that, people were willing to travel longer distances for specialized medical services or advanced medical care (Stock, 1983).

Based on individuals' culture and beliefs, some injured person trust the traditional practice to be the ultimate cure for injuries. The traditional injury management procedure is sometimes well established within a locality hence the practice is generally seen as the primary care for specific diseases (Elujoba et al., 2005).

In localities where the traditional injury management predominates, known reasons for mass patronage include cost effectiveness of the services, convenience, accessibility and acceptability (Dada et al., 2009). The mode of settlement of the cost of injury care under the traditional practice is relatively attractive and flexible since most practitioners accept cash or kind and permits deferred payment. In many developing countries

prominent determinant of utilizing alternative medicine is due to the fact that the service is socially and culturally accessible and acceptable (Osujih, 1993). The economic status of a household has been proven to be paramount element in the choice and utilization of various health systems. Households with lower income are known to consume comparatively limited orthodox medical services (Woods et al., 2003).

The time spent at health institution and duration of treatment is an important factor in choosing care for injury cases. The procedures involved in general care at the formal health institutions often prolong time spent at such facilities. As an example, the long queues at consulting rooms and dispensaries at the formal health institutions often cause patients to seek care at the traditional centres. In Nigeria, the main reason why 71% of selected injury patients preferred seeking traditional care was relatively shorter period of time spent at the traditional centres. Similarly, 62.4% of respondents opted for traditional care due to unhealthy and strictly formal attitudes of health workers and poor quality of service in some hospitals (Dada et al., 2009).

Irrespective of the positive conditions that favour the utilization of traditional health care, for various reasons, injury patients strongly opt for the orthodox medical care. It has also been shown that even with higher costs and longer distances, people may tend to use health facilities if they perceive sufficient compensation in the form of improved quality of care (Asenso-Okyere et al., 1998).

Examining the determinants and choice of health care utilization among injury patients is necessary in order to address the weaknesses in the injury reporting system. This will help to determine the proportion of injury cases which will be managed at the informal sector of the health care system in study district for the necessary action to be taken to cater for injury conditions that are not documented over a given period of time.

### **2.3.1 Determinants of Injury care and Treatment Options**

Various factors determine the choice of health care in respect to various diseases and injuries in a locality. Utilization of health care facilities is influenced by proximity, socio-economic status, the social structure, psychological as well as the availability, quality and cost of health care services (Chakraborty et al., 2003, Manzoor I. et al., 2009). This study examined some key components and their effect on health seeking behaviour. These include injury severity, cost of injury management, economic background of the injured person and the social status in respect to the highest educational level attained and type of settlement.

#### **2.3.1.1 Injury Severity**

Injury severity is measured on injury severity scales which are basically used for anatomical descriptions of the injury in respect to the degree of damage to tissues and other body parts. Various injury severity scales such as the International Classification of Diseases (ICD) and Abbreviated Injury Scale (AIS) are widely used in describing the extent of damage caused by an injury mechanism. Injury severity scale generally describes the impact of an injury in terms of the extent of tissue damage (the pathological evidence of trauma) and the physiologic response of the body to the damage.

Injury severity scales reflect recognition that severity classification is critical for surveillance, epidemiological investigations and evaluations of programmes and policies aimed at mitigating the impact of injury at both the individual and societal levels (Rivara, 2003). This study considered two out of the numerous injury severity scales due to their convenience and usage in Ghana.

The International Classification of Disease (ICD) is a general purpose classification of diagnoses and related matters to all health conditions and diagnostic codes for both natures of injury and external causes of injury (WHO, 1992). The ICD is widely used to classify health conditions in the clinical, administrative, public health promotion and research settings in both the developed and developing countries. In many sub Saharan countries, mortality data are currently coded using the 10<sup>th</sup> revision of the ICD, ICD-10 and morbidity data are currently coded using the clinical modification of the 9<sup>th</sup> revision of the ICD, ICD-9-CM (Osler et al., 1996).

The ICD plays significant role in injury severity classification however the system does not incorporate an explicit severity dimension. Again, the Barell Matrix is a framework for ICDCM injury codes by anatomic region and type, but does not consider relative severity (Barell et al., 2002).

The Abbreviated Injury Scale (AIS) was introduced in 1971 and is in its 5th revision. It is a specialized trauma classification of injuries based mainly on anatomical description of the tissue damage caused by the injury (Gennarelli and Wodzin, 2006). The AIS consist of two components namely the injury descriptor (often referred to as the pre-dot code) which is a unique numerical identifier for each injury description and the severity score (can be referred to as the post-dot code). The severity score under the Abbreviated Injury Scale ranges from 1, which is relatively minor injury case to 6 which is untreatable injury situation. A higher severity score indicates a progressively more severe injury. An AIS score of 1 translates to a minor injury, while an AIS score of 6 is deemed an injury that could not be survived. It is important to note that the scores from 1 to 6 do not reflect an interval scale, and similar AIS scores may not be comparable across body regions. For example, an AIS 3 score for head trauma

may reflect an injury of different severity than an AIS 3 score for another body region, such as the extremities

The severity scores are consensus assessments assigned by a group of experts and implicitly based on four criteria: threat to life, permanent impairment, treatment period, and energy dissipation. Although the reliability and validity of the AIS and its derivatives for assessing the combined effect of multiple injuries have proven to be effective however, their utility for population-based research is limited due to the time it takes to assign adequate scores (MacKenzie, 1984). Major weaknesses of the Abbreviated Injury Score are the inability to take into account multiple injuries in the same body region and the poor correlation with AIS severity and survival (Rivara, 2003).

Irrespective of the weaknesses associated with the Abbreviated Injury Scale, the treatment period component is very useful criteria in measuring injury severity in rural health facilities where the absence of experts to assess injuries to determine the severity pose challenges to the injury severity concept. Again, the treatment period component is suitable for ranking injuries managed outside the formal health facilities since it is easy to recall or estimate the duration of incapacitation due to injuries. The use of duration of hospitalization or incapacitation in determining injury severity has proven to be useful in rural Ghana (Mock et al., 1997). In respect to the AIS scale, this study ranked injury severity based on the number of disability days as Minor, Moderate and Severe. Injury case which was treated and discharged or lasted within one day was classified as minor, Two days to one week is moderate while more than one week is severe.

When dealing with injury severity in rural communities, using any of the severity scoring methods would be very time consuming, require highly skilled staff, and would be very expensive so much so that it would be out of reach for almost all developing countries. This problem has been bypassed by using indirect methods of deriving severity of injury from diagnosis codes captured in admissions data which often use the duration of hospitalization or incapacitation to determine the severity of the injury (Mock et al., 1999b).

### **2.3.1.2 Education**

Higher education levels are associated with greater awareness of need for specialized care for the injured. A study found that adults with higher education often have more physician visits for health care and management (Arcury et al., 2005b). High and low consumption of specific medical services can be explained, in part, by the patient's knowledge of health and health services and the injured person's perceived health needs and beliefs (McGauhey and Starfield, 1993).

The level of education of a household is a key factor that determines the level of health services utilization. It has been established that education enhances a person's efficiency in the selection and usage of health services and may enable an individual to choose a more health conscious behavior to improve his / her health conditions. In rural Guatemala, educational background of the family head has proven to be a paramount determinant of health care usage. It was as well observed that family size, parity, educational status and occupation of the head of the family were also associated with health seeking behaviour (Goldman and Heuveline, 2000).

In Ghana, individual's attitude to specific medical care seems to be influenced by the duration in schooling, since more years of education of an individual is associated with

a choice of medical care. Thus, in the campaign to raise the utilization of various specialised health care services, there is the need to encourage people to pursue higher education (Overbosch et al., 2004). Contrary to the general perception on the influence of education on health care utilization, a study has shown that, household heads with low reading skills are more likely to report poor health status than those with adequate reading skills (Baker et al., 1992). The study intends to validate the effect of the level of education on injury patient's perception on the role of injury surveillance system in injury control and the willingness to report injury reporting as well as promoting public patronage of the injury surveillance services.

### **2.3.1.3 Economic Status and Level of Income**

Determination of socio-economic status and its effect on health seeking behaviour is very relevant in addressing public health issues in the world. Wealth indices are used for studying variation in health, mortality, poverty, education, work and other outcomes in almost all countries in the developing world (Gwatkin et al., 2007).

The level of individual's income plays an important role in access and utilization of health care (Arcury et al., 2005b). Households with lower income consume fewer health services than the high income class (Woods et al., 2003). Low economic status has also been linked to lower levels of primary care and higher levels of emergency room use due to late reporting of illness (Janicke and Finney, 2000).

The level of household wealth signifies the economic status of a family. Various empirical studies have established positively relationship between wealth and the use of health services hence as income level increases, the utilization of formal health services increases (Ortiz et al., 2007). In Ghana, the poorer population assesses health facilities much more than the poorest, however, families in the higher economic

quintiles (Wealth Index for households) patronize specialist health facilities much more than the poor people (Abor et al., 2011). Health service utilization trend among the rich and the poor substantiate that the former is more likely to report an injury condition to the institutions under the injury surveillance system than the later.

Measurement of household economic status is crucial not only for studies focusing on the social determinants of health, but also for the vast majority of observations in health research.

The under listed variables are often considered to measure the economic status of respondents in developing countries

- ❖ Assets (farm land, poultry and livestock, building plot, building, bicycle, motorcycle, car, lorry, tractor)
- ❖ Income ( direct and indirect income, cash or kind)
- ❖ Dwelling material( mud, cement or wood)
- ❖ Floor material (mud, cement, tile)
- ❖ Roofing type (iron sheets, asbestos, thatch, bamboo)
- ❖ Source of water ( pipe, well, rain, stream / river lake)
- ❖ Source of energy ( electricity, gas, fire wood, charcoal, kerosene)
- ❖ Toilet facility (flush, KVIP, pit latrine, bush)

Although socio-economic index has positive properties in assessing individuals living status, and the likelihood of determining health and well being, yet this concept sometimes suffer from one great disadvantage since they are not comparable among countries and time points (Gwatkin et al., 2007).

Beliefs plays significant role in health seeking behaviour of many people. In many parts of the world, the beliefs of certain ethnic groups strongly favour the utilization of certain medical systems. It has been found that preferences for health facilities may be based on a common language or religion that leads to the utilization of specific types of healers or medical providers (Ramesh and Hyma, 1981). In many developing countries, the traditional sector has health beliefs in which disorders are seen not to require the intervention of scientific medicine (Joseph and Phillips, 1984).

#### **2.3.1.4 Settlement / Proximity**

The health care utilization of a population in a geographical space is related to the availability of medical services as well as the perceived quality of the services provided (Buor, 2003). However medical services in many developing countries tend to be urban based. In Africa, the uneven distribution of health facilities among rural and urban settlements influences health facility utilization among the residents. As an example, physicians preference of urban based health facility often leads to reduction of health workers in rural areas, in effect causing insufficient medical coverage over a geographical space irrespective of the predominance of rural population (Joseph and Phillips, 1984).

The fundamentals of the uneven distribution between urban and rural health facilities is the presence of better facilities in the cities such the potential for private practice, various opportunities for career progression, better infrastructure and more social amenities than rural areas (Dussault and Franceschini, 2006). The Ghana Ministry of Health reported that, close to 70% of Ghanaian physicians practice urban settlements in the Greater Accra region or in the Ashanti region, specifically, the Kole-Bu and Komfo Anokye Teaching Hospitals in Accra and Kumasi respectively. Relating to this

trend, the physician to population ratio in the Greater Accra region is 1:5000, whereas the ratio in rural Northern region, where over 2 million people live, is 1:92 000 (GHS, 2003). The absence of health staff and medical facilities in rural communities to some extent translate into low reliability and patronage of health services in rural Ghana. Comparatively health facility utilization indicates that rural minorities have worse health care utilization than urban minorities (Mueller et al., 1999). A study on the trend of spatial health care utilization showed 86.0% of urban women deliver in a health facility compared with 39% of rural women (Ghana Statistical Service, 2007). In Nigeria, a study revealed that urban women patronize health service much more than women in rural communities (Dairo and Owoyokun, 2010). An investigations on health seeking behaviour and health service utilization in Pakistan asserted that the factors determining the health behaviours may be seen in various contexts; physical, socio-economic, cultural and political. Therefore, it was established that the utilization of a health care system either public or private, formal or non-formal, may depend on the proximity and settlement structure in respect to socio-demographic factors, social structures, level of education, cultural beliefs and practices, gender discrimination, status of women, economic and political systems, environmental conditions, and the disease pattern and health care system itself (Babar and Hatcher, 2004).

In deciding to improve injury surveillance system in rural Ghana, it is very important to consider the degree of health services utilization among the settlement patterns to guide the location of key services in rural communities and to determine appropriate strategies to encourage public patronage.

#### **2.4 Sources of Injury Data**

Various sources of injury data play significant role in the development and management of an injury surveillance system. Through collaboration with the various injury data

sources, the injury surveillance system is provided with credible information on the occurrence and distribution of either specific or classified injury information. Generation and provision of injury statistics on continuous basis require a strong links between the central injury surveillance system and a composite of injury data sources in a geographical area. Determining the sources of various types of injury data is essential to the establishment and operation of a credible injury surveillance system to provide reliable injury data to support injury prevention and safety promotion initiatives.

Several private, public and international institutions manage injury data on regional, national and international basis. On a global scale, the WHO operates Life Tables for the 193 Member States and releases published results showing world health statistics.

Major component of this data is the regional distribution of injuries and their outcome (WHO, 2007).

Various types of injury data are produced by various institutions depending on the mission statement and the primary objectives of the centres. In the United States of America, data on violent deaths is managed by the US National Violent Death Reporting System (NVDRS) which was implemented by the Centre for Disease Control and Prevention. (CDC Manual, 2003) Similarly, in Ghana the National Road Safety Commission Act (NRSC Act 567 of 1999) has mandated the Road Safety Commission the full capacity to establish and maintain safety on Ghana road. This mandate has conferred on the commission the right to develop and maintain a comprehensive database on road traffic accident and publish reports related to road traffic crashes. In many developing countries the primary source of injury data is the Health Records, Police Reports, Births and Deaths Registry, National Household

Surveys and many other institutions contribute significantly to the compilation of information on injuries (Robertson, 1998)

#### **2.4.1 Health Institutions**

The orthodox medical practice observes documentation of the process involved in general medical care. Although the legal framework for the health information system in Ghana is relatively under developed, however in pursuing the Millennium Development Goals (MDGs), the Ministry of Health and the Ghana Health Service statutorily required collection, analyze and disseminate health data hence meeting the core minimum requirement of an injury surveillance system. This requirement in practice mainly covers information generated from the routine medical practice. Appropriate information and Health Information Systems (HIS) are seen as crucial to strengthen the health system and the operation of an injury surveillance systems in developing countries (AbouZahr and Boerma, 2005). A number of hospital based injury surveillance systems in Africa have registered positive impact on the efforts of controlling the occurrence of injuries. As an example, the digitized injury data from the Komfo Anokye Teaching Hospital in Kumasi has substantially supported investigation into injury mortality patterns within the catchment area of the hospital (Adofo et al., 2010, London et al., 2002). The data from the National Injury Mortality Surveillance System (NIMSS) in South Africa showed transport-related injuries accounted for 74,3% of all accidental (or unintentional) deaths in South Africa (Medical Research Council and UNISA, 2007). Though various hospital- based injury surveillance systems in Ghana contribute significantly to injury prevention, however some of the systems exhibit various weaknesses. A major weakness of the health injury data is underreporting due to low patronage of the hospital services among the injured persons, Again, the low hospital utilization of health services by the injured in Ghana limits the

reliance on the medical centres as ultimate source of injury statistics as many injury cases are managed outside the formal medical centres (Mock et al., 1997).

#### **2.4.2 Births and Deaths Registry**

The Births and Deaths Registry also provides accurate and substantial information on all births and deaths including injury cases occurring within Ghana for socioeconomic development of the country through their registration and certification. The Births and Deaths Registry is a potential source of injury data which could contribute immensely to the efforts to strengthen an injury surveillance system.

In respect to the Births and Deaths Registration Act, 1965, all activities involved in the Vital Registration System are coordinated from the national headquarters, referred to as the Central Registry Office in Accra. The registration of Births and Deaths Act of 1965, popularly referred to as Act 301 of 1965 makes it compulsory for every birth and death occurring within the borders of Ghana to be registered with the registry. Based on this statutory instrument, the Birth and Death Registry is required by law to document, analyze and disseminate accurate and reliable data on all deaths including injury mortality cases. This function complements the core concept of an injury surveillance system. The registry further provides stakeholders with detailed information on deaths to guide planning and decision making on births and deaths in Ghana. The registry documented 52, 382 deaths as against the projected 400,000 births in the year 2008 (Births and Deaths Report, 2009). Major challenge facing the registry is low patronage as shown by an independent investigation when the Health Metrics Network confirmed low coverage of vital events registration and statistical analysis of the data is necessarily limited (AbouZahr and Boerma, 2005). Again the inability to attract and retain highly qualified personnel due to low remuneration and poor service

conditions limits the level efficiency of the services. Relating to performance, the absence of training opportunities for the sector's staff has translated into weak monitoring and supervision mechanisms contributing to injuries in a locality. The 2000 Population and Housing Census revealed coverage of births and deaths registration as 49% and 25% respectively (GSS, 2002).

#### **2.4.3 Police / Motor traffic and Transport Unit (MTTU)**

In addition to the operations of the health records and vital registration, the Ghana Police Service manages data on crime related injuries. The Crime Unit of the Ghana police service keeps data on intentional and unintentional murder, gunshot, stab, hit, poison, strangulation / asphyxia, rape, assault, manslaughter cases etc. The Ghana Police Service is the principal custodian of crime information in Ghana hence it plays a key role in the development and management of an injury surveillance system in Ghana. The Police Service Act, [Act 350] of 1970 gives the police the right to promote peace through crime detection, investigation, prevention, apprehension and prosecution of offenders. As part of the measures to execute the above duties, the police systematically document and keep comprehensive information on all crimes and related activities as well as the outcome of crimes such as injury or deaths. As an example, the Ghana Police Administration on Tuesday, November 3<sup>rd</sup> 2009, observed that the general Crime Statistics across the country had reduced by 8% from 1,150 cases between January and September 2008 to 1,054 cases in November 2009. The statistics further showed that Greater Accra Region topped the general crime events of 392 while Ashanti Region registered the highest murder cases of 44 in the year 2009. Again, the police crime statistics showed 14 injury related deaths, 50 gunshot injuries and 2 lynched cases in Accra during the year 2009 (Peace FM News. 03-Nov-2009).

The Motor Traffic and Transport Unit (MTTU) is the arm of the Ghana Police Service responsible for road safety in Ghana. The unit was formally established by the passage of the Road Traffic Ordinance No. 55/52 in 1952. The core functions of the Unit are traffic control and management, investigation into and collection of data on motor traffic crashes as well as educating motorists and the general public on road safety in Ghana. In the year 2003, the Ghana MTTU recorded a total of 14,163 road traffic cases including various degrees of injuries (MTTU Report, 2004). Based on the respective roles of the Crime Unit and the Motor Traffic and Transport Unit (MTTU) in the documentation and reporting of injury cases, the Ghana Police Service is a key custodian of injury data and a primary component of an injury surveillance system.

#### **2.4.4 Building and Road Research Institute (BRRI)**

The Building and Road Research Institute (BRRI) operates an active injury surveillance system in Ghana. The Institute's crash data is mainly extracted from the police road traffic accident information gathered across the country. The Institute conducts in-depth analysis of the crash data periodically and compares it with the immediate previous year, as well as the base year (2001) when the first National Road Safety Strategy (NRSS I) was developed in Ghana (NRSC report, 2010). The statistics highlight the long term trends in fatality rates, regional distribution of crashes and casualties, road user groups at risk and identify the key contributions as well as factors leading to the crashes. The report further focuses on areas that need to be targeted in order to achieve reduction in road traffic accidents in Ghana. As an example, the crash statistics in 2010 represent a 5.4% decrease in total number of crashes and a 10.7% increase in fatalities over the 2009. However, relative to the year 2001, the 2010 fatality figure of 2,199 deaths represented an increase of 32.7%, indicating an upward trend in road traffic deaths in Ghana (*Road Traffic Crashes Statistics 2010*). For various

reasons, the police and the BRRRI accident data may fail to provide the full road traffic injury burden due to the inability to cover all traffic crash cases over a given period of time. Several injury cases including violence and motor accidents are sometimes not captured in the police data. The magnitude of the level of under reporting in the police crash data is very high as a study in Ghana found as low as 10% of pedestrian knockdowns in the police crash data (Salifu and Mock, 1998). Contrary to the situation in Ghana, Fatality Analysis Report System in the USA derives injury information from the police accident reports and the vital statistics to provide full coverage report on transport related deaths (US National Highway Traffic Safety Administration. Traffic safety facts 1998).

Many injury data sources in Africa are urban based where health institutions are logistically equipped to establish and manage composite of clinical database

(Kobusingye et al., 2001). For this reason, the Network of Health and Demographic Surveillance Sites (HDSS) are potential sources of injury data in rural Africa. Periodically, the Health and Demographic Surveillance Sites monitor morbidity through structured questionnaires and mortality by means of continuous verbal autopsy within the area of operation. This exercise is mostly carried out in rural populations, presenting an untapped infrastructure for rural injury surveillance. In Ghana, Health and Demographic Surveillance Sites are located at Navrongo, Kintampo and Dodowa (Kavi et al., 2012).

#### **2.4.5 National Household Surveys**

Household survey is capable of capturing detailed information on various types of injuries in a locality. Unlike the institutional injury data which provide data on injuries managed at specific centre alone, community based injury survey provides statistics on injuries managed at medical institutions, traditional centres and at household levels (Mock et al., 1999c). Initiatives to

consider the development of community based injury surveillance system could improve the quality of injury data in Ghana.

## **2.5 Characteristics of Injury Data Sources in Ghana**

The injury data sources in Ghana are characterized with weaknesses such as under reporting which have adverse effect on their usefulness. The principal reason of under reporting of injury data is that several injury cases are managed outside the formal medical care hence hospital injury data may not reflect the full burden of injury in a locality (Mock, 1997).

The gap between the performance and expected output of the injury data sources especially in Ghana justify efforts to improve injury reporting through strengthening the injury surveillance system. An improved injury data collection system is essential to understand the pattern of injury and the associated burden in a geographical space in order to formulate appropriate injury control policies for safety.

The usual sources of data on injuries exhibit weaknesses such as under reporting, missing and incompleteness of data. These attributes diminish the absolute reliability of such data for effective planning, monitoring and evaluation of injury control programmes (London et al., 2002). Unreliable injury data limits stakeholder's effort to effectively address the injury problems facing our communities especially the rural settlements. Many road traffic crashes, occupational injuries, agricultural injuries and even injuries caused by violence, are sometimes not reported to the police or the hospital. As an example, a recent study in Ghana showed that only 10% of injuries sustained by pedestrians were included in police statistics (Mock, 2003).

Attempts have been made to address the injury surveillance system in urbanized health institution in Ghana to serve as model for centres with minimum resources to establish

and maintain injury surveillance to manage injury cases in Ghana (London et al., 2002). The evaluation of the urban based injury surveillance system proved successful and buttressed the possibility of establishing injury surveillance system in health institutions with appropriate human, technical and minimum funding support (Adofo et al., 2010). There is therefore the need to pay attention to the burden of injury in rural Ghana where about 60% of Ghanaians live (GSS, 2002).

## **2.6 Problems with Injury Surveillance System in Developing countries**

Injury surveillance data may direct the priorities of injury research to the areas in greatest need of attention. It is as well used to determine the trends in specific types of injuries. Surveillance data may be analyzed to determine whether specific injury morbidity and mortality levels have increased, decreased or remained stable over a specific period of time (Graitcer, 1987).

In developing countries, the usual sources of data include the Police Accident Reports, Vital Statistics and Hospital Records (London et al., 2002). These sources are reliable provided the data generated from such institutions could be analyzed on —on-going basis in order to follow the trend of injury incidence in a locality and to assess the trend success or failure for safety policies. The usual sources of data in Ghana have their weaknesses that diminish their usefulness in support of planning and decision making. Several accidents and even injuries caused by violence are sometimes not reported to the police. Recent studies in Ghana showed that only 10% of injuries sustained by pedestrian were included in police statistics (London et al., 2002, Afukaar et al., 2003). Again, many injured persons do not receive formal medical care. A study in Ghana on the utilization of formal health service by the injured persons in rural Ghana showed that close to half (49%) of the total number of injury cases did not seek formal medical

treatment, even among those who sought formal medical care; many attended clinics rather than hospitals. Again among the severely injured patients, only 25% reported to hospital close to their locality (Mock, 2003). The low utilization of the formal medical services in the rural areas limits the usefulness of the hospital records and data from other health institutions. Probably the most important types of injury that should be recorded accurately are those leading to death. Unfortunately however, vital statistics are often under assessed (Rahman et al., 2000). It has been estimated that, only 20% of the deaths in Ghana are officially registered and even there exist lapses in the registration procedure since the exact mechanism causing the death is sometimes not recorded accurately or omitted (London et al., 2002).

The increasing utilization of the informal sector by the injured has a serious effect on the injury surveillance system in rural Ghana since the informal sector does not contribute to the compilation and dissemination of information on the occurrence of injury. Reliable injury surveillance system comprising injury cases managed at both the formal and informal centres is essential for prioritizing public health issues, monitoring trends and assessing intervention programmes. Many low-income and middle-income countries in the world have inadequate information system on injuries, making it difficult to realize the full nature of the public health problems associated with various types of injuries and thus gain the attention that is required from policy makers and decision makers.

There are a number of areas where injury data are often problematic, these include;

1. Source of data, including data from Police reports and Hospital records etc.
2. The type of data collected
3. Inappropriate use of indicators

4. Non standardization of data
5. Underreporting
6. Incomplete reports
7. Poor harmonization and linkages between different sources of data.

The lack of reliable data is very critical at the international, national and local levels, where injury data is needed as a sound basis for safety planning and decision-making. (World Report on road traffic injury prevention, 2004). Comparison of data from the main injury systems in Ghana, namely, the Police Medical Report, Health Services Records and Mortuary data and Household Surveys indicate a wide margin of disparity. It was documented that, the national annual road traffic mortality rate from police crash report was 7 / 100,000 (BRII report 2004). Contrary to the police crash report, a household survey conducted in Ghana showed road traffic mortality of 36 / 100,000 (London et al., 2002). Thus only 20% of road traffic deaths were reported in the official statistics. It is estimated that nearly 49% of those injured in the rural areas did not receive any formal medical care these cases were not captured in the national injury data. In contrast, 68% of urban injured persons received formal care, primarily at hospitals, making hospital records a reasonable source of data in urban centres. Reasons identified with weak injury surveillance system include knowledge base on the educational status of the populace and exposure to health information and statistics on the role of injury surveillance system in injury control, economic status of the injured person, distance and beliefs in alternative medical care for injuries etc.

### **2.7 Appropriate Method of Strengthening the Injury Surveillance System**

The process of strengthening an injury surveillance system in a geographical area can be daunting especially in rural area with least resources (Quigley, 2005). An injury

surveillance system requires resources such as funding, personnel, and infrastructure etc. However in many developing countries, these resources are not available consistently across geographical space. Indeed, professional health staffing in Africa remains the lowest in the world, with 2.3 health professionals per 1,000 populations compared to 18.9 per 1,000 in Europe (WHO, 2007). In addition to the limited health personnel, many health information systems are weak or ‘dysfunctional’. In such situations, the development of a surveillance system can begin in a specific health institution in a geographical space. This provides a ‘pilot’ for the implementation of a nationwide system but does not require the outlay of tremendous resources. It also offers the means to convince government officials and medical staff that the creation of such a system is warranted and useful. It is important to select an appropriate test case to demonstrate the utility of the injury surveillance system in an accredited health institution.

In an effort to understand the distribution of injury, developing countries often implement a hospital-based injury surveillance system, largely because such a system can be readily integrated into existing hospital infrastructure where the system could utilize the existing resources (Adofo et al., 2010). The minimum infrastructure required to start an injury surveillance system can be found in many existing health facilities. The material resources necessary include computers and database software. The human resources include medical staff to record patient information and individuals to input this data on a regular basis. Ideally, hospitals already collect patient data. This data forms the basis for the injury surveillance system, and additional data requirements are not significant. Instead, the creation of an injury surveillance system is often simply the standardization of data collection include basic demographic information (e.g. place of residence, place of injury) and information relevant for the treatment of the

individual injury cases such as medical history and use of drugs or alcohol. This can be achieved through the creation of a standardized form for data collection, and the input of this data into a computer system, which enables the analysis of injury patterns. Information about injury, which might be perceived as ‘extra’ information by medical personnel, includes: the relationship of the victim to the perpetrator, the mechanism of injury and the context of the injury (e.g. time of day, location). Much of this information is often, but inconsistently, written in the narrative of the circumstances of the injury obtained by the admitting nurse or physician. Including this information in a standardized form and providing incentives for routinely using the form can enhance the collection of data and make it useful for analysis, interpretation and dissemination of injury data in a geographical area.

The ideal injury surveillance system is an ‘integrated’ one. An integrated surveillance system includes the participation of not only medical institutions, but also of any other institutions that are involved in detecting, investigating, reporting, and attending injury cases. Linking data elements from more than one data set has many advantages over the use of a single data set. Many types of databases have been linked for public health surveillance and found to be useful in understanding injury risk factors and outcomes (US National Highway Traffic Safety Administration Revised catalog, 2000). Injury data could be obtained from several sources such as schools, community structures, law enforcing agencies and morgues etc. A coordinating centre can facilitate the collection of information in a central location, which can enhance the coverage and completeness of the data and provide a basis for collaborative efforts to prevent and reduce violence. The implementation of an integrated injury surveillance system in a geographical space requires a certain level of infrastructure as well as human and financial resources

(O'Neill and Mohan, 2002). An integrated system also requires significant collaboration among public and sometimes private institutions such as;

- Engineers from a variety of backgrounds who can deal with highway design, traffic flow, and vehicle-safety design, as well as broader infrastructure issues, such as promoting safer alternative means of transport, and mobility management and urban planning to decrease dependency on cars.
- Epidemiologists, who can understand and handle injury data, develop surveillance systems, conduct research to elucidate injury-related risk factors, and assess the outcome of intervention efforts.
- Police, lawyers, and others involved in legislation can see traffic safety from a broader view-point. Traffic law is usually thought to comprise catching and punishing those who commit infractions. While this is necessary, the concept of assessing traffic laws in terms of safety and health effects must, however be promoted.
- Clinicians from multiple specialties who can understand the public health viewpoint and develop cost-effective improvements in the entire system of trauma treatment.
- Psychologists, sociologists, and media experts with a background in safety-related behaviour change and
- Economists to assist with studies of cost-effectiveness on injury prevention interventions as well as trauma care modalities.

The above institutions may have their respective priorities, agendas, policies and data management structures. Cooperation across such institutions will often require policy decisions to be made at a higher political level and then translated into administrative

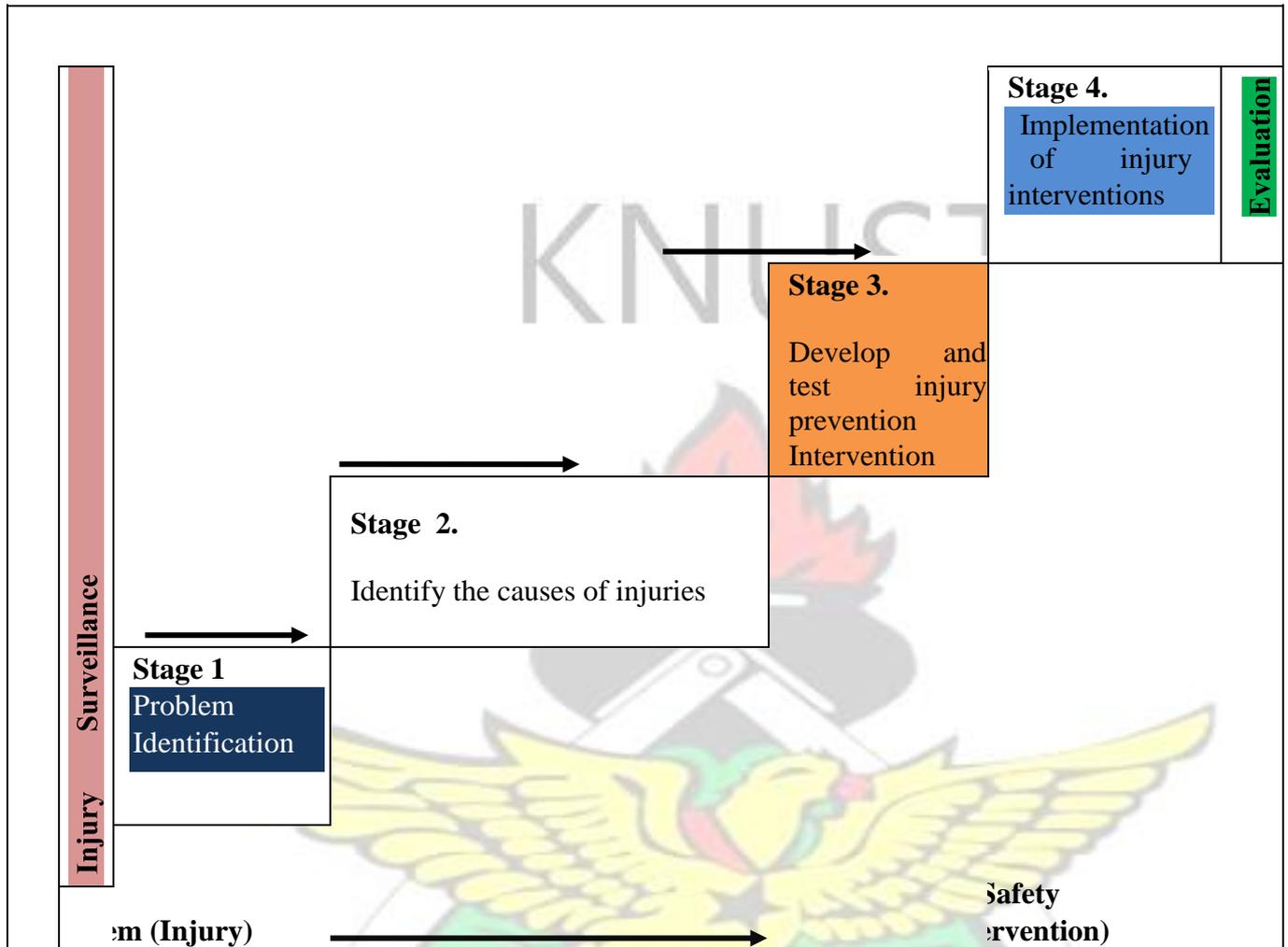
directives that can be implemented locally to enhance the establishment of an injury surveillance system in a geographical space.

## **2.8 Linking Injury Surveillance System with Injury Prevention**

The primary objective of an injury surveillance system is to make injury data available to support planning and decisions aiming at reducing morbidity and mortality emanating from injuries in order to promote safety in a locality. In practice, the foundation of the various stages of public health approach to injury prevention is a reliable injury surveillance system (Teutsch and Churchill, 2000).



**Figure 2.1: Linking injury surveillance with injury prevention**



*Source: Adapted and modified from Sleet et al, 2003.*

The public health approach to safety promotion is described in four stages as shown in figure 2.1). According to *Sleet et al, 2003*, at stage one, the burden of injury is define in terms of the population at risk, place of occurrence and the frequency in relation to other forms of morbidity and mortality. At stage two, the various causes of injuries in a locality are identified in order to determine the contribution of the various injury mechanisms to the total burden of injury. This stage is necessary to guide planning and decisions on the adoption of the right methods of injury prevention. The third stage comprises the development and testing of injury prevention interventions.

The decision to adopt any injury prevention method should put into consideration the culture of the people, environmental factors as well as human and financial resources available in the locality (Hahn and Stroup, 1994). Finally, at the fourth stage, effective and efficient injury control interventions are implemented. In order to sustain injury prevention intervention, there is the need for periodic evaluation (Romaguera et al., 2000). The occurrence of injuries during the post intervention era is then compared with the pre intervention period or an established standard to ascertain the effectiveness of the injury prevention intervention.

The intervention method could be maintained when there is reduction in the incidence of injuries; however the injury prevention intervention could be improved or modified when it fails to provide maximum protection (Dodge, 2001). An injury prevention intervention is dropped or replaced when it proves to be ineffective in preventing injuries.

Figure 2.3 shows an ordered process that begins with the delineation of the nature and extent of the injury problem through the systematic collection of information about its magnitude, scope, characteristics and consequences.

The process involves a determination of the risk and protective factors that can be modified through intervention. Counter measures, and strategies for implementing the countermeasures are then generated to address the modifiable factors. The efficacy of both the countermeasures and strategies are quantified and effective interventions are then scaled up into programmes for implementation and dissemination at a population level. The public health approach is well developed in terms of injury surveillance, risk factor identification, and quantifying the efficacy of countermeasures. Injury research evidence should be implemented to achieve improved outcomes at the community level

(Mallonee et al., 2006). The first three stages of the approach to injury prevention follow an epidemiological method of scientific enquiry. The fourth stage also relies on scientific enquiry, which is not limited to epidemiology, but to determine methods of implementation and intervention effectiveness. This is derived from gaining an understanding of social values and decision-making processes within government, other stakeholders and the general public. To achieve this, injury prevention practice necessarily takes place in the public domain. The public health approach entails a 'research-to-practice' shift that occurs between the third and fourth stages of figure 2.1.

The term 'translation' in this context is used to describe the process of moving ideas from the research paradigm into the public domain to ensure that the population in a geographical area will voluntarily adopt safety measures to reduce the occurrence of injuries in a locality (Greene and Simons-Morton, 1998).

## **2.9 The Role of Injury Surveillance System in Injury Prevention and Safety Promotion**

The efforts to establish and maintain safe communities in developing countries are sometimes not supported with reliable injury database to monitor the occurrence of injuries, trauma management and effectiveness of injury interventions (Maier and Mock, 2003). The significance of injury surveillance system in injury control and safety promotion is based on the system's function which comprises systematic collection, analysis, interpretation, and dissemination of data on health-related events for in supporting public health actions to reduce morbidity and mortality and to improve health conditions in a locality (Thacker, 2000).

An injury surveillance system is the principal and central source of data needed to support injury prevention and safety planning and decision making. The burden of injury in terms of social, economic and psychological effects on public health requires

a protocol to establish safety in order to address the occurrence of injuries in a locality. The injury burden is enormous, the number of people who die from injury every year runs into millions (Krug et al., 2000). However, deaths constitute a small fraction of the total injury problem; for every person killed, many more are seriously injured and permanently disabled and many more suffer minor or short-term disabilities (Heinrich et al., 1980). The costs of injury mortality and morbidity are immense, not only in terms of lost of economic opportunity on demands on national health budgets, but also in terms of personal suffering. Despite the public health problems associated with injuries, only few countries have surveillance systems that generate reliable information on the nature and extent of injuries, especially with regards to non-fatal injuries (Parrish and McDonnell, 2000).

Injury surveillance system provides basis of understanding the magnitude of injury problem well enough and to identify the exact risk factors. Continuous recording and processing of crash data in Ghana by the Police and the Building and Road Research Institutes has led to the motor vehicle crashes and injuries to pedestrians being accounted for the overwhelming majority of deaths. Similar injury pattern has been observed in other developing countries (Odero et al., 2007).

The injury surveillance system is a key instrument to generate data on injuries to support research and epidemiological investigations on the distribution of injuries that justify the need for appropriate intervention programmes. Epidemiological investigations and empirical research have established that pedestrian crashes are more common among males in all regions and across all ages especially the 15–59 years. Again, pedestrian injuries and fatalities are most prevalent among young children between the ages of 5 and 9 years, and older adults over 70 years of age (Retting et al., 2003); (Peden et al., 2004, Nantulya and Reich, 2002). The above records confirm significant economic

consequences associated with injuries. In Ghana, vehicular-pedestrian collisions account for over 60% of all urban road user deaths (Afukaar, 2003). Surveillance system contributes to the identification of injury risk factors. Data on crash victims' behaviour has revealed that Pedestrian alcohol use is an established risk factor for pedestrian traffic injury (Vestrup and Reid, 1989). A study on pedestrian safety in the United States of America stated that, 55% of the pedestrians aged 16 years or older who were fatally injured at night had blood alcohol concentrations of 0.10% or more conversely, the intoxication rate among drivers involved in pedestrian collision was only 12% during the same period (US Insurance Institute for Highway Safety (1997). There exist limited data on pedestrian bloodalcoholic concentration levels in Ghana, but anecdotal evidence suggests that alcohol consumption may be high among teen and adult pedestrians in Ghana, perhaps higher than reported rates of drunk driving in the country (Mock et al., 1999a).

Injury surveillance system facilitates the evaluation of an injury intervention. The process of product or service evaluation requires comparison between the pre and post intervention results. The continuous collection, analysis and interpretation of injury data makes it possible to measure the effectiveness of an injury intervention (Jones et al., 2005). The comparison of pre and post injury intervention initiatives in Ghana showed the effectiveness of speed humps and rumble strips in reducing traffic crashes on road (Afukaar, 2003). For various reasons, many developing countries do not benefit fully from injury surveillance systems. Effectiveness of injury surveillance is derived when injury data is processed and analysed on ongoing basis (US National Highway Traffic Safety Administration, Traffic safety facts 1998).

In Ghana, the leading sources of injury data have significant shortcomings which seriously affect their reliability and usefulness. Injury surveillance systems are

characterized with under reporting and incomplete records. As an example a study found only 10% of injuries sustained by pedestrians were included in police statistics (Salifu and Mock, 1998). Furthermore, many injured persons may not receive formal medical care, and this limits the usefulness of records held by hospitals and other health facilities (Mock et al., 1997). The ever increasing burden of injury in Ghana and other developing countries calls for improvement in the injury surveillance system to mitigate the occurrence of injuries.

### **2.9.1 Injury Prevention and Safety Promotion**

The primary objective of an injury surveillance system is to contribute to injury prevention and safety promotion through the provision of accurate injury data for effective decision making to prevent injury and to promote safety in a geographical area (CDC Surveillance Update, 1988). Injury prevention approaches could be grouped conveniently into four main areas namely Education and behavioral change, Engineering of Product, Environmental modification, Enforcement of the legislation (Rice et al., 1989).

### **2.9.2 Education and Behavioral Change**

Educational and behavioral change approach to injury prevention assumes that injury is often the result of inadequate knowledge, skills or attitudes (Johnston, 1992). Educational strategies are intended to increase individual knowledge to enhance positive behaviour which is conducive to safety in human environment. Education has always featured as the mainstay of injury prevention (Duperrex et al., 2002). Educational strategies seek to provide individuals and the general public with information on potential injury risk factors and how to avoid injuries. Effective educational injury prevention approach adopt appropriate educational strategies in respect to culture, beliefs and other social factors to transform public attitude to

various injury risk factors such as high speeding, riding bicycles and motorcycles without helmet. Educational programmes can raise awareness on safety and may have a positive impact on behaviour changes through increased knowledge, skills and awareness of road safety (Gielen and Sleet, 2003). Conducting educational programmes such as workshops, or broadcasting television programmes on road safety are important to encourage the adoption of safety measures such as the use of helmets among cyclists. For instance, interactive discussions and video shows on road safety measures do not only improve the knowledge and skills among the cyclists immediately, but also lead to knowledge generation with respect to bicycle safety over a period of time (Celements, 2005).

Injury prevention education can be carried out through the school health educational programmes, one-on-one basis, small groups, community level, the use of the mass media and through community leader and other stake holders. Education in injury prevention aims to influence a range of stakeholders (including individuals, communities, health professionals, policy makers, businesses and the media) by increasing their knowledge, changing their attitudes and altering their behaviours. However, it is important to note that education methods alone will not necessarily result in behavioural change. Education is considered an *active* intervention, which requires an individual to take action each time they undertake a safety measure (Birken et al., 2006). Success is dependent on the beliefs, efforts and actions of those that the education is targeting (Christoffel et al., 2006). Education on injury prevention is useful when there is a need for new information or when there is no other way to prevent injuries either through product changes, environmental design or legislation.

Generally, education plays an important role in laying the foundation for sound injury prevention approaches. However it should not be used in isolation but rather as a part of an overall multi-strategic approach.

### **2.9.3 Product Engineering**

Product design approach to injury prevention focuses on the safety of consumer products. In recent years, some products have been redesigned in conformity with safety standards. A good example is the —deadmanl brake on lawnmower blades which is designed to make it impossible for operators to lose a limb in the course of operating the mower. This is an achievement which public education and common sense had not been able to achieve (Christoffel et al., 2006). Improved seatbelts and booster seats have been found to be effective in preventing death among motor vehicle occupants aged 4-8 years (Rice et al., 1989).

The contribution of the various mechanisms to the burden of injuries in a locality is essential in assessing the magnitude of the burden associated with specific products. Bicycles have consistently contributed to head injuries, however the redesigning of two –wheeled vehicles with helmet has reduced the severity of bicycle injuries (Thompson et al., 2001). Appropriate product design could dramatically reduce the risk of injuries especially if the modification is based on findings on specific features of the product which contribute to injuries. As an example, the installation of airbags on vehicles reduced automobile related injuries considerably. Similarly, Lap-shoulder belts are known to reduce automobile fatalities by up to 50% when used by passengers (Zhu et al., 2007).

Product engineering ensures that products or equipment are designed in such a way to protect the user/consumer from potential hazards. The agent of injury is often a product

obtained by a consumer in the marketplace including motor vehicle, firearms and agro-chemicals etc. Success of injury prevention has involved research demonstrating that product alterations could reduce the risk of an injury-causing event or ameliorate its effect. A research on pre-event interventions resulted in the development of centre high-mounted brake light on automobiles that assist in preventing rear end collisions by giving drivers that follow a quick warning of deceleration (McKnight, 1992).

Prevention of fire-related injuries requires modifying the vector of thermal energy to reduce the risk of the energy that will escape from control. A study has demonstrated that feasibility of safer design for cigarettes to make them self-extinguish lighters designed to make it difficult for children to ignite have resulted in decrease in cigarette and lighter related injuries in a locality (Rose-Ackerman, 1991). Good product engineering is therefore necessary to prevent the occurrence of injuries. There are variations in the level of acceptance and utilization of various products which have been designed in conformity with safety standards. Comparison on the use of safety belts in a developing country and an industrial state showed that the level of usage in Saudi Arabia was only 7% whilst utilization of seatbelts in Sweden was 80% (Mufti, 1986). The differences in the utilization of product design to mitigate the occurrence of injuries are due to the differences in enforcing the laws on safety.

#### **2.9.4 Environmental Modification**

Environmental modification refers to altering the physical surroundings such as highway layout, recreational centre and swimming pools etc to prevent injuries. The environmental modification is based on the premise that human beings can alter the physical surrounding (building a dam) or create a mechanism to either increase or reduce injury risks. According to Leon Robertson, —The vast majority of injurious human contact with energy is the result of human use and alteration of that energy,

usually in ways that increase its concentration at points where it is likely to cause harm in contact with human beings (Robertson, 1998).

Environmental modification is used to encompass the broader range of possible interventions, ranging from product design to social attitudes. Certain conditions, such as slippery surfaces, unguarded ponds and exposed explosives etc expose human beings to various forms of risks. The physical surroundings and product engineering should be designed to conform to passive injury prevention conditions since it is difficult to change human behaviour and attitudes especially among high-risk groups in a society. The excessive vehicle speeds that prevail on Ghana inter-urban highways and on roads in built-up areas have been shown to be a key contributory factor in serious traffic crashes (Afukaar, 2003). In recent years, speed bumps have been installed at some crash-prone locations on the highways in Ghana so as to lower the speed of vehicles and improve the traffic environment for other road users, including pedestrians and cyclists, in built-up zones along the highways. The speed bumps produce discomfort when vehicles pass over them at high speeds; with the vehicles lifted off the ground and with the resulting noise, drivers are forced to reduce their speed. This in turn decreases the kinetic energy of the vehicle that can cause injuries and deaths on impact, and gives drivers longer warning of possible collisions, thereby lessening the likelihood of road crashes. Environmental modification in the form of speed humps has been found to be effective on Ghanaian roads. A good example of a modified road environment is the rumble strips at Suhum, on the main Accra-Kumasi highway. The motive of this engineered work was to reduce the number of traffic crashes. The outcome of this intervention was a decrease in fatalities by 55% and serious injuries by 75%, between January 2000 and April 2001 (Afukaar, 2003). The design of the environment and product must ensure public safety in their everyday usage. Engineering defect

especially on roadways, recreational centres and automobiles etc are major injury risk factors. Environmental modification strategies are considered as passive interventions where individuals are not required to undertake any action to be protected. These strategies have been shown to be more effective than active measures, which require continued effort from individuals (Hanson et al., 2005). Examples of passive measures include a car airbag, which is activated automatically in a car crash, or tempering valves that automatically reduce the temperature of hot tap water to a safer level.

### **2.9.5 Enforcement of the laws**

Legislation and policies are often put in place to prevent injuries. Enforcement of the law requires that penalties and deterrents are imposed for not observing and not yielding to injury prevention signs and regulations. The legal requirements are used to influence the actions of individuals, organizations and businesses to reduce risk and injury such as seatbelt use, enforcement and penalties for non-use (Hanson et al., 2005). Some of the greatest successes in injury prevention are from a combination of enforcement of the law and education (Modeste and Tamayose, 2002).

Law enforcement by the police contributes to compliance with safety measures like wearing of helmets among bicycle and motorcycle riders. In Malaysia, the introduction of the compulsory wearing of crash helmet by all users of motorized two-wheeler vehicles reduced motorcycle deaths by 30% (Supramaniam et al., 1984). Several investigations and international experience point to the effectiveness of setting and enforcing speed limits in reducing the frequency and severity of road crashes (Zaar, 1994). Some of the greatest successes in injury prevention are from a combination of enforcement of the law on safety and education on injury prevention (Modeste and Tamayose, 2002).

### 2.9.6 Safety Promotion

Safety has been defined as \_a state in which hazards and conditions leading to physical, psychological or material harm are controlled in order to preserve the health and well-being of individuals and the community (Maurice et al., 1997). Among injury researchers and epidemiologists, safety is —a state or situation characterized by adequate control of physical, material, or moral threatsl, which —contributes to a perception of being sheltered from danger (Welander et al., 2000).

Safety is commonly viewed through the lens of specific injury domains since some researchers in the injury prevention field believe that safety has come to mean the prevention of crime and violence; for others, safety is the reduction in motor vehicle deaths or a feeling of being out of danger rather than being in a positive state of human growth and development (WHO, 1998). The state of safety is not only related to the absence of intentional or unintentional injuries rather, it must also lead to a perception of being sheltered from danger (Harden et al., 2000).

Safety comprises two dimensions namely objective and subjective. The objective dimension of safety is referring to behavioural and environmental factors measured against *external* criteria while subjective dimension is based on individual's internal feelings or perceptions of being safe which can be aggregated to the macro level or represent the community's perceived safety conditions (WHO, 1998). From the World Health Organization's point of view, safety is more than merely —non-injuryl.

Subjective safety in traffic is referring to the personal feelings of being unsafe in the environment in which people live. The feeling of not being safe especially in high risk activities such as mining and lumbering is caused by personal experiences or

observations in related activities, contact with other people, and/or information gained from the media (Miedema et al., 1988).

In the injury prevention domain, safety is rarely operationalised in a manner that is consistent with WHO's broad definition of the concept. Indeed, most injury prevention interventions and programs are designed and implemented with the overall objective to reduce the incidence of injuries in a geographical area. Measuring a change in the rate of injury occurrence depends on a solid injury surveillance system. Public safety is seen as the primary objective of the development of an injury surveillance system which serves as a portfolio for guiding decision on injury control and safety promotion (Klassen et al., 2000).

Safety promotion can be defined as a process that aims to provide populations with the means to establish and maintain the conditions necessary to reach and sustain an optimal level of safety (Welander et al., 2000). Organized efforts by individuals, organizations and communities are needed to achieve the final goal. Safety promotion can be carried out at various levels: national, regional, local, organizational and individual. In practice, safety promotion at a local community level is the essence of a 'Safe Community'.

Safety is again is a state in which hazards and conditions leading to physical, psychological or material harm are controlled in order to preserve the health and wellbeing of individuals and the community (Maurice et al., 1997). Among various injury researchers and epidemiologists, safety is —a state or situation characterized by adequate control of physical, material, or moral threats, which —contributes to a perception of being sheltered from danger (Welander et al., 2000).

Safety is commonly viewed through the lens of specific injury domains; for some researchers in the injury prevention field, safety has come to mean the prevention of crime and violence while other category of researchers view safety as the efforts to reduce injury related deaths or a feeling of being out of danger rather than being in a positive state of human growth and development (WHO, 1998)‘ The state of safety is not only related to the absence of intentional or unintentional injuries rather, it must also lead to a perception of being sheltered from danger (Harden et al., 2000).

Measuring a change in the rate of injury occurrence depends on a solid injury surveillance system. Public safety is seen as the primary objective of the development of an injury surveillance system which serves as a portfolio for guiding decision on injury control and safety promotion (Klassen et al., 2000).

Promoting a public health programme in a society has been defined by the World Health Organization's 2005 Bangkok Charter for Health Promotion in a Globalized World as "the process of enabling people to increase control over their health and its determinants, and thereby improve their health (The Bangkok Charter for health promotion in a globalized world, 2005).

Safety promotion therefore is a process that aims to provide populations with the means to ensure the presence of, and maintain the conditions necessary to reach and sustain, an optimal level of safety (Welander et al., 2000). Safety promotion requires organized efforts by individuals, organizations and communities in order to achieve the final goal. It can be carried out at many levels including national, regional, local, organizational and individual. In practice, safety promotion at community level is the essence of a Safe Community (Maurice et al., 1997). Safe Community‘ in effect is a local district with an active injury-prevention programme covering all ages, environments and

situations, where networks of public authorities, health services, voluntary organizations, enterprises and interested individuals work together to promote safety (Svanström et al., 1995).

The fundamental idea behind the Safe Community is to address all aspects of safety and prevent injuries in all areas, encompassing all ages, environments and situations, and involving both governmental and non-governmental community sectors. The Safe Community model provides a framework for a community-based injury-prevention programme. Community intervention is designed to encourage individual contribution to address injury problem in a community (Ekman and Svanström, 1999).

### 2.9.7 Injury Prevention Model - the Haddon's Matrix

The Haddon's Matrix as shown in table 2.1 is one of the injury prevention models that addresses injury situation based on the interaction between factors of injury and the various stages or events of injury. Primarily, the Haddon's matrix consists of four columns and three rows. The columns comprise host, vehicle / mechanism, the physical environment and the social environment. The rows are made up of pre-injury phase, event phase and post-injury phase.

Table 2.1: The Haddon's Matrix (Application to Road Traffic Crash Prevention)

	<b>FACTORS</b>			
<b>PHASES</b>	<i>Host</i>	<i>Vehicle</i>	<i>Physical Environment</i>	<i>Social Environment</i>

<b><i>Pre-Event</i></b>	Driver ability, driver training	Maintenance of brakes, vehicle inspection programmes, installation of child restraint and child restraint checking programmes	Adequate roadway markings, correct installation of child restraint, right child restraint for child's height and weight	Attitude to drink driving/speed/use of child restraints for every car trip
<b><i>Event</i></b>	Human tolerances to crash forces, wearing seat belt, having a child in a correctly fitting child restraint.	Crush space worthiness of the vehicle (eg. Crush space), crush worthiness of child restraint such as head extrusion	Presence of fixed object near road way, presence of unsecured object within the vehicle	Enforcement of mandatory seatbelt and child restraint use
<b><i>Post - Event</i></b>	Crash victims general health status	Petrol tank designed to minimize likelihood of post crash fire.	Availability of effective and timely emergency response	Public support for trauma care and rehabilitation

**Source:** Baker et al. 1992.

The column of the Haddon's Matrix consists of the host, vehicle, physical environment and the social environment. The host refers to the person at risk of injury (eg. Passenger on board of a vehicle). The rows of the Haddon's Matrix are made up of pre event phase, the event phase and the post event phase. The pre- event phase is when primary prevention is recommended. It involves activities designed to prevent the injury event from occurring by acting on its causes (e.g. road safety policies such as divided highways, and good road design).

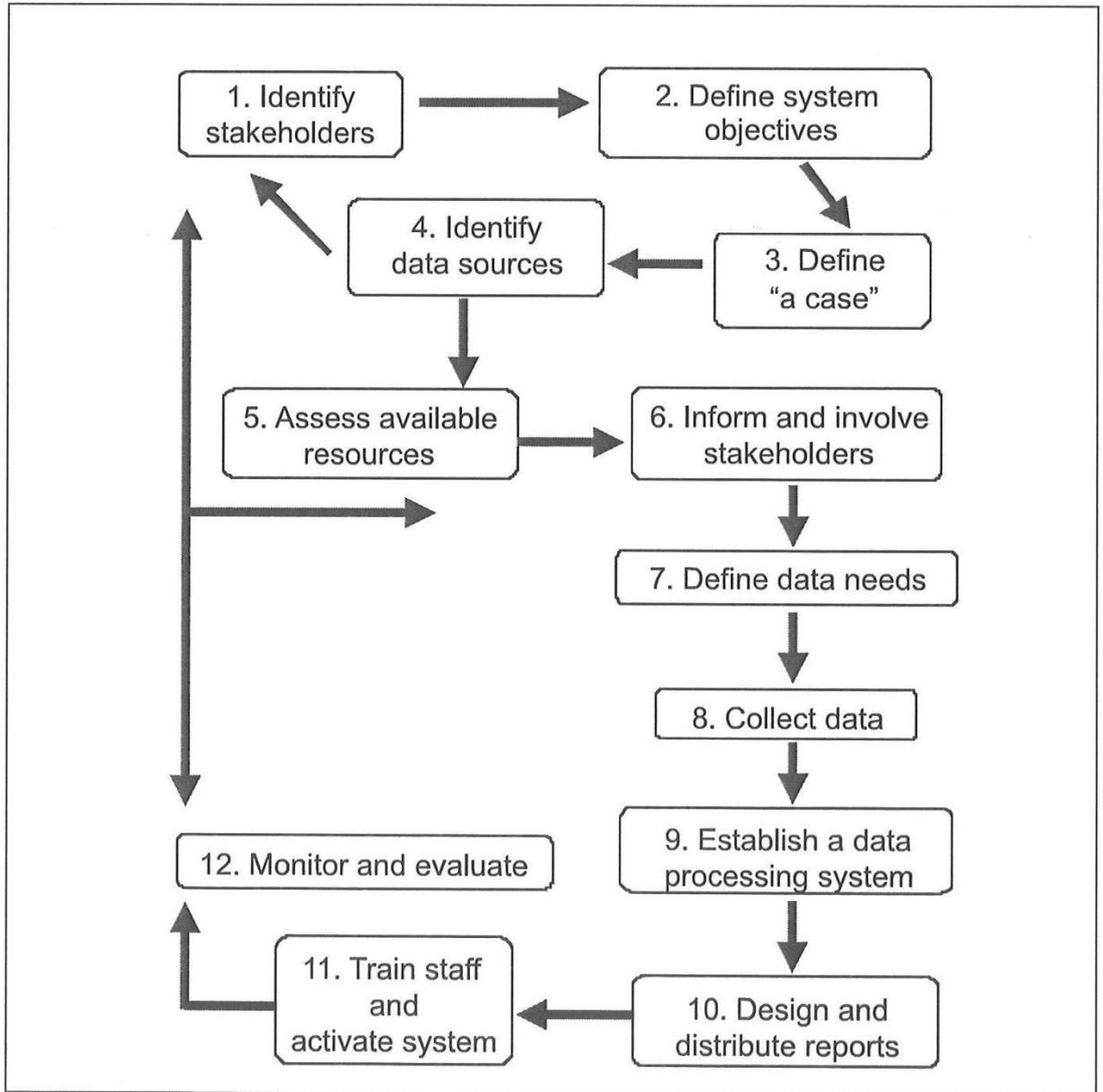
The injury event phase corresponds with secondary prevention stage. This is when there is an attempt to reduce the severity of an injury or to reduce the seriousness of an injury when an event actually occurs by designing and implementing protective mechanisms e.g. a seatbelt.

The vehicle is the object that generates energy to cause the injury. An example is a moving vehicle. The physical environment includes all the characteristics of the setting in which the injury event takes place e.g. roadway. Finally, the post injury event phase is linked with tertiary injury prevention or the treatment and rehabilitation stage. At the post injury event phase, there is an attempt to provide appropriate clinical care to manage the seriousness of an injury or disability immediately after an event has occurred.

### **2.10 Conceptual Framework**

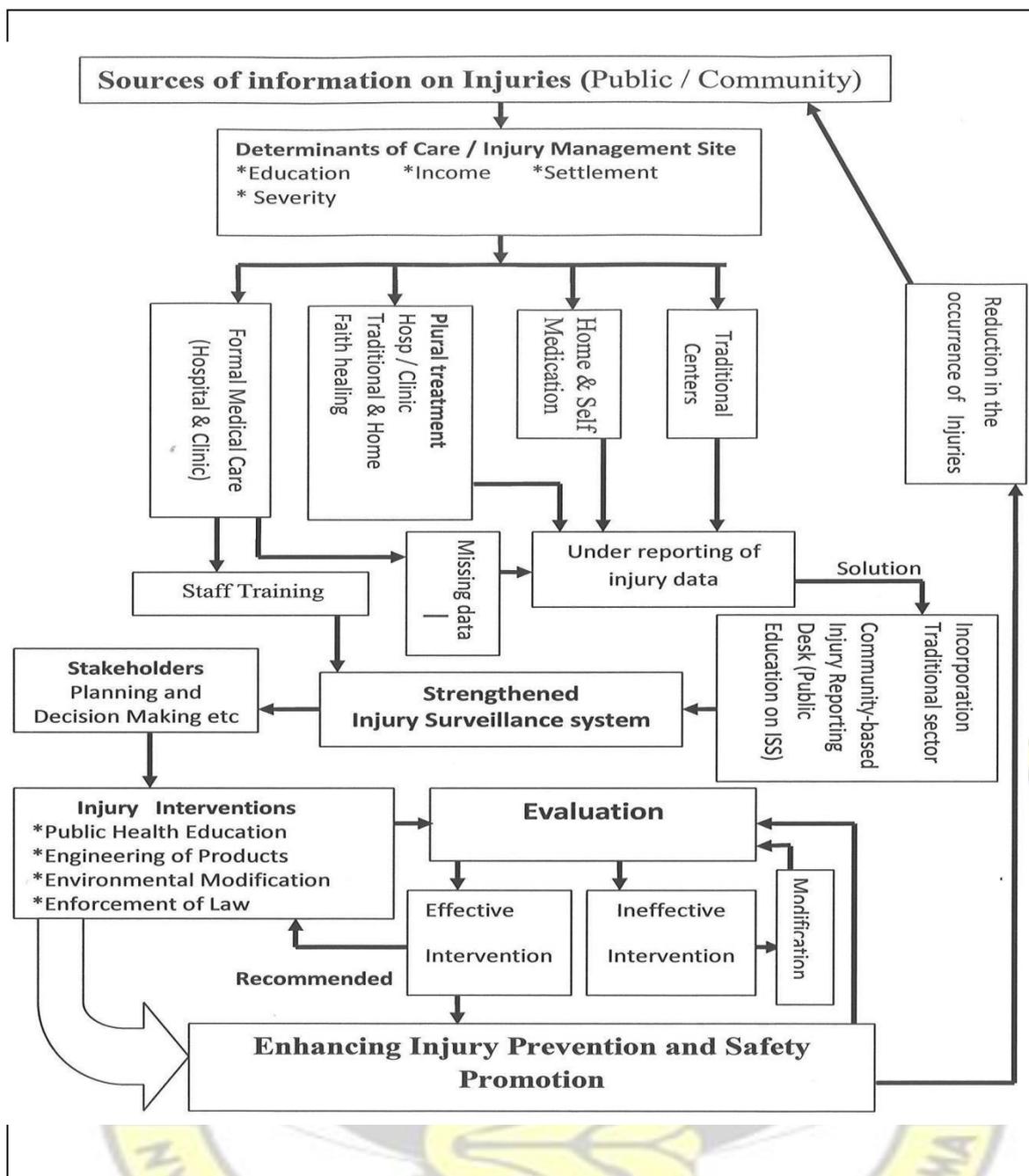
The procedures involved in the development of an injury surveillance system requires a comprehensive framework which identifies the various stages and their linkages. Figure 2.2 shows the World Health Organizations model for the development of an injury surveillance system. This framework is the basis of the development of the conceptualized framework for this study as shown in figure 2.3.

**Figure.2.2: The World Health Organization's model for designing and building a surveillance system**



Source: WHO, Holder et al, 2001

**Figure 2.3: Conceptualized Framework to Strengthen the Injury Surveillance System in the Ejura-Sekyedumase District**



**Source:** Adapted and modified, 2010

Major injuries in rural localities include agricultural related injuries such as lacerations, agro-chemical poisoning, and fall from trees during crop harvesting (Mock et al., 1999b). A number of road traffic crashes normally occur on highways within rural environment. In such an environment, over speeding, mixed traffic and non compliance with road safety measures often contribute crashes and pedestrian knockdowns

(Damsere-Derry et al., 2008). Drowning often occurs at water bodies such as irrigational sites, streams, rivers and wells. Animal bites by snakes, other wild and domestic animals are common in rural environment (Mock et al., 1997).

According to the 1994 -1998 police data, road traffic crash was the leading cause of injuries and related deaths in Ghana. Vast majority of road traffic fatalities (61.2%) and injuries (52.3%) occurred on roads in rural areas and pedestrians accounted for 46.2% of all road traffic fatalities (Afukaar, 2003). The other leading causes of injuries were occupational injuries involving agricultural and industrial workers.

Having defined the problem to be investigated, the next step is to collect data on injuries. In this regard, there is the need to determine the right sources of injury data in a locality. In both the developed and developing nations, source of injury data include the health institutions, the Police, National Road Safety institutions, National Ambulance Services and Statistical Services etc (Rahman et al., 2000).

Effective injury data collection exercise depends on the identification of the right injury data sources. Basically the sources of injury data in rural Ghana (EjuraSekyedumase district) are the injury management centres. Upon the occurrence of injury, the injured person has various treatment options to repair the injury. Injury is managed at the formal health care, the traditional centres or in homes. Occasionally, injury cases are managed with a combination of traditional, formal health care and self medication. Besides the injury management centres, various institutions such as the Police – Criminal Investigation Department, the Motor Traffic and Transport Unit, the Statistical Service, the National Disaster Management Organization and various Non Governmental Organizations manage various categories of injury data.

Among the various treatment options namely the formal health care, traditional practice and home based care, it is only the formal medical system that keeps records on clinical cases including injury data, hence a major contributor to the operations of the injury surveillance system in the district. Records are not kept on injury cases managed at the traditional centres and in homes.

Although under-reporting of injury data in rural Ghana generally emanates from cases managed outside the formal medical services, however a study on injury surveillance in urban tertiary hospital in Ghana showed substantial volume of incomplete records and under-reporting of injury data among the police crash data and hospital injury data (London et al., 2002). Solution to the loss of injury data through the activities of the traditional medical centres lies with the incorporation of the traditional medical system into the injury surveillance system. The creation of the community based injury surveillance system requires an effective public educational campaign to enlighten the general public on the role of an injury surveillance system in injury control in a locality

Injury data may be meaningless until it is properly managed and blended to contribute meaningfully to injury prevention and safety promotion in a locality. The process of blending injury data to achieve safety involves data entry, processing, analyzing and interpretation.

The likelihood to transform the injury data to meaningful tools to support injury prevention and safety promotion initiatives in a locality depend on the mission and aspirations of the centre where injury is managed (Holder et al., 2001). An active injury surveillance centre such as the BRRI in Ghana which is entrusted with the mandate to handle national police accident data is more likely to process injury information, interpret and disseminate injury data much more than a passive injury management

centres such as a private rural clinic with a primary mission of providing clinical services.

Again, staff competence in managing injury data is essential in the processes under injury surveillance since the stage of entering and processing of injury data requires appropriate knowledge and skills on suitable statistical instrument to explore the distribution of injuries within the study area. Injury data could then be entered either onto appropriate database designed for the purpose, or into a computerized database set up to generate daily, weekly, monthly or yearly statistical reports. In Ghana, most health institutions run passive injury surveillance systems, a condition where the management of the injury surveillance system is secondary to the main objective of the institution hence, the collection of injury data may be in fulfillment of administrative requirement (Adofo et al., 2010). Providing technical training to staff at the data collection unit on injury data management has shown a significant contribution to the strengthening an injury surveillance system in a developing nation (London et al., 2002). As part of the intervention to improve staff competence in handling injury data, the study provided technical training on injury data management. Procedures considered include designing injury data collection tools, coding, designing database and data analysis using Epi Info 3.1 version and SPSS version 16.0. Funding was provided in support of six months post intervention trial to ascertain the effectiveness of the intervention.

### **2.10.1 Reporting**

Injury data generated under the surveillance system need to be presented and disseminated to guide formulation of injury prevention policies. This is usually done in the form of written reports, bullets and flyers aimed at stakeholders who are mainly concerned with injury prevention and safety promotion initiatives. Often one report will

suit all intended readers. In some cases several reports, each containing varying levels of details, may be necessary in order to satisfy the requirements of individuals or the general public.

Various stakeholders play significant role in translating injury data into injury prevention and safety promotion through formulation of policies and adoption of preventive interventions. Stakeholders with remarkable contribution to the management of injuries and safety promotion in Ghana are the Ghana Health Service, the Ghana Police Service, the Ghana Road Safety Commission, The Building and Road Research Institute of the Council for Scientific and Industrial Research, the National Ambulance Service and various NGO's such as Amend.org. Stakeholders in the study district who may need the injury data in support of safety initiatives include the District Assembly, District Health Administration, National Disaster Management Organization, District Education Secretariat, Police, and the World Vision International etc.

Various steps under the World Health Organization's injury surveillance model are directed towards safety. The ultimate purpose of an injury surveillance system is to contribute to safety through the identification of patterns and types of injuries and to adopt appropriate method to prevent the occurrence of injuries in a locality (Holder et al., 2001). The results of an injury surveillance system are intended to help stakeholders to respond to the injury problem through the development of new or improving existing policies and strategies for injury prevention or effective interventions (Afukaar, 2003). In this context, the term —planners, can be defined as narrowly or broadly depending on the prevailing conditions. It might be the public, private or Non Governmental Organization working to promote safety in a

geographical area.

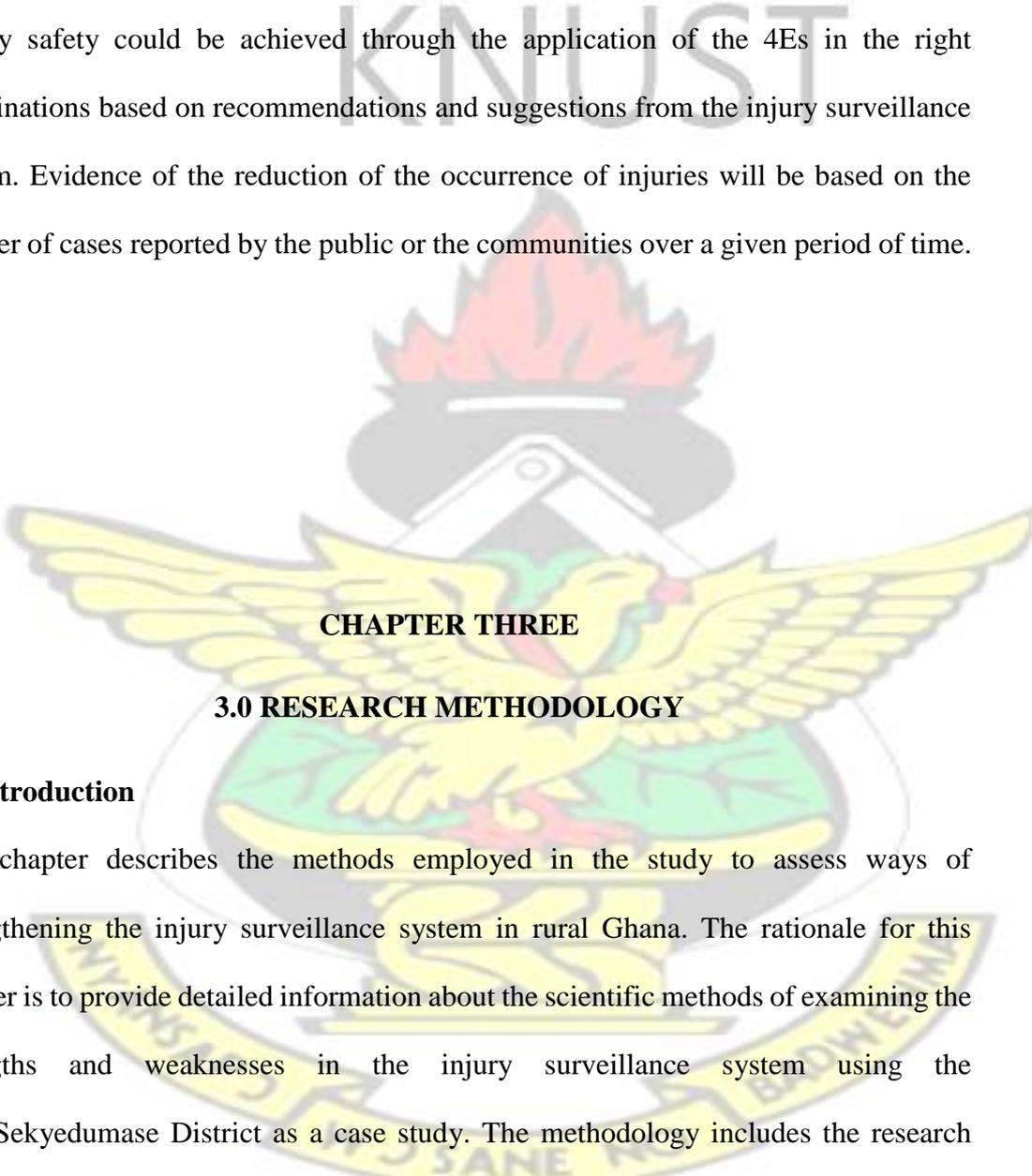
According to the WHO injury surveillance model a good injury surveillance system is assessed periodically to determine the extent of response to changing needs and circumstances. Again, the system needs to be dynamic especially whenever the system is identified to be producing information which may no longer be relevant to the objectives of safety in a locality. Mechanisms for continual evaluation and adjustment should therefore be built into the system at the design stage to cater for situations that may require immediate modifications. The end users of the information produced such as injury prevention practitioners will often be the best judges as to whether or not the system is serving its purposes. Planners should be assured that, the system is receptive to feed back, hence comments and suggestions will attract the appropriate attention.

Keeping the injury surveillance system updated requires an ongoing evaluation of the entire processes involved in the system. Various steps may be repeated whenever flaws or opportunities for improvement are identified. The process of problem definition may include elements which may need to be refined or expanded. As an example, the statistical methods for processing, analysing and interpreting the data could be improved to suit prevailing conditions.

The original injury surveillance model produced by WHO fails to address weaknesses associated with the informal data sources in developing countries especially in rural communities where due to the existence of alternative injury care, injury cases are managed at centres which do not document injury cases. Again, lack of technical skills to manage injury data weakens the capacity of the formal injury data sources to release credible data on injuries.

Injury interventions are evaluated to confirm their capacity of preventing the occurrence of injuries. Positive outcome of interventions are forwarded to stakeholders to decide on the adoption and scaling up of effective interventions. Ineffective strategies are dropped or modified.

Finally safety could be achieved through the application of the 4Es in the right combinations based on recommendations and suggestions from the injury surveillance system. Evidence of the reduction of the occurrence of injuries will be based on the number of cases reported by the public or the communities over a given period of time.



## **CHAPTER THREE**

### **3.0 RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter describes the methods employed in the study to assess ways of strengthening the injury surveillance system in rural Ghana. The rationale for this chapter is to provide detailed information about the scientific methods of examining the strengths and weaknesses in the injury surveillance system using the EjuraSekyedumase District as a case study. The methodology includes the research design, operationalisation and measurement of the study variables, sampling method, data collection procedures, data entry and analysis and interpretation. The chapter also present methods used to improve injury surveillance system to make injury data readily available to support safety and injury prevention programmes.

### **3.2 Scope of the Research**

To assess the existing injury reporting situation in order to identify the key institutions and their challenges to guide the development of training modules to train health staffs with the view of improving injury reporting in rural Ghana. .

### **3.3 Study Population**

Study populations include injury patients (households), health staffs and stakeholders in the field of injury prevention and safety promotion.

#### **3.3.1 Inclusion Criteria**

The inclusion criteria for study participants were all persons who had sustained any form of injury either intentional or unintentional due to the various injury mechanisms namely, road traffic crash, vehicle knockdown, motorcycle crash, bicycle crash, gunshot, poisoning, drowning or asphyxia, violence and thermal etc, from 1<sup>st</sup> January to 31<sup>st</sup> December, 2009 which resulted in at least one day of incapacitation. With respect to individual who sustained multiple injuries within the immediate past twelve calendar months, the most recent episodes were considered. Injury cases considered under the study were those which occurred within the borders of the Ejura – Sekyedumase district.

#### **3.3.2 Exclusion Criteria**

Again, an injury case which occurred beyond the borders of the district or elsewhere and was managed in the district was excluded. The study did not consider injury cases which were not available for inspection; hence injuries resulting in deaths were also not included.

### **3.4 Research Design**

The study employed an interventional design preceded by cross sectional survey that investigated into public appreciation and patronage of the existing injury surveillance system in the Ejura-Sekyedumase District. Stakeholder interview was conducted to explore the strength and the weaknesses of the injury surveillance system with the view to determine pathways to improve injury reporting in the Ejura-Sekyedumase District.

### **3.5 The Intervention (Provision of Training on Principles of Injury Data Management)**

The intervention consisted of a two-hour daily training programme for one week on how to design and record injury cases on a simple questionnaire, data entry with Epi data and analysis with SPSS software respectively. The programme started at 3oclock in the afternoon when the hospitals had closed and lasted for two hours. The entire staff at the Records Unit of the two hospitals attended the training programme.

The records staff capacity at the Ejura Government Hospital and the St. Luke Mission Hospital were 11 and 8 respectively. The Ejura hospital had 4 males and 7 females. The youngest staffs were 21 years old whilst the oldest person was 56 years old. The mean age was 32 years. The Kasei Records Unit had 3 males and 5 females. The oldest person was 45 years old and the youngest was 23 years old. The mean age was 27 years. The heads of the record units were appointed as the coordinators of the intervention.

Two records staff were assigned to attend to the in-patient and out-patient logbooks daily to extract information on every injury case reported to the two hospitals within the study period (1<sup>st</sup> July to 31<sup>st</sup> December 2010). The staffs were then guided to process the injury data (questionnaire sorting and coding, data entry, screening, coding, analysis and interpretation of results). Both the pre and post intervention reports were

compared to determine the magnitude of improvement between the two reports (Baseline and the post intervention results).

### **3.6 Limitations of the Study**

The study was a household survey hence injury cases among homeless migrants in the streets were not captured. It is believed that injuries due to criminal activities such as violence and armed robbery were deliberately hidden and were not disclosed by the victims to avoid arrest and prosecution by the police.

Finally, the study relied on respondents reports and there was no strong basis for verification of vital information such as the duration of incapacitation. Some respondents did not document events on their injuries hence; some of the accounts were based on estimations.

### **3.7 Assumptions**

- It was assumed that every injured patient in the Ejura-Sekyedumase district had equal chance of being included in the study.
- Information provided by the injured persons were accurate
- Injury cases considered took place in the study area.
- All respondents had at least a single injury episode over the past twelve calendar months

### **3.8 Assessment of the strengths and weaknesses of the injury surveillance system**

An assessment of the strength and weaknesses of the injury surveillance system was conducted through a baseline survey on the procedures involved in the methods of injury reporting and documentation among the principal custodians of injury data. The assessment was conducted by comparing the general procedures involved in injury data management and processing with the World Health Organization's standards.

Assessment of the strength and weakness of the injury surveillance system helped in measuring the gap between the actual and the expected output. Systems with adequate resources provide reliable injury data which contributes to safety. However, limited resources comprising absence of logistics, low funding support and lack of human competence to manage a surveillance system may constitute internal weakness. A major external challenge could be low public patronage of the services of the system. In settings where the general public is less informed about the role of the injury surveillance system in injury control and safety promotion, patronage may be very limited. Under such conditions, injury data to be generated may not be sufficient enough to represent the real burden of injuries in the district. The identification of the strengths and weaknesses of the injury surveillance system is necessary to address the exact problems facing the system in a locality.

### **3.9 Methods of Strengthening the Injury Surveillance System**

Procedures involved in strengthening the injury surveillance system include, a baseline investigation on the procedures involved in documentation, processing of injury data and the mode of dissemination of information on injury at the Ejura Government hospital and the St. Luke Mission hospital at Kasei since these health institutions were the main centres where a wide range of injury cases were managed in the district. Based on the deficiencies identified during the preliminary investigation (baseline results), an intervention in the form of a training programme on principles of injury data management was organized for the staffs of the records units of the Ejura Government hospital and the St. Luke Mission hospital at Ejura and Kasei respectively. Further investigations in the form of a survey among injury patients and stakeholders were conducted to solicit broader views on the challenges facing the injury surveillance system to guide the development of appropriate strategies to fully improve the

operations of the injury surveillance system in conformity with the World Health Organizations' minimum standards.

The intervention method consisted of a two-hour daily training programme for one week on how to design and record injury cases on a simple questionnaire, data entry with Epi data and analysis with SPSS software respectively. The entire staff at the Records Unit of the two hospitals attended the training programme. The programme started at 3-o'clock in the afternoon when the hospitals had closed and lasted for two hours. Two records staff were assigned to attend to the in-patient and out-patient logbooks daily to extract information on every injury case reported at the two hospitals within the study period (1<sup>st</sup> July to 31<sup>st</sup> December 2010). The staffs were then guided to process the injury data (questionnaire sorting and coding, data entry, screening, coding, analysis and interpretation of results). Both the pre and post intervention reports were compared to determine the magnitude of improvement between the two reports.

### **3.10 Measurement of Economic Status and injury severity**

#### **3.10.1 Determination of Economic Status**

In determining the economic position of households, the study considered household assets, income level, dwelling materials, source of water, source of energy and toilet facilities. The SPSS statistical software (Principal Component Analysis) was used to rank household economic status into high, medium and low levels.

#### **3.10.2 Determination of Injury Severity**

Basis of determining of injury severity was the period of hospitalization. Injury severity was classified into severe, moderate and minor in respect to the disability days.

### 3.11 Sampling

The estimated population at Ejura-Sekyedumase District as at January 2009 was 109,594 and the target population from which the sample was drawn is 20,170 (Estimates based on 2000 Ghana Statistical Services Report on the 2000 Population and Housing Census). The sample represents 0.59% of the total population and 5% of the target population. Households for interview were selected by a multi-stage cluster sampling method, with probability proportional to size. This is a modification of the methods used in the World Health Organization's (WHO) Expanded Program on Immunizations (Lemeshow and Robinson, 1985). This sampling method has been used extensively in developing countries and has been found to provide a high degree of statistical precision in settings like the Ejura-Sekyedumase District where accurate listings of individual households are not available. In the first stage, five out of the seven sub-districts were randomly selected. In the second stage, 12 communities were selected from the 5 selected sub-districts relative to their population sizes. At the third stage, research assistants visited each of the selected communities and randomly selected a group of households to be interviewed. The reference point for house selection was the entrance to the Chief's Palace. A coin was tossed to determine the starting point of the survey. In the absence of an injury case in the selected household, the next immediate household was selected until an injury case was found. The process continued until the allocated sample size for the selected community was exhausted. Information was sought on only individual household member who had experienced injury within the previous year (January – December 2009). Based on this assumption, only patients or persons (in community) who were selected and consented to be part of the study were interviewed. This strategy helped to avoid redundancy, improved distribution of sample and reduced design effect as demonstrated by Brown et al., 2002.

### 3.12 Sample Size Determination

$$n = \frac{z^2 pq}{d^2}$$

$d^2$

**Source:** Bartlet, 2001

Where:

$n$  = the desired sample size (when population size is greater than 10,000)

$z$  = the standard normal deviate (95% C.I)  $p$  = the proportion of the population (0.5)

$q = 1.0 - p$   $d$  = degree of freedom,

usually set at 0.05  $n = (1.96)^2 (0.50)$

$$(0.50) = \frac{600.25}{(0.05)^2}$$

$$(0.05)^2 \quad n$$

$$= 650$$

Based on the calculated sample size, a total number of 650 persons who had sustained various forms of injuries were randomly selected for the interview.

**Table 3.1: Sub-districts and the selected communities for the survey**

Sub districts	Selected communities	Population Size	Percentage sample to Population	Subsample
Ejura	Ejura	44,548	45.1	293
Sekyedumase	Asuyeboah	24,387	25.0	163
	Nkrapo			
Nkwanta	Kasei	17,847	18.0	117
	Ghana Akura			
	Hianoanwo			
Anyinasu	Aframso	7,423	7.3	49
	Anyinasu			
	Duayase			
Kyenkyenkura	Kyenkyenkura	4,486	4.3	28
	Dwenwoho			
	Yayakura			

<b>Total</b>	<b>12</b>	<b>98,691</b>	<b>100</b>	<b>650</b>
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**Source;** Authors Construct

The sample is based on the selected community's population size to the overall population size in the district (Population and Housing Census report 2000) as shown in Table 3.1

Any injury occurring to household members during the previous year (1<sup>st</sup> January – 31<sup>st</sup> December 2009) that resulted in at least one disability day (Inability to perform normal activity due to the injury) were considered. Under this study, disability is referred to a condition under which the injured had not regained the pre-injury functional status (International Classification of Diseases, WHO, 1980).

### **3.13 Data Collection Techniques and Tools**

The data collection was carried out in May – June 2010. Quantitative and qualitative data were gathered in support of the study. The quantitative data was obtained by means of a structured questionnaire. Major sections of the questionnaire were precoded. However, provision was made for additional response in order to accommodate broader views from the respondents.

The questionnaire was made up of four sections with forty-one questions. Section —A| was the socioeconomic background information of the respondent. Sections —B| and —C| investigated into the occurrence of injuries and management of injuries respectively. Section —D| examined the injury burden and finally the section —E| was mainly on the knowledge on injury surveillance system and methods of improving the system in the Ejura-Sekyedumase District.

### **3.14 Pre Testing**

Thirty questionnaires were pre-tested at Serwakura in the Ejisu- Juaben district to assess the strengths and weaknesses of the tools for data collection. The communities where the questionnaires were pre tested were akin to the Ejura –Sekyedumase district in terms of population structure, occupation and infrastructural development. Some of the weaknesses identified with the questionnaires during the pretesting were as follows:

- Respondents were reluctant to disclose the exact monthly income
- Magnification of the degree of injury severity
- Inability to recall the full days of incapacitation
- Language problem among the recent settlers from northern Ghana.
- Speculation that the use of herbal medicine by the injured may lead to arrest by the Police.

Appropriate corrections were made to make the questionnaire effective for the study.

### **3.15 Selection of Research Assistants and Data Collection Exercise**

Ten Community Health Volunteers were selected from the selected sub districts and were trained for two days on methods of administering the questionnaires. Demonstrations were performed on how to approach a household, self introduction, questionnaire administration and data handling. Letters of introduction and explanation of the objectives of the study were given to the field workers for selfintroduction to respondents.

The questions were written in English language however, during the field training session, the questionnaire was translated into Twi and Hausa languages since these languages are widely spoken in the district. Three out of the ten field staff speak the two languages hence they assisted in interviewing respondents who were not able to

explain their injury experiences in Twi or English very well. Literate respondents were allowed to fill out the questionnaires themselves.

A consent form was written in English language and translated into Twi (Asante) and Hausa. Every respondent endorsed the consent form either by signature or thumbprint before participating in the exercise. With respect to injured patients who were less than 18 years, parents or guardians as well as a matured family member endorsed on their behalf. Participants were made aware that, participation in the survey was voluntary, and participants could decide not to respond to sections of the questionnaire or may withdraw their participation at any point in time. Respondents were assured that, their responses would be treated as confidential. The maximum time for the questionnaire administration was twenty- five minutes.

### **3.16 Key Informants Interviews**

The second phase of the field work was the interview with key personnel selected from health institutions, the Police and Motor Transport and Traffic Unit officers since these institutions meet the minimum requirements of injury surveillance system in the district. Personnel interviewed included the District Director of Health Services, the Deputy District Director of Health Services, the District Disease Control Officer and his assistant, four officers from the District crime office of the Ghana Police Service and four officers from the MTTU Office. The rest were the two Health Administrators at the Ejura Government Hospital and the St. Luke Mission Hospital, the two heads of the Records sections and the two Medical Officers from the two hospitals and four community-based Disease Surveillance Volunteers. A total of 24 key informants were interviewed. The key personnel interview was very important in determining the strength and weaknesses of the injury surveillance system in the Ejura-Sekyedumase District. The purpose of the discussions with the District Police was to find out the

reasons why many people fail to report injuries to the institutions under the injury surveillance system and the police. It was also to assess stakeholders' knowledge on the use of injury data and the extent of applying injury data in injury prevention in the district.

During the stakeholders' discussions, matters considered included the injury reporting behaviour of the injured persons and factors affecting their decisions and preferences.

Again, it was to determine the appropriate methods of upgrading the staff capacity to overcome the challenges facing the injury surveillance system in the district.

### **3.17 Data Processing and Analysis**

The data gathered from the study communities were entered onto Epi data 3.1 databases. Data was cleaned through running programmes on logical values and consistency checks. Data was then exported to the Statistical Product and Service Solution (SPSS 15<sup>th</sup> version) for the final analysis.

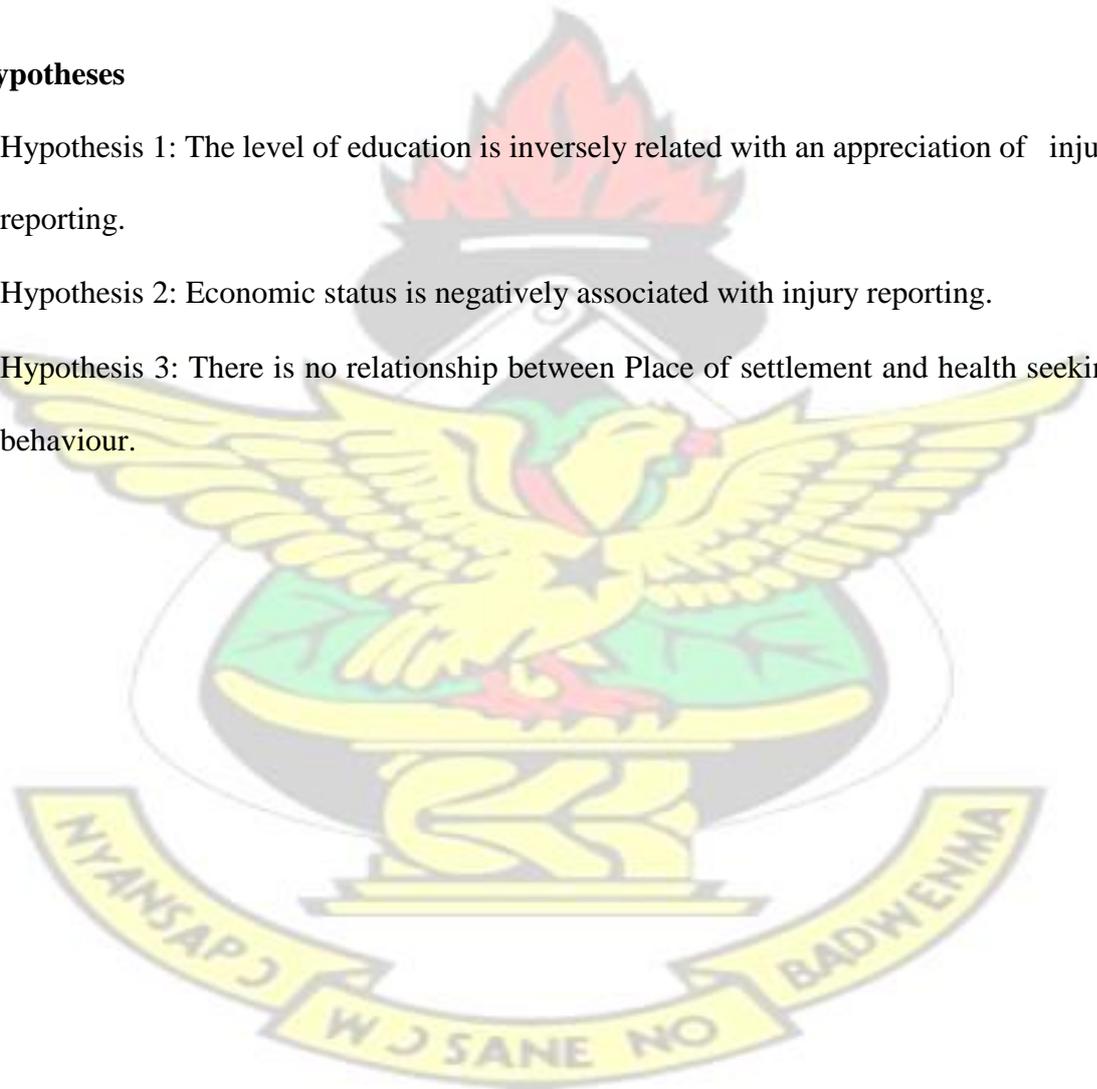
Descriptive statistics were used to summarize and display results in tables and charts. Major statistical method employed to interpret the findings was frequency tables. Chi square and logistic regressions were used to find the relationship between independent and dependent variables. The testing of the hypothesis of the study was set at 95% confidence interval (CI) and significance level of  $p < 0.05$ .

The main independent variables were the severity of injury, settlement type, level of education and level of income of the respondents. The dependent variable was injury reporting attitude of the respondents. Principal Component Analysis was used to assign weights to specific variables to determine socio-economic status of respondents.

With respect to the qualitative data, purposive sampling method was used to recruit participants and informants for the Key Informants Discussions. The interviews were recorded by a note taker and taped with permission from participants. Interviews were recorded and transcribed verbatim and analysed thematically. Salient quotes were used to stress on key issues. Recorded interviews were transcribed verbatim in the language used in the interview. The qualitative data were thematically analysed using variable matrix, flow charts and relevant quotes to highlight results.

### 3.18 Hypotheses

- Hypothesis 1: The level of education is inversely related with an appreciation of injury reporting.
- Hypothesis 2: Economic status is negatively associated with injury reporting.
- Hypothesis 3: There is no relationship between Place of settlement and health seeking behaviour.



## CHAPTER FOUR

### 4.0 PROFILE OF THE STUDY AREA

#### 4.1 Introduction

This chapter discusses the study area in terms of its physical background – location and size, climate, vegetation, geology and soil etc. Other features discussed include the socio-economic factors, population characteristics, settlements, education, health, water and sanitation as well as economic activities. The chapter again seeks to establish a link between the physical features, population and social and economic activities and the occurrence of injuries and associated public health problems in the Ejura-Sekyedumase District.

#### 4.2. Physical Characteristics

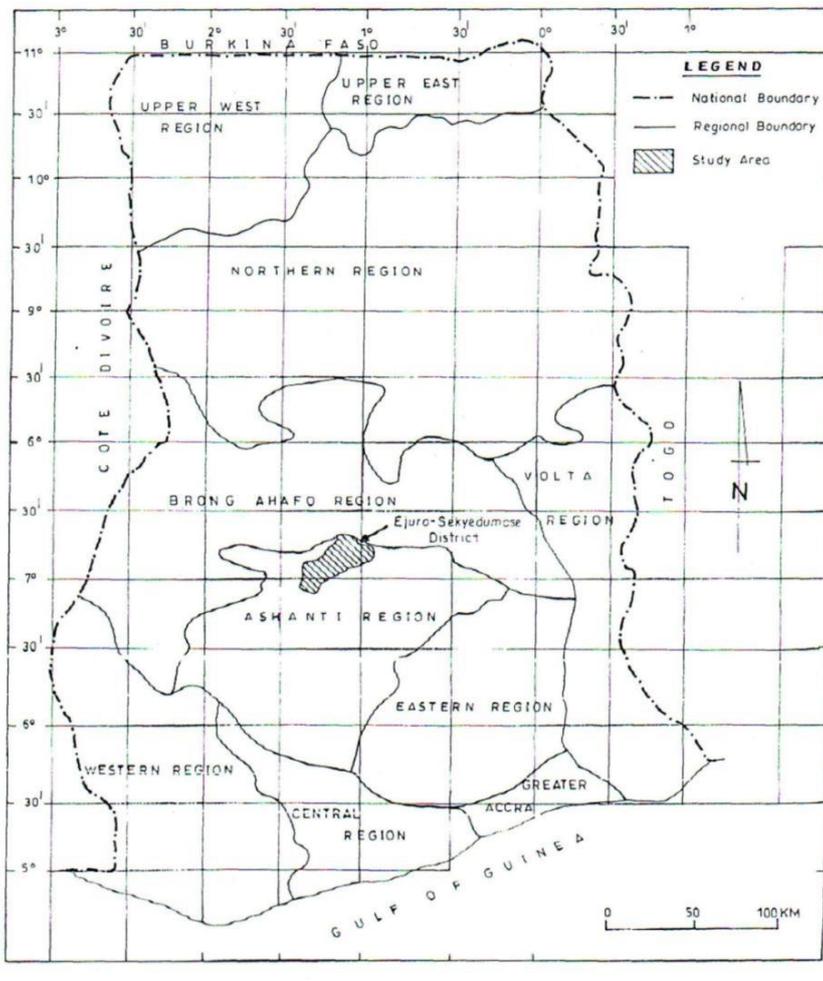
##### 4.2.1 Location and Size

The Ejura-Sekyedumase District is located within longitudes  $1^{\circ}5'W$  and  $1^{\circ}39' W$  and latitudes  $7^{\circ}9' N$  and  $7^{\circ}36'N$ . It is in the northern part of the Ashanti Region, sharing borders with Atebubu and Nkoranza Districts to the north, Sekyere West District to the east, Afigya Sekyere District to the south and the Offinso District to the west as shown in figure 4.1b. The Ejura-Sekyedumase District covers a total area of 1,782 square kilometres, constituting about 7.3% of the total land area of the Ashanti Region, making it the fifth largest district among the twenty-one districts in the Ashanti Region (Ministry of Local Government, Rural Development and Environment Report, 2006). Ejura is the administrative capital of the district, which is about 98 kilometres north of Kumasi, the Ashanti Regional capital.

Its location in the northern part of Ashanti region makes it close to the three northern regions in Ghana (Northern, Upper East and Upper West regions) as shown in figure

4.1.and 4.2.

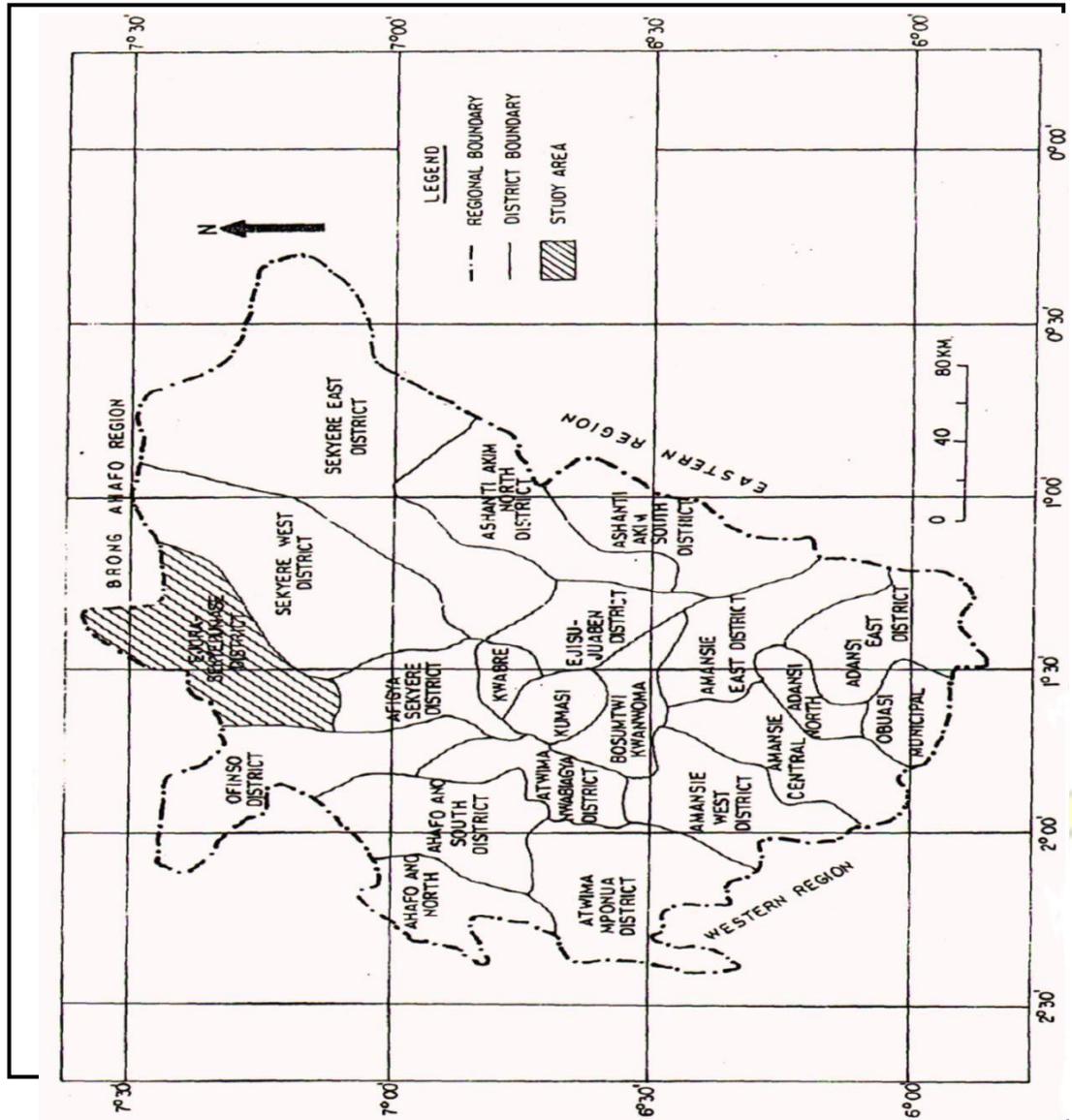
**Figure 4.1: Map of Ejura-Sekyedumase District in National Context**



**Source:**Ejura –Sekyedumase District Assembly, 2010

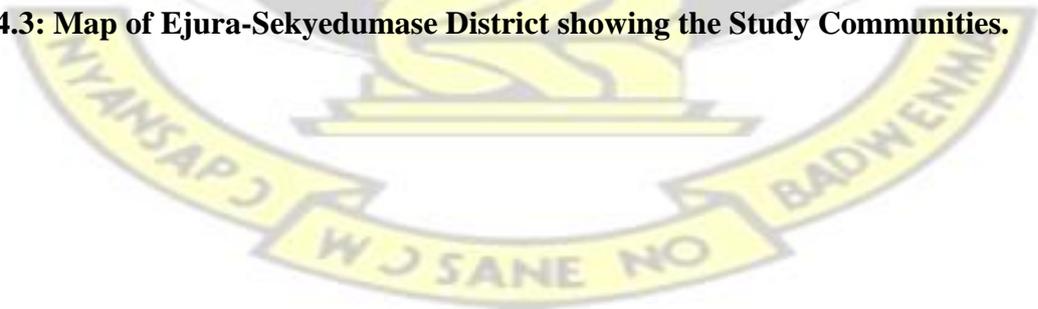
The district occupies a nodal position on the eastern corridor on the Kumasi-Yeji Tamale highway as shown in figure 4.3. The seasonal heavy traffic especially during the peak farming season often leads to increased road traffic crashes in the district. Many road traffic crashes often take place during the market days for the various communities along the Yeji highway. Factors accounting for the vehicle crashes include overloading, over speeding and drunk-driven (Ejura-Sekyedumase District Police Report, 2009). There is therefore the need to improve injury documentation to yield credible injury statistics to support decisions on injury prevention and safety promotion

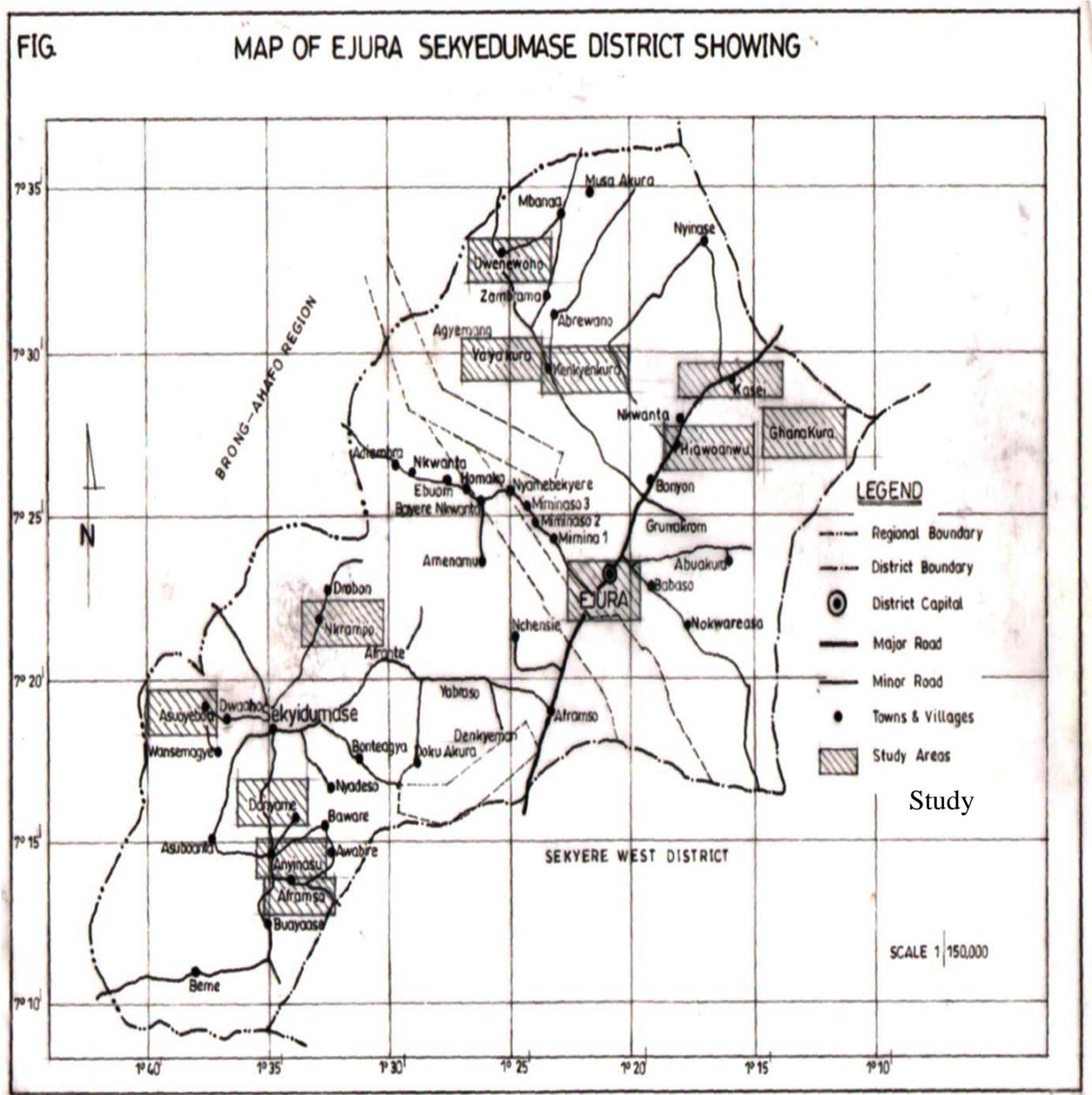
**Figure 4.2 Map of Ashanti Region showing Ejura-Sekyedumase District.**



Source: Ejura-Sekyedumase District Assembly, 2010

**Figure 4.3: Map of Ejura-Sekyedumase District showing the Study Communities.**





**Source:** Ejura-Sekyedumase District Assembly - 2010

Figure 4.3 is the map of Ejura-Sekyedumase district showing 12 communities where the respondents for the household survey were selected from.

#### 4.2.2 Climate

Ejura-Sekyedumase District lies within the transitional zone of the semi-deciduous forest and Guinea Savannah zones. The southern and the northern parts of the district experience forest and savannah climatic conditions respectively. The district is marked

with two rainfall patterns; the southern part of the district has the double maxima rainfall pattern and the northern sector experiences the uni-modal rainfall pattern. The climatic conditions in the district together with the topographical layout are a favourable condition for the cultivation of food crops.

Solar radiation is very high during the dry season between November to January when the north-east trade winds blow dry and dusty winds across the entire district. Also the derived form of savannah vegetation at the northern part of the district supports the cultivation of cereals. The district experiences both equatorial and savannah climatic conditions due to its location in the transitional zone (Benneh and Agyepong, 1990). Temperatures are generally high throughout the year, with average of 30°C for all months, except July and August, which often record below 25°C. Relative humidity is also high, with an average of 75%-80% during the rainy season. The main rainy season is between April and November. Annual rainfall varies between 1,200mm and 1,500mm. The district experiences the double maxima regime pattern of rainfall. The major rainy season occurs between April and July, whilst the minor is between September and November. During the rainy season the risk of injury associated with drowning increases as streams, rivers, ponds and several drainage basins get flooded. A study on rural drowning in China showed that most drowning in rural communities occurred in rivers, ponds or lakes close to schools or homes. Flooding during the rainy season could therefore be classified as a major risk of drowning to the rural populations (Li Yang et al., 2007). Generally, drowning is preventable. Installation of fences around swimming pools and proper child care could help reduce the incidence of drowning (Pitt and Balanda, 1991). Epidemiological studies have found that lack of effective barriers between the water body and a victim is a major risk factor of drowning (Bugeja and Franklin, 2005).

### **4.2.3 Vegetation**

Two types of vegetation are found in the district. These are semi-deciduous forest in the south-western and open or derived savannah in the north-eastern part. The vegetation characteristics in the district are to a large extent dictated by the topography. The Ejura scarp and sections of the highlands are forested with varied tree species which are harvested under the Forestry Timber Concession permission. Timber lumbering and logging often contribute to the burden of injury in the locality. In rural areas, most of the workers in the logging and lumbering industry do not have the requisite safety skills to avoid injuries. Employees acquire safety skills through years of apprenticeship and experience. In some cases, many workers enter logging and lumbering industry as traders and not as a trained wood industry worker with requisite professional knowledge. The mode of operation in the wood industry expose the wood workers to various levels of occupational hazards (Bello et al., 2010).

The lowlands are grassland with dispersed trees whilst the northern part is covered with sparse derived deciduous forest vegetation. Growth of the savannah vegetation is largely attributable to the high increase in shifting cultivation; bush fallowing, bush burning and overgrazing of livestock in the district. The savannah vegetation at the northern part of the district supports the cultivation of cereals and nomadic activities. During the dry season, the savannah vegetation is often set ablaze in search of game meat and to enhance growth of fresh pasture for cattle. Uncontrolled bush fires sometimes result in burns related morbidity, mortality and destruction of properties (Courtright et al., 1993).

### **4.2.4 Geology and Drainage**

The landscape in the southern part of the district is fairly rolling with valleys and peaks. Averagely, the valleys have a depth of about 135m whilst the peaks rise to about 315m

above sea level. The highest point in the district is made up of a range of hills found in the eastern part of the district and passes through Ejura and Mampong, forming part of the Kintampo-Koforidua ranges. Some of the hills found in the EjuraSekyedumase district include; Kwasi Mahu hills (1,350), Ejura chem scarp (1,000) and Dente scarp (rock outcrop) which accommodate a greater part of the district's forest reserve on and around the scarp. On the other hand, the northern part is undulating and fairly flat with heights ranging between 150-300m.

The rock type in the district is of the Upper Voltaian series, which consists mainly of sandstones. The Pre-Cambrian Upper Birimian rock series is made up of shale and mudstone (ESDA, 2006). The generally relatively low-lying and undulating nature of the land is suitable for both subsistence and mechanized farming. The extraction of rocks for construction and varied purposes often results in injuries especially when the right safety measures are not observed.

The district is drained by Afram, Akobaa, Chirade, Bresua and their primary and secondary tributaries. The drainage system conforms to the dendritic pattern and flows from northwest to southeast direction. These water bodies are the main sources of water for domestic, agricultural and industrial activities in the district. The drainage conditions imply great potential for mechanised and irrigation farming which promote all-year farming and could substantially increase yields and profit margins of the farmers. The drainage system is the major risk factor of drowning in District. The absence of fence and other protective devices around sources of domestic water bodies increase the risk of drowning among children and young adults (Rahman et al., 2009). Then again, the use of poisonous chemicals for fishing, especially during the dry season poses serious threat to human, livestock and aquatic life in the district.

#### 4.2.5 Soil

The soils in the district are generally well drained, deep, light in colour, well-aerated and rich in organic matter and plant nutrients (Nsiah-Gyabaah, 1996). Soils in the district are of the Savannah ochrosol type which is mainly made up of sandy loam or clay. The soil is easy to till and specially suited for mechanized farming. The type of soils found in the forest zones of the district are the forest ochrosol type. These soil types tend to support the cultivation of food and cash crops. Root tubers such as yam and cocoyam as well as cereals such as maize do well especially in such soils (Benneh and Agyepong, 1990).

Various types of soil contribute to the occurrence of injuries in the district. A good example is clay. The clay soil is a common cause of fall among elderly and children at homes, footpaths, and other places. Exposed lateritic surfaces are serious risk factors for vehicle crash on farm and village roads. During such crashes, many people sustain various degrees of injury with different levels of disabilities (Mock, 2003). The presence of fertile soil and availability of arable land serve as a —pull factor to the migrant farmers from the three northern regions to settle in the district especially during off farming seasons in northern Ghana. Increased agricultural activities in the district have resulted in numerous agricultural injuries. The major farm tools used in the district, cutlasses and hoes, are known to be the leading cause of lacerations and wounds in Ghana and other African countries. Specifically, laceration is a common injury among farmers in rural environments (Kobusingye et al., 2001, Mock et al., 1999b). The injury burden in the district is compounding since most injured persons do not seek formal medical care hence many injury conditions often result in avoidable disabilities. Then again, the existence of large hectares of loamy soils in the drainage basin of the major rivers such as Afram has necessitated market gardening along the rivers

especially during the dry season. Many drown cases are associated with irrigational activities since anti drowning measures are sometimes not put in place to prevent children and inexperienced people from drowning (Li Yang et al., 2007).

### **4.3 Socioeconomic Characteristics**

#### **4.3.1 Population Size and Distribution**

The Ejura-Sekyedumase district has 16,402 households. The average household size for the district is 5.1 which is comparatively higher than the regional average of 4.2.

The rural area has a household size of 5.5 whilst the urban households size is 4.8 (GSS, 2002). Household composition refers to the patterns of relationships between the head of household and other members of the household comprising spouse (husband or wife), children including grandchildren, parent or parent-in-law, brother/sister and other relatives and non-relatives.

The total housing stock in the Municipality is 9,670 with 60.8 percent of them in the rural areas and only 39.2 percent in the urban areas. The number of persons per house is 8.7 which is comparatively higher than the regional average of 8.1. This means that about nine persons live in each house in the Municipality. There are 11 persons per house in the urban areas while the rural areas have an average of 7.2 persons per house.

Ejura-Sekyedumase district has a population of 88,753. Between 1984 and 2000, the population increased from 60,997 to 88,753 with an average annual growth rate of 3.2 %. The growth rate varies from 4.2% in 1960 to 3.6% in 1970-1984 and 1.8% between 1984-2005. The sudden drops in the growth rates between 1984 and 2004 could possibly be due to the incidence of migration which is prevalent. The variations in the growth rate is attributable to the fact that the district serves as the immediate- link between the north and the south hence harbours most northern extracts that are in search

of greener pastures especially during the off farming season in northern Ghana. Rainfall pattern is a significant factor determining the volume of migration. Stable and timely rains necessitate bumper harvest which creates wide range of employment to migrant farm labourers from the north. The wide range of employment opportunities ranging from land cultivation, harvesting and processing of crops serve as a strong pulling force of labour to the district. Majority of the migrants are in their reproductive age hence they tend to contribute directly to the population growth rate in the district.

The age-sex structure of the district population is typical of the rural Ghanaian situation. The population pyramid has a broad base which tapers to the top. Males slightly outnumber their female counterparts. Males constitute 51.7% whilst females constitute 48.3%. This is the opposite of the national figures (males- 49% and females-51%). Within the female populace, 39% are within the reproductive age group (15-49 years).

The economically active group constitutes 53% of the population. Forty percent fall under the school going age (4 - 20 years) whereas the aged constitute 7% of the total population. This brings the dependency ratio to 1:0.89. This implies every 100 persons cater for themselves and an additional 89 persons. The injured persons among the dependent population depend on the economically active population for the management of their injuries. This shows the extent of magnitude of the burden of injury in the district. The population in the Ejura-Sekyedumase district is unevenly distributed in terms of urban - rural consideration. Out of the district's 130 settlements, only two (Ejura and Sekyedumase) are urban centres with the rest being rural settlements. This gives the District a rural status with the associated forms of injuries such as laceration, agrochemical poisoning and animal bites as well as fall (Kobusingye et al., 2001).

The Ejura-Sekyedumase District is divided into five zones namely, Ejura Urban Council, Sekyedumase Area Council, Dromankuma- Bonyon Area Council, Kasei Area Council and Ebuom Area Council. It is estimated that more than 40% of the total populace are resident in the three major urban centres- Ejura, Sekyedumase and Anyinasu with the remaining 60% in the rural centres. It is estimated that majority of injury cases may not be captured under the injury surveillance system due to greater preference of the services of the traditional medicine and bonesetters (Spangenberg and Mock, 2006).

#### **4.3.2 Settlements**

Settlements are not evenly distributed over the entire surface area in the district. The Ejura-Sekyedumase District has been divided into five zones namely, Ejura Urban Council, Sekyedumase Area Council, Dromankuma- Bonyon Area Council, Kasei Area Council and Ebuom Area Council. It is estimated that more than 40% of the total populace reside in the three major urban centres- Ejura, Sekyedumase and Anyinasu with the remaining 60% in the rural centres. The three urban centres namely Ejura, Sekyedumase and Anyinasu with total land size of 760sq.kms are densely populated. The rural communities which have a total surface area of 1022sq.km are sparsely populated. On the average, the Ejura-Sekyedumase district has a population density of 50 persons per square kilometre which is far below the national population density of 90 per square kilometer. Out of the district's 130 settlements, only three communities are urban, and this gives the district a rural status. Known rural injuries such as laceration, bites and agro-chemical poisoning are common among agricultural workers in the district (Mock, 2005).

### 4.3.3 Education

The district has a total of 58 nursery/kindergarten schools with an enrollment of 3280; 75 primary schools with an enrolment of 11,341; 32 junior high schools with 2861 students; two senior high schools with 508 students; and one tertiary institution (Ejura Agricultural College) with 60 students. There is also a total number of 519 teachers (372 males and 147 females) in the district (ESDA report, 2006). The secondary and tertiary institutions are all located in the urban settlements, thereby making accessibility to higher education a problem for the rural population. Vast majority of the students ride on bicycles along footpaths, feeder roads and major highways to and from school. The over speeding and non observance of road safety measures often result in bicycle crashes and pedestrian knockdowns among school children in the District (Forjuoh, 2003).

Educational facilities in the district are generally poorly developed. Some of the physical structures for some schools especially basic schools in many rural communities expose the school community to numerous injury risk factors. Some of the risk factors include exposed nails, hanging roofs and cracked walls which collectively are potential injury mechanism which could injure the users of the facility. Harmful insects and reptiles occasionally disrupt classes which are organised under trees and other open spaces on school compound. School participation rate in the district is estimated at only 25%, while drop-out rate is over 70% (EjuraSekyedumase District Assembly Report, 2006). Illiteracy is very widespread, with estimated 32% being literate(GSS, 2002). This situation leads to problems of ignorance, misconceptions and superstitious beliefs about the occurrence and management of injuries as many people describe the occurrence of injury as

=accident' or act of nature hence unpreventable, once it is destined to occur, it will happen irrespective of safety measures. Safety has therefore not been given little or no attention.

Illiteracy is the fundamental principle underlying the inability of many farmers to read and understand simple instructions on safe application of agro-chemicals and operation of agricultural machines. Non observance of safety measures due to ignorance and lack of appropriate knowledge on mode of operation of specific farm equipment often result in preventable injuries among farmers in the district.

#### **4.3.4 Economic Activities**

The predominant economic activity in the district is farming comprising of crop cultivation and livestock production. The sector alone employs about 70% of the labour force. Major crops produced are maize, yam and vegetables, mainly practiced on subsistence level using simple farm implements such as cutlass and hoes. These simple farm tools are the leading cause of lacerations among farmers. Other challenges facing farming activities include high cost of land, depletion of soil fertility, high dependence on the weather, lack of agro-processing industries, insufficient storage facilities and low producer prices for farm produce, leading to low returns for farmers. For this reason many farmers have become poor. Injured farmers therefore find it difficult to pay for appropriate medical services which could provide the right injury management and effective cure. Many injured farmers therefore resort to the informal medical services and herbal treatment with serious consequences such as infections and prolonged disability days.

Commercial activities flourish in the main urban centres. Beside various kinds of agricultural products, ranging from tubers, grains, and livestock, imported and locally

manufactured goods such as building materials, automobile parts, textiles and light weapons such as ammunitions etc. are sold in quantities in respect to the existing population and demand sizes in urban and rural communities in the district. The service industries constitute a small fraction of the economic activities in the district. These include civil / public services, artisan and road transport services. Trading employs about 27% of the population. Weekly markets are held on Mondays at Ejura, Thursdays at Sekyedumase, and Tuesdays at Anyinasu. Transportation plays an important role in the economic activities in the district. Both motorized and nonmotorized vehicles are used in transporting goods and passengers to various destinations in the district within and beyond the district. Poor road conditions, overloading of both passenger cars and cargo trucks, tractors, the use of old and weak vehicles coupled with irregular vehicle maintenance of vehicles often result in road traffic crashes. Road traffic accident has remained one of the top ten causes of admission in the Ejura-Sekyedumase District over the past five years (2005 to 2009, Health Sector Review, District Health Administration Report, 2009).

Transportation plays a key role in economic activities in the district. The commonest means of transportation in the district is bicycle. This means of transport is widely patronised by farmers, school children and the general public. The absence of bicycle lanes and pedestrian pavement and crossing along the major roads and streets has resulted in bicycles and pedestrians competing with high-speed motorized vehicles for space on roads. Bicycle and pedestrian knockdown are therefore very common in urban centres and highways in the Ejura-Sekyedumase District. Tractors and other agricultural machinery are predominantly used for carting farm produce and passengers from villages and farms to market centres. The Kumasi – Mampong – Ejura – Yeji highway is the only first class road in the district. The road is very busy during the

market days of the various towns along the Yeji road. The high speed and non observance of road safety regulations on the road are the major causes of road traffic crashes in the district (Afukaar, 2003).

In 2007, road traffic crash was among the top ten cases at the Out –patient Department, Admissions and cause of deaths in the Ejura-Sekyedumase District (DDHS report, 2007). Road traffic crashes and knockdowns are serious public health problems in both rural and urban communities in the district and other regions in Africa (Kobusingye et al., 2001).

#### **4.4. Health Characteristics**

##### **4.4.1 Health Care**

The Ejura-Sekyedumase District Directorate of Health Service is the highest institution with the mandate to implement, supervise and evaluate Ghana Health Service’s policies to promote health and well-being among the residents in the district. The District Health Directorate is managed by the District Health Management Team (DHMT) under the chairmanship of the District Director of Health Services. The Ejura-Sekyedumase district has seven health facilities which are actively working to promote the health and well-being of the 89,227 inhabitants. Two out of the seven health facilities (The Ejura Government Hospital and the St. Luke Mission Hospital) have attained fully fledged hospital status; four of them are clinics and the remaining one is a health centre. The district hospital is located at the district capital, Ejura whilst the St. Luke Mission Hospital is at Kasei in the north-eastern part of the district. Five communities namely, Homako, Nkwanta, Nyamebikyere, Zambrama and Anyinasu have clinics. The only health care facility in the district is located at Sekyedumase (Ejura-Sekyedumase District Directorate Health Services Report, 2009).

The district has 3 medical doctors which is woefully inadequate to cater for the health needs of a total population of 89227. The doctor-population ratio of 1:29742 as against the current national ratio of 1:20000 shows that the district is lagging behind the national average in terms of the distribution of medical doctors. It is even worse as compared to the UN standard of 1:5000. In a well-accepted environment, the district should have not less than 18 doctors to support this population and appropriate measures should be adopted to increase their numbers. According to the National Planning standard, a hospital should have at least 250 beds yet the two hospitals in the district have a total of 99 beds.

The absence of specialist and consultant surgeons such as Traumatologist, Orthopaedic and Neuro-Surgeons and modern injury management equipment such as Computed Tomography Scan means that severe injury cases can not be properly managed at the district level. Such cases have to be referred to the Komfo Anokye Teaching Hospital (KATH) in Kumasi, about 97 km south west of Ejura. Again, the absence of ambulance services coupled with poor road network especially in the rural areas in the district often result in delay in transporting injury cases to appropriate referral centres for medical care and rehabilitation. Farming communities in the hinterland such as Nokwareasa and Dwenwoho where transport and communication system remain intermittent face the problem of transporting injured persons to the nearest health centres for treatment during the rainy season.

A study to access the level of health care services in the district showed that, 41% of the population complained of inadequate facilities and health personnel, 27% complained of high cost, 17% mentioned the problem of poor attitude of staff while the remaining 15% also complained of long queues in the various health centres (Ministry of Local Government, Rural Development and Employment, 2006). In general, medical

facilities in the district are poorly resourced and overstretched, denying many people appropriate health care. Many people thus resort to selfmedication, and the use of herbal medicine. Some injured persons patronise the services of quack doctors, while others resort to the services of the traditional medical practitioners such as bone setters, herbalists and faith healing centres for treatment.

These practices often result in complicating injury situations leading to amputations and disfigurement with prolonged disability adjusted life years (DALYs).

#### 4.4.2 Injury Reporting

Injury reporting in the Ejura-Sekyedumase district is passive rather than active. There is no permanent and independent injury database in the district. Injury data is obtained through documenting clinical activities at the Out-patient department, the wards and the consulting rooms etc. The health system in the Ejura-Sekyedumase District keeps statistics on the causes of morbidity and mortality in the district. It is the primary function of the Records Unit of all orthodox health institution to collate and keep basic demographic and clinical records of every patient assessing health care from the facility. Periodically, the District Health Directorate collates morbidity and mortality records from all the public health institutions and tabulates them to determine the leading top ten causes of morbidity and mortality in the district as shown in table 4.1. Through the compilation of general clinical data, vital information on injuries is documented to provide primary statistics on injuries in the district.

**Table 4.1: Disease and mortality situation in the Ejura-Sekyedumase District, 2010**

Top 10 Communicable diseases		Top 10 Non-Communicable Diseases		Top 10 OPD Cases		Top 10 causes of admission		Top 10 causes of death	
Disease	% of Cases	Disease	% of Cases	Disease	% of Cases	Disease	% of Cases	Disease	% of Cases

Hypertension	36.8	Malaria	59.2	Malaria	48.9	Malaria	46.8
Rheumatism	25.4	Cough/Cold	9.5	Diarrhoea	10.0	Anaemia	13.9
Anaemia	23.6	Hernia	9.1	Anaemia	9.3	Pneumon-ia	11.9
Diabetes	5.7	Diarrhoea	6.1	Typhoid	8.5	Hepatitis	10.1
Malnutrition	99	Typhoid	4.6	Pneumonia	8.2	Typhoid	5.1
Asthma	4.8	Intestinal Worms	2.8	Gynaecologi cal	5.7	Meningitis	3.8
Sickle Cell	0.9	<b>RTA</b>	2.7	Preg.Rel. Comp.	3.3	Diarrhoea	2.5
Cardiac Dis.	0.3	Rheumatism	2.1	<b>RTA</b>	3.2	Malnutrit- ion	1.3
Epilepsy	0.1	Pneumonia	2.0	Cough/Cold	2.6	Food <b>Poisoning</b>	1.3
Psychosis	.04	Anaemia	1.9	<b>Domestic injuries</b>	0.9	<b>RTA</b>	1.3
Total	100		100		100		100

**Source:** Ejura-Sekyedumase District Health Directorate Annual Report, 2010.

#### **4.4.3 The Nature of the existing Injury Surveillance in the Ejura-Sekyedumase District.**

The health institutions run passive injury surveillance system in the Ejura-Sekyedumase District. There is no institution mandated with the sole responsibility to collate, collect, analyse and interpret injury data. Information on injuries is obtained as part of clinical diagnosis, management and rehabilitation on injury cases. The Ejura Government Hospital and the St. Luke Mission Hospital are the major health institutions where many injury cases are managed. These health institutions therefore play major role in injury reporting. The two hospitals run the Records Units which take the basic demographic information on patients and history about the occurrence of injury. Based on clinical diagnosis recorded in patient's folder, the records units compile and rank cases to determine case contribution to the disease burden in the

district. Periodically, the health institutions release documents showing the top ten causes of admission, out-patients visit and mortality at the institutional level.

The District Health Administration plays an important role in the collection and tabulation of all diseases recorded at all public and some private health institutions in the district over a period of time. All diseases and injuries are tabulated and ranked in respect to their frequencies to the overall burden of disease in the district. At the annual performance review meeting, the top ten leading causes of in-patient, and outpatient and mortality cases in the district are discussed and released. Injury cases are ranked among the various diseases hence detailed and relevant information on injuries such as injury mechanism, place of occurrence and intent etc, which are needed to help in injury control are lacking. Epidemic of communicable diseases such as cholera and diarrhea could register high frequencies and push injury out of the top ten cases table. In such conditions it is likely that injury may not be considered as a public health problem that should warrant attention in the district.

Injury surveillance however is a continuous process hence for various reasons if the process involved in handling injury information breaks, the reporting process can not be described as an active injury surveillance system. There is therefore the need to adopt appropriate strategies to ensure continuity in injury reporting in the EjuraSekyedumase to meet the minimum standards of an injury surveillance system in order to provide reliable injury data for effective decision to control the occurrence of injuries in the district.

A major weakness of the existing injury surveillance system is the absence of injury data on the cases managed at the informal health centres comprising the herbal centres, bonesetters and the faith healing practitioners in the district. The statistics on injuries

which is periodically issued by the District Directorate of Health Services does not include large number of injury cases managed under the informal sector. Again, there is no uniformity in the pattern of injury data collection since there is no specific format to guide injury data collection process. The absence of injury data form for injury data collection in the district makes information on injuries inconsistent. There exist gaps and missing data on injury cases. The injury reporting situation in the Ejura-Sekyedumase district is similar to the conditions identified in other parts of Ghana during previous injury prevention initiatives (Mock, 1997).

The police contribute to injury reporting through prompt visits to the site of injury occurrence and through investigation and documentation of the circumstances leading to the occurrence of an injury. The police again provide detailed information on injury cases and refer cases to the nearest health centre for treatment. The police Motor Traffic and Transport unit visits the site of every road traffic crash that is reported to their office. Reports on road traffic crashes are more detailed which help injury surveillance system to capture relevant information on injuries. A primary limitation of the police injury data is that injury data is not processed at the district level where the data is needed to support injury prevention initiatives.

#### **4.5 Conclusion**

In conclusion, the discussions on the background characteristics of the EjuraSekyedumase district have shown the potential injury risk factors associated with the existing physical features, environmental factors, and socio-economic activities in the district. Socio-economic activities are the leading background characteristics of the Ejura-Sekyedumase district that expose residents in the district to a wide range of injuries. These include road traffic crashes, laceration, fall, burns and agro-chemical

poisoning. Other primary occupations that contribute to the occurrence of injuries are lumbering and logging as well as stone quarrying.

The existing human behaviour such as non-compliance to safety measures, illiteracy and negative perception about the occurrence of injuries, the absence of active injury prevention and safety promotion programmes in school and community levels have collectively increased the occurrence of avoidable injuries in the Ejura-Sekyedumase District. Then again, water and sanitation contribute to numerous public health problems such as malaria, enteric fever and injury. The uneven distribution of health facilities and health personnel has a negative impact on the management of injuries and rehabilitation of the injured persons.

The above discussions on the background information of Ejura-Sekyedumase in respect to the occurrence of injuries calls for immediate intervention to promote safety and to control the occurrence of injuries in the district. In this respect there is the need to strengthen the existing injury surveillance system in order to provide stakeholders with realistic statistics on injuries to help in identifying the real public health problems associated with injuries, the exact cause of injury, associated risk factors and their spatial distribution. Injury data is also needed to identify group of people in the district who are at high risk of specific types of injuries in order to develop appropriate injury prevention educational programmes to increase their level of awareness on potential conditions that could result in injury. Again a reliable injury data is very important to guide the implementation of injury interventions such as erecting warning signs at —blood spotl sections on highways, construction of cross roads at vantage points for pedestrians as well as distribution of Liquidified Petroleum Gas (LPG) detectors among households who use gas in their homes etc. Finally, improved injury surveillance system is needed to assist in monitoring and evaluating the effectiveness of specific

injury interventions such as a ban on drunk driving, enforcing the wearing of helmets and construction of traffic islands on highways. Strengthened Injury surveillance system could ensure efficient and effective utilization of limited resources to achieve optimum safety in the Ejura-Sekyedumase district.

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## CHAPTER FIVE

### 5.0 RESULTS

#### 5.1 Introduction

This chapter examines the nature and distribution of injuries and their management in respect of the demographic and background characteristics of the injured persons. The background information is very important in order to determine its effects on injury reporting in a locality. Other factors considered include the occurrence of injuries in spatial context, injury mechanism, injury severity and types of fracture to determine the geographical distribution of injuries in the study area. This is followed by an assessment of the methods of injury management since the choice of management may have direct or no linkage with appropriate injury reporting procedures. Knowledge on the importance of injury reporting and hindrances to injury reporting were examined to determine appropriate measures to improve the injury reporting pattern in the district. Finally, respondents' views were solicited to determine the level of their willingness to support the efforts to strengthen the injury surveillance system in the Ejura-Sekyedumase district.

#### 5.2 Background Characteristics of the Respondents (Household Survey among Injured Persons)

Table 5.1 presents the socio-demographic background characteristics of the 650 respondents who participated in the household interview. All the respondents met the condition of injury experience within the past twelve calendar months prior to the study.

**Table 5.1: Background characteristics of Injured respondents. (n = 650)**

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Variable	Frequency	Percent (100)
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<b>Sex</b>		
Male	382	58.8
Female	268	41.2
<b>Age group</b>		
<20	210	32.3
20 - 29	214	32.9
30- 39	117	18.0
40 – 49	60	9.2
50 - 59	29	4.5
60+	20	3.1
<b>Educational status</b>		
None	234	36.0
Basic	310	47.7
SHS	58	8.9
Tertiary	48	7.4
<b>Religion</b>		
Islam	316	48.6
Pentecostal	222	34.2
Orthodox	94	14.5
None	10	1.5
Traditional	8	1.2
<b>Employment status</b>		
Farmer	252	38.8
Civil servant	107	16.5
Unemployed	106	16.3
Artisan	99	15.2
Petty trading	50	7.7
Transport	22	3.4
Construction	14	2.2
<b>Level of Income</b>		
Low	357	54.9
Middle	231	35.5
High	62	9.5

**Source:** Field survey, June 2010

The sample size was 650 injured persons who sustained various types of injuries within the immediate twelve calendar months. The findings show that males constitute 59%

and females 41% of the respondents. The mean and age of the injured persons was 27.3 years with a standard deviation of  $\pm 14.3$ . Greater proportion of the injury patients (32.9%) were within the 20 – 29 year age group. The less than 20 years age group constitutes 32.3% and the proportion of the 60 years and above was 3.1%.

With respect to respondent's educational status, the —no formal education respondents were 36% and the proportion of basic education comprising primary and Junior High Schools was 47.7%. Respondents with secondary and tertiary education were 8.9% and 7.4% respectively.

Respondents were from different religious denominations. The predominant religion was Islam, forming 48% of the sample size. This confirms the dominance of the Muslim community in the study area. The Pentecostals were the next dominant religious denomination with a significant proportion of 34.2% whilst the Orthodox Christians formed 14.5%. Respondents who did not belong to any specific religious faith were 1.5% while the traditional faith constitutes slightly over one percent.

With respect to the occupation of the respondents, majority of the respondents (38.8%) were farmers who engaged themselves in crop cultivation and animal rearing. The proportion of civil servants was 16.5% while 16.3% were unemployed. The fraction representing artisans was slightly more than fifteen percent and the petty traders were 7.7%. The percentage of the sample of the injured respondents who worked in the transport and related activities was 3.4%.

The respondents were from different economic backgrounds. Slightly more than on half of the entire respondents were in the low income group. The middle and the high income respondents were 35% and 9 % respectively.

### 5.3 Spatial Distribution of Injuries

#### 5.3.1 Rural –Urban Distribution of Injuries

The occurrence of injuries has different patterns in a geographic space. In table 5.2, out of the total sample of 650 injury cases that resulted in at least one disability day, majority (63.1%) occurred in rural environments while 36.9% took place in urban communities.

**Table 5.2: Rural – Urban Distribution of Injuries**

Settlement	Frequency	Percent
Rural	410	63.0
Urban	240	37.0
<b>Total</b>	<b>650</b>	<b>100.0</b>

**Source:** Field survey, June 2010

#### 5.3.2 Distribution of Injury Mechanism by status of Settlement

In respect to spatial distribution of injury cases as seen in table 5.3, motor vehicle and motorcycle crashes were more frequent in rural environment. Slightly more than 65 % of Motor Vehicle crashes and 66% of motorcycle accidents occurred on rural sections of highways and on feeder roads. Contrary to the trend of occurrence of motorized crashes, the urban settlements recorded 80% of pedestrian knockdowns. The rural environments registered 83.1% of agricultural injuries. Similarly, 80% of chemical poison occurred among rural residents as 83.1%, 90% and 80% of agricultural, gunshot and chemical poisoning respectively took place in the bush or on farmlands.

**Table 5.3: Injury Mechanism by Type of Settlement**

	Type of Settlement		Total
	Urban	Rural	
<b>Injury Mechanism</b>			
MVC	30 (34.1%)	58 (65.9%)	88 (100.0%)
Pedestrian knockdown	12 (80.0%)	3 (20.0%)	15 (100.0%)

Motorcycle crash	29 (33.7%)	57 (66.3%)	86 (100.0%)
Bicycle crash	48 (38.7%)	76 (61.3%)	124 (100.0%)
Poison	2 (20.0%)	8 (80.0%)	10 (100%)
Assault	1 (16.7%)	5 (83.3%)	6 (100.0%)
Gunshot	0 (0%)	5 (100.0%)	5 (100.0%)
Burns	32 (52.5%)	29 (47.5%)	61 (100.0%)
Agricultural activities	27 (16.9%)	133 (83.1%)	160 (100.0%)
Fall	52 (66.7%)	26 (33.3%)	78 (100.0%)
Bite / Sting	7 (46.7%)	8 (53.3%)	15 (100.0%)
Other	0 (0%)	2 (100.0%)	2 (100.0%)
<b>Total</b>	<b>240 (36.9%)</b>	<b>410 (63.1%)</b>	<b>650 (100.0%)</b>

**Source:** Field survey, June 2010

Various types of injuries were very common at specific places within a geographical space. With reference to table 5.4, close to sixty-six percent of motor vehicle crashes occurred in rural environment (highways) while farm roads recorded 28.4%. The streets registered greater number of pedestrian knockdowns (86.7%), motorcycle crashes (87.2%), and bicycle accidents (83.1%) and violence or assault injuries (83.3%). Slightly more than sixty- seven percent of the total burns cases occurred in residential areas and the streets recorded 19.7% burns. Finally, the common place of occurrence for agricultural related injuries, gunshot and chemical poisoning is the bush or farm.



**Table 5.4: Spatial Distribution of Injuries**

Place of Occurrence	Injury Mechanism								
	MVC	Pedestrian knockdown	Motorcycle crash	Bicycle crash	Poison	Assault	Gunshot	Burns	Agric
<b>Highway</b>	<b>58 (65.9%)</b>	2 (13.3%)	4 (4.7%)	15 (12.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
<b>Street</b>	5 (5.7%)	<b>13 (86.7%)</b>	<b>75 (87.2%)</b>	<b>103 (83.1%)</b>	0 (0.0%)	<b>5 (83.3%)</b>	1 (20.0%)	12 (19.7%)	0 (0.0%)
<b>Home</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.8%)	1 (10.0%)	1 (16.7%)	0 (0.0%)	<b>41 (67.2%)</b>	1 (6%)
<b>Farm/Bush</b>	<b>25 (28.4%)</b>	0 (0.0%)	7 (8.1%)	4 (3.2%)	<b>9 (90.0%)</b>	0 (0.0%)	<b>4(80.0%)</b>	7 (11.5%)	<b>133 (83.1%)</b>
<b>Worksite</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (1.6%)	0 (0.0%)
<b>Recreation site</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	12 (7.5%)
<b>School</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	14 (8.8%)
<b>Total</b>	88 (100.0%)	15 (100.0%)	86 (100.0%)	124 (100.0%)	10 (100.0%)	6 (100.0%)	5 (100.0%)	61 (100.0%)	160 (100.0%)

Source: Field survey, June 2010



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## 5.4 Injury Treatment Options and Determinants of Choice of Care

### 5.4.1 Injury Treatment Options

The leading injury treatment option is the traditional care with drugs bought from drugstore as seen in table 5.5. The orthodox medical care (28%) was slightly patronized much more than the traditional medicine (26.5%). Occasionally, for various reasons, some injury cases were managed under the dual care (either seeking initial treatment at the orthodox centre or continue at the traditional care or vice versa).

**Table 5.5: Injury Treatment Options and Level of Patronage**

	Frequency	Percent
Orthodox Care	182	28.0
Traditional Care	172	26.5
Traditional / Drugstore	223	34.3
Dual Care	73	11.2
Total	650	100.0

**Source:** Field Survey, June 2010

### 5.4.2 Determinants of Injury Care

Various factors accounted for choice of injury care. Paramount determinants of injury care include cost of treatment, distance and trust in the medical system. Other reasons include recommendations and relative's influence.

Table 5.6 shows that 34.1% of the 182 injury patients who sought care at the formal medical care based their decisions on trust in the scientific methods of managing injuries. Then again, recommendation was the reason why about 21% of the patients attended hospital or clinic while another group representing 19.2% utilized the formal medical care due to the distance involved. Cost of treatment was among the least factors

which influenced the decision on assessing hospital / clinic services among 17% of those who visited hospital for injury treatment.

**Table 5.6: Determinants of injury care.**

Determinants	Treatment Options				Total
	Hosp and Clinic	Traditional and Herbs	Hospital and Traditional	Traditional and Drugstore	
Cost	31 17.0%	43 25.1%	17 23.0%	32 14.3%	123 18.9%
Distance	35 19.2%	34 19.9%	11 14.9%	43 19.3%	123 18.9%
Trust (Efficiency of Treatment)	62 34.1%	38 22.2%	19 25.7%	81 36.3%	200 30.8%
Recommendation	38 20.9%	37 21.6%	22 29.7%	41 18.4%	138 21.2%
Relatives Influence	11 6.0%	15 8.8%	2 2.7%	20 9.0%	48 7.4%
Other	5 2.7%	4 2.3%	34.1%	6 2.7%	18 2.8%
Total	182 100.0%	171 100.0%	74 100.0%	223 100.0%	650 100.0%

**Source:** Field Survey, June 2010

Among the leading category of injured patients who managed their injuries at the traditional medical centres and the use of herbal medicine, twenty-five percent considered cost as their prominent reason for their choice of injury treatment. For another group of about 22.2%, trust was the basis of the choice of selecting treatment for injuries whilst 21.6% relied on recommendations. The least ranked reason for utilizing traditional medicine was relatives' influence (8.8%).

The third category of injured patients combined scientific medicine with the traditional medical practice. Among this category, 29.7% mentioned recommendation from the public as the basis of their decision on injury management. A significant reason why 25.7% of the injured patients managed their injuries with traditional centres was —trust. Cost of treatment and distance were the third and fourth ranking reasons for combining hospital services with herbs in treating injury cases.

Finally, with respect to the —pluralistic utilization of medical care, another group combined traditional medical care with drugs from the chemical shops, and within this group, thirty-six percent of the patients who opted for traditional medicine and drugs from chemical shops based their decisions on their trust in the combination of herbs and drugs in managing injuries. A section of the respondents, representing 19.3% who used drugs alongside herbal medicine considered distance or proximity to the source of care which include the drug house and the premises of the practitioner as their reasons for selecting medical care for injuries. For another group of injury patients (14.3%), the relatively cheaper cost involved in managing injuries with traditional medicine and drugs from chemical shops informed the decisions of their choice of treatment.

The key informant discussions showed that, the absence of modern medical services such as X-ray services at the traditional health facilities often cause the traditional healers even to direct injury patients to seek clinical attention at the orthodox health institutions in order to get an X-ray to show the exact damage to the bones or the tissues in order to guide treatment. Upon treatment, injury patients are sometimes advised to visit the orthodox medical centers for additional X-rays to determine the extent of bone union and the effectiveness of the traditional treatment.

Again, the traditional medical system lacks analgesics to control pains hence patients often buy —pain killers from chemical shops or visit hospital or nearest clinic for drugs to control pains during and after the traditional injury management procedures.

Based on some culture of the people, it is believed that orthodox injury management is never complete until the care is supplemented with the herbal medicine.

*Extracts from the key informants discussions on Determinants of Injury Care Major reason why many injury cases are managed at the traditional centres is due to trust in the traditional injury management practice. The success and achievements in caring for fractures (bone breakage), are known among the people.... [Medical Officer]*

*[...] Cost of managing injuries at the informal sector is comparatively low and the mode of payment is flexible than the formal health care... [Health Service Staff]*

*[...] The cost of treatment of injury cases at the hospitals is sometimes huge hence many poor injury patients sometimes ended up with “self medication” herbs and traditional practices....[ Disease Surveillance Volunteer]*

*[...] distance and convenience in service utilization often cause many injured persons to patronize the traditional / herbal services much more than the orthodox medicine. The bad nature of some of the roads which link rural communities and hamlets with urban centre where the hospital and clinics are located hinder travelling to assess formal medical services for injuries [Disease Surveillance Volunteer.]*

*[...] Injuries occurring in urban centres are likely to be reported to hospital than in rural area due to accessibility and convenience in transportation. [Police Officer]*

### 5.4.2.1 Education as a Determinant of Injury Care.

Determination of the knowledge on the importance of injury reporting (Table 5.7) based on respondents' educational status revealed that, 91.7% of respondents with tertiary qualification reported their injury cases to the health institutions and the corresponding proportion of respondents who completed Senior High School was 74.1%.

**Table 5.7: Level of education and Injury Reporting**

	Injury reporting		Total
	No	Yes	
Education none	144	89	233
	61.8%	38.2%	100.0%
basic	182	129	311
	58.5%	41.5%	100.0%
shs	15	43	58
	25.9%	74.1%	100.0%
tertiary	4	44	48
	8.3%	91.7%	100.0%
Total	345	305	650
	53.1%	46.9%	100.0%

**Source:** Field survey, June 2010

The injury reporting behavior reduced to 41.5% among respondents who completed basic education (Primary and Junior High School). The contribution of —no formal education respondents was 38.2% as shown on table 5.7. The corresponding Pearson

chi-square test was 66.7 with a p-value of 0.001. The cross-tabulation and the chisquare results showed that there is a significant relationship between education and injury reporting behavior.

The proportion of injury reporting increases from 38.5% among respondents with —No education to 91.5% among respondents with tertiary education. The findings validate the first hypothesis that a progression in education could enhance good injury reporting behavior among people in the study community.

Key informants explanation on the reason why the educated people report injuries much more than the illiterates are as stated below;

*[...]The ability to read and understand basic clinical procedures in managing injuries help the educated people to compare the procedures of injury management procedures at both the orthodox and traditional centres. The comparative clinical advantage in terms of modern equipment and logistics at the orthodox centres make injury care at the orthodox centres very effective and efficient in caring for injuries and hence attract the literate populace to report injuries much more than the illiterates [A Disease control Officer.]*

#### **5.4.2.2 Income as a Determinant of Injury Care.**

The study found that, (Table 5.8) eighty-four percent of the high income earners were in support of injury reporting while the proportion of middle income group who reported their injury cases was 53.5%. Injury reporting support was as low as 40.4% among the low income respondents. It could therefore be established that as an individual income level increases, the willingness to report injury cases to the hospital also increases.

**Table 5.8: Crosstab on level of income on the importance of injury reporting**

		Reports		Total
		No	Yes	
Income Level	low	212	144	356
		59.6%	40.4%	100.0%
	middle	123	107	230
		53.5%	46.5%	100.0%
	high	10	54	64
		15.6%	84.4%	100.0%
Total		345	305	650
		53.1%	46.9%	100.0%
		100.0%	100.0%	100.0%

**Source:** Field Survey, June 2010

The corresponding Pearson Chi-Square value of 67.0 and p-value of 0.001 makes it significant to establish that as one's income increases, the desire to report injury cases to the appropriate institution increases.

Key informants attributed the variations in the trend of injury reporting among the various income groups as stated below;

*[...] Comparatively richer people could readily afford formal medical services much more than the poor people [Health Administrator]*

*[...] Most of the high income earners are civil servants and may need medical reports on their injuries to facilitate the request for sick leave and payment of medical bills etc [Health Administrator]*

### 5.4.2.3 Type of Settlement as a determinant of injury care

The study found that majority of the injury cases in both rural and urban communities were not managed at the formal medical care hence those cases were not reported.

The volume of rural injury cases that was not documented was 53% as compared to 47% urban based injury cases. The results showed that, the proportion of injury cases seen at the orthodox medical centres where case documentation is mandatory was slightly greater than the rural folk. However, the corresponding chi square test on type of settlement and injury reporting resulted in a Pearson Chi-Square value of 0.3 and a p-value of 0.58 which is far greater than accepted significance level of 0.05. It is therefore clear that, type of settlement has a weak influence on the pattern of injury reporting in the study area.

**Table 5.9: Univariate and Multivariate and Logistic regression on Injury Reporting**

Variable	OR	P-value	95% CI	AOR	95% CI
<b>Economic Status</b>					
Low	1.00			1.00	
Middle	1.28	0.15	0.91 - 1.78	1.09	0.76 - 1.55
High	7.80	0.00	3.84 - 15.84	2.45	0.97 - 6.20
<b>Education</b>					
Basic	1.16	0.39	0.82 - 1.64	1.13	0.79 - 1.61
SHS	4.53	0.00	2.37 - 8.64	4.15	2.13 - 8.05
Tertiary	16.98	0.00	5.89 - 48.99	7.92	2.13 - 29.40
<b>Settlement</b>					
Rural	1	0.18	0.90 - 1.69	1.01	0.72 - 1.41
Urban	0.80	0.04	0.65 - 0.98	0.58	0.43 - 0.79

OR – Odds Ratio ; AOR – Adjusted Odds Ratio

Source: Field Survey, June 2010

Table 5.9 shows the likelihood of reporting injury conditions to the orthodox medical centres in respect to the injury person's economic status, level of education and type of settlement. The odds of reporting an injury condition was 7.8 times among the high income group compare to the low income group. There is an increasing trend of the odds of reporting injury with the educational level. The odds of injury reporting increased from 1.16 in the basic education respondents to 16.9 among the tertiary respondents.

There is slight difference in the odds of reporting injury conditions among the rural and urban communities. The odds of reporting injury condition among injury patients residing in urban centres was 0.8 lower than rural communities.

#### **5.4.3 Reasons why some injured persons failed to Report to centres which contribute to the Injury Surveillance System**

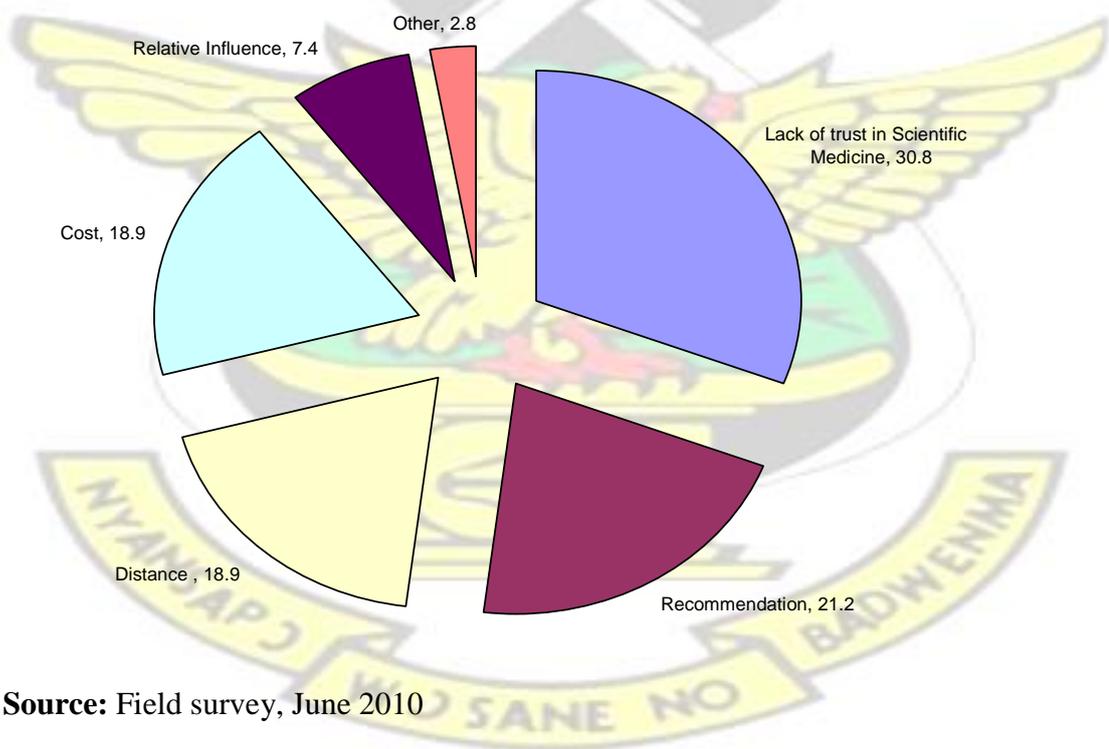
In determining the importance of injury reporting among the injured persons, it was found that more than one half of the respondents (54.6%) were willing to report their injuries to appropriate institutions. Alternatively, the proportion of respondents who were not willing to report their injuries was 45.4%. Among the respondents who were of the view that not all injuries should be reported, more than seventy-one percent explained that only severe injuries should be reported. During the Key Informants Discussions, the police rated the level of injury reporting to their office as 25% criminal cases and 60% of vehicle crash cases. Similarly, the health authorities estimated the percentage of injury cases managed at the hospital as 20% domestic injuries and 80% transport related injury cases.

Some injured persons were initially not willing to report injuries however; they argued that specific injuries may be reported. Injury cases that should be reported were

moderate and severe injuries. Among this group of respondents, 1.4% prefers to report moderate injury cases while greater majority (72%) support reporting of severe injuries. Nearly twenty-seven percent were not able to support their decisions with reasonable explanation.

The general view of the overall respondents in respect to the reason why some injured persons failed to report and seek appropriate health care for their injuries at the formal health institutions are as shown in chart 5.1. Accordingly, lack of trust of effective injury care (30.8 %) by the scientific medical practice is a major reason why many injured persons failed to report their injuries to the injury reporting system.

**Figure 5.1: Pie Chart Showing Reasons why injured persons failed to Report to Hospital / Clinic**



**Source:** Field survey, June 2010

Discussions with the stakeholders revealed that, the trust in the traditional medical practice in terms of injury care is very strong among the people. The health care personnel admitted about 40% of urban and 10% of rural fractures are managed at the

hospitals. Specifically, people mostly report severe injuries with uncontrollable bleeding to the hospitals. Among the injury cases reported to the hospitals, about 70% of bone fracture cases were finally sent to the bonesetter for complementary care. The strong impact of trust in the traditional medical care for injuries has resulted in recommending the practice to other injured persons. Recommendation is therefore a prominent reason why more than 21% of the injured persons managed their injuries at the informal medical centres.

Distance (18.9%) to the health institutions and the cost involved (18.9%) in seeking medical care at the hospitals are also significant reasons for not reporting of injury cases. Although the district has fair distribution of health facilities, yet distance continues to affect the degree of health care utilization among the injured. About 50% of the stakeholders attributed this situation to the difficulty involved in transporting the injured to the nearest health facility since some of the roads linking the villages and hamlets with the health centers are not motorable especially during rainy season when farming activities are at their peak and related agricultural injuries frequently occur. Again due to the deplorable nature of some roads in the district, transporting injury cases to hospitals remains a difficult task.

Cost is an important determinant of health care utilization in rural .Although the National Health Insurance Scheme is in operation yet the cost involved in injury care at the formal health institutions still deters many injured persons from seeking formal medical care. This study identified cost as the reason why almost 19% of the respondents failed to report their injury cases to the formal medical facilities. Stakeholders admitted cost as a serious factor preventing maximum hospital / clinic utilization.

It was realized during stakeholders interview that comparatively, the cost involved in managing injury at the traditional centres is affordable than the formal health care. It was further explained that, the mode of settlement of cost involved in injury care at the traditional medical centres is flexible and the injured persons and their relatives are comfortable with such conditions. Settlement of cost could be deferred until favourable future condition such as harvest period.

Payment could be on installment basis, or could be in kind. Again, the cost of injury management could be bargained to meet the pocket capacity of the patients. Other category of injured persons (7.4%) especially children and other dependants fail to report their injury cases to the hospital due to the direct influence of their relatives.

As to why some respondents failed to report their injury cases to the health centres, about three percent of the respondents were not able to give tangible reasons in support of their decision for not reporting their injuries. These respondents consider the practice of injury reporting as irrelevant hence they do not make attempt to report their injury cases.

### **5.5 Sources of Injury Data**

With reference to table 5.10, the traditional injury management practice is the leading injury data source in the study area since it managed 60.2% of the total injury cases which occurred during the study period. This was followed by the Orthodox medical institutions comprising hospitals and clinics.

**Table 5.10: Data Sources**

<b>Data Source</b>	<b>Frequency</b>	<b>Percent</b>
Hospital / Clinic	215	33.1
Police	44	6.8

Traditional	391	60.2
<b>Total</b>	<b>650</b>	<b>100.0</b>

**Source:** Field survey, June 2010

The police, both the Motor Transport and Traffic Unit and the Crime Unit recorded 6.8% of the injuries occurring in the district.

Data on various injury mechanisms are obtainable from specific centres. For instance, all road traffic crashes are required by law to be reported to the Police Motor Transport and Traffic Unit. Similarly, cases such as gunshot and violence injuries should be reported to the Crime Unit of the Ghana Police Service. The police is therefore expected to be the custodian of transport and violence related injuries however the police recorded only 44 cases representing 6.8% of the general injuries. Individual cases recorded are as follows; motor vehicle crash (20.5%), pedestrian knockdown (14.3%), motor cycle crash (11.6%). Assault (66.7%) and gunshot (20.0%). Contrary to the smaller amount of injury cases reported to the police, the traditional centres recorded significant number of motor vehicle crash (54.5%), pedestrian knockdown (47.6%), Motor cycle crash (54.7%) and gunshot (40.0%). The trend of injury reporting indicates that with the exception of assault injuries, the traditional centre is the primary source for data on transport related and gunshot injuries. The traditional centres are again the key place for injury data as the centre alone documented 60.2% of the injuries caused by the various injury mechanisms as compared with 33.1% and 6.8% by the orthodox health institutions and the police respectively.

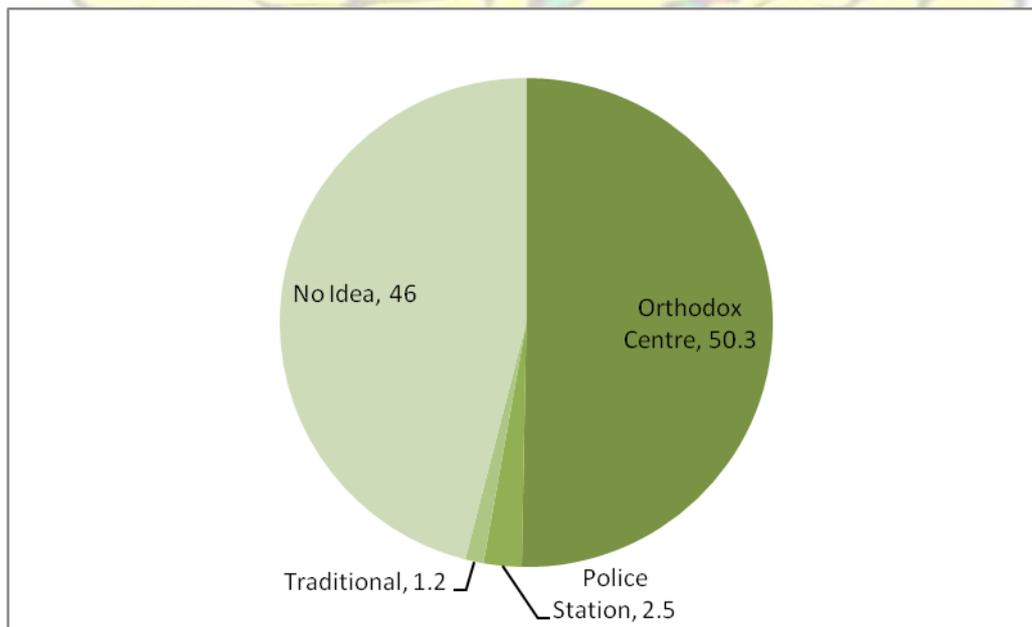
## 5.6 Strengthening the Injury Reporting System

### 5.6.1 Assessment of the Awareness of Injury Reporting among Injury Patients

The injury surveillance system depends on the patronage of the communities to collate information on the occurrence of injuries over a given period of time. In figure 5.2, the assessment of the level of awareness of the presence of the injury reporting institutions in the district showed that 50.3% of the respondents were aware that, injury cases could be reported at the orthodox health centres.

Respondents who were of the view that injury cases could be reported at the Police station were almost 2.5%. A smaller fraction (1.2%) of the respondents mentioned traditional centres. The proportion of the respondents who had no idea about exact places where injury cases could be reported was 46%.

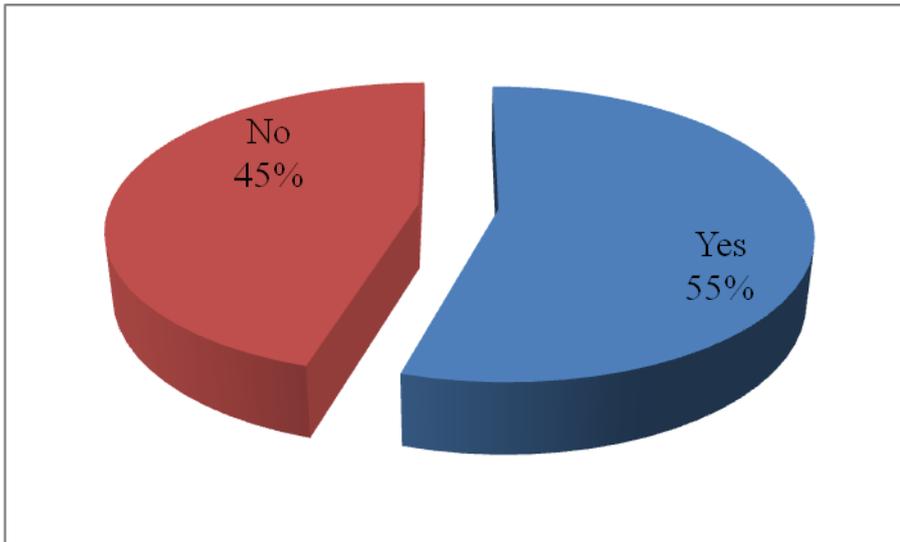
**Figure 5.2: Awareness of the Injury Reporting Centres**



**Source:** Field survey, June 2010

### 5.6.2 Perceived Importance of Injury Reporting among Injury Patients

**Figure 5.3: Perception on the Importance of Injury Reporting**



**Source:** Field survey, June 2010

### 5.6.3 Factors Affecting Injury Reporting

Further investigations into the reasons why some injured patients do not support the concept of injury reporting to the various institutions under the injury surveillance system was carried out. As shown in table 5.11, a paramount factor for avoiding injury reporting was the cost involved (54.6%) in getting injury cases reported. Other category of the respondents referred to the lengthy time (27.5%) involved in reporting an injury case since most of the injury reporting centres are sometimes crowded. Relating to time, other respondents were more concerned about the complex process and bureaucracy involved in getting an injury case documented at the reporting centres. Again, the circumstances leading to specific injuries, beliefs and household heads decisions caused 12.5% of the patients to keep injury cases as secret; hence a deliberate avoidance of activities such as reporting that could publicly expose the injury condition. Finally, the capacity to manage injury cases personally or at centres where case documentation is not observed is the reason why 6.1% consider injury reporting as not necessary.

**Table 5.11: Reason why some injured persons were not willing to report injuries**

Reasons	Frequency	Percent
Avoiding cost	159	53.9
Avoid time wasting	81	27.5
Keeping injury secret	37	12.5
Capable of managing injury	18	6.1
<b>Total</b>	<b>295</b>	<b>100.0</b>

**Source:** Field survey, June 2010

#### 5.6.4 Relevance of Injury Reporting among Injury Patients

An investigation into the role of injury surveillance system among the 355 respondents who were in support of injury reporting showed that, greater majority (72.4%) believe that injury reporting helps in measuring the occurrence of injuries in a locality. Again, as seen in table 5.12, close to 21% of the respondents who acknowledged the importance of injury reporting, mentioned planning and decision making as the major reasons for managing injury surveillance.

**Table 5.12: Reasons why injuries should be reported**

	Frequency	Percent
Planning / decision making	73	20.6
Measuring occurrence injuries	257	72.4
other	25	7.0
Total	355	100.0

**Source:** Field survey, June 2010

#### 5.6.5 Injured Persons Willingness to Patronize the Injury Surveillance System

Public willingness to support the establishment and operation an injury surveillance system is an essential element in improving injury reporting in a locality. It is therefore imperative to examine the extent to which injured persons and caregivers are willing to support the injury surveillance system in the district. In this regard, a total of 412 respondents representing 63.4% indicated that, they will patronize the services being

rendered by the reporting institutions provided they know the benefits of injury reporting. Respondents' views directly support the findings from the key informant's interview as majority of the key informants cited lack of understanding of the role of the injury surveillance system in injury control as a major reason why many people do not report injury cases, hence the low patronage of the injury surveillance system.

Respondents' preparedness to offer voluntary services as a contribution to the efforts to strengthen the injury surveillance system was assessed and 52% agreed to offer voluntary services to improve upon the injury surveillance services in the EjuraSekyedumase district. Similarly, a section of the respondents (30%) were willing to support the injury surveillance system provided they would be remunerated.

The interview with key informants again revealed that, a major element needed to strengthen the injury surveillance system is intensive public health education on the role of injury surveillance system in injury control and safety promotion. Other important suggestions include the formation of the injury surveillance committee and the creation of injury surveillance desk at community levels across the district to mobilize injury cases at the doorsteps of the people.

Key informant contributed that;

*[...] For maximum public patronage and support of the injury surveillance system, there is the need to educate the people on the role of the system in injury prevention in the district through the mosque, churches, durbars and school programmes etc. [ A District Disease Control Officer]*

*[...] Many people lack knowledge on the role of injury data on injury prevention hence they are not willing to report even severe injury conditions either to the police or the hospital. [ A Disease Surveillance Volunteer]*

## 5.7 Challenges facing Institutions under the Injury Surveillance System

Main institutions which meet the minimum injury surveillance criteria in the study district are the orthodox health institutions and the police stations. The former handles close to 90% of the overall injury cases which were reported. The later is mainly concerned with traffic, violence and criminally related injury cases.

A major challenge undermining injury reporting is low public patronage. Discussions with stakeholders revealed that,

*[Reporting cases to the police is synonymous to payment of undefined fines, bureaucracy, time wasting and unending legal battle..[A Police MTTU Officer].*

*[Many people therefore employ several possible means to avoid reporting even very serious injury conditions to the police...[A Police Crime Officer]*

*[... Cases which are more likely to be reported to the police are those which the injured want compensation or reimbursement from the insurance companies or the one who caused the injury respectively...Police MTTU Officer].*

*[...Similarly, reporting of injury cases to the health centres is relatively low due to the keen competition from the alternative injury management practitioners ...[A Health Administrator].*

### 5.7.1 Injury Data Management and Presentation

This section is the presentation of the basis of strengthening the injury surveillance system. The baseline information is compared with the results derived from the

—intervention through the provision of training programme to equip the staff of the Records Units of the Ejura Government Hospital and the St. Luke Mission Hospital with basic data management skills.

Beside low public patronage of the services rendered by the major injury reporting institutions, another challenge confronting the centres is the weaknesses in data management spanning from data collation, collection, analysis, interpretation and reporting.

Injury reporting under the police and the orthodox health centres could be described as ‘passive’ rather than ‘active’. The general injury data collection exercise at the health centres is focused on injury care and rehabilitation. At the health centres, injury data is tabulated along with other clinical cases and presented at the health services annual meeting to show the top ten causes of morbidity and mortality. The police injury reporting exercise mainly facilitates docket preparation in supporting legal issues. The police injury data is analyzed by an independent institution outside the district.

**Table 5.13: Pre Training Injury Data Management Capacity**

	<b>Institution</b>	<b>Computerised Data Entry</b>	<b>Analysis / Interpretation</b>	<b>Dissemination /Presentation</b>
<b>Pre Intervention</b>	Orthodox Health Centres	67%	11%	9%
<b>Pre Intervention</b>	Police	4%	4%	4%

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Oct-Dec 2010

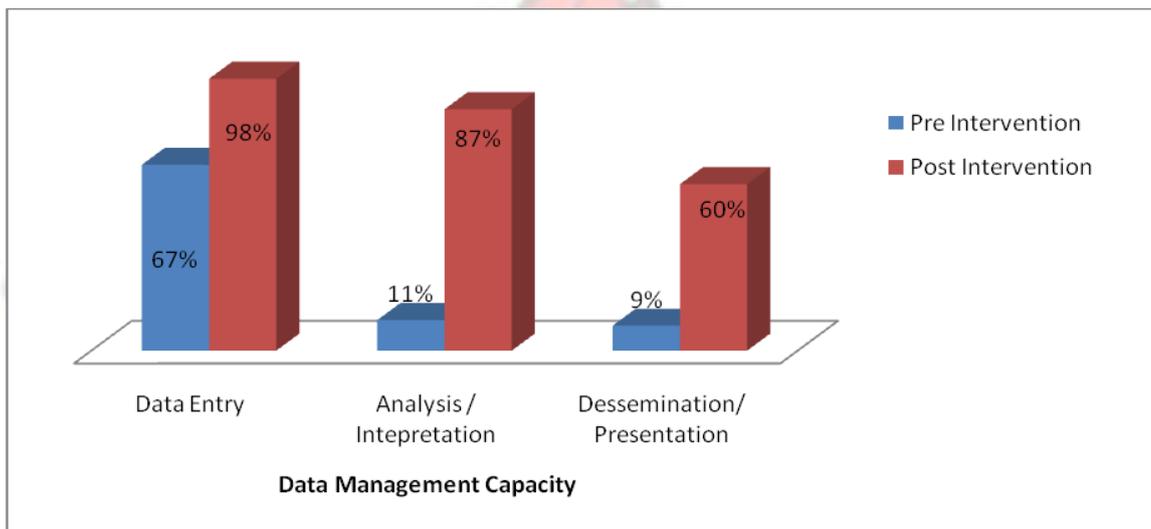
Table 5.13 shows that, 67% of the staff at the Records Unit of the Ejura government hospital and the St. Luke mission hospital could skillfully enter data into a Microsoft computer. The staff capacities to effectively analyse and present data were 11% and 9%

respectively. The investigation among the police showed that 25% were capable of entering data while 4% could analyze and present data.

### 5.8 Intervention Results (Testing the tools for Strengthening the Injury Surveillance System)

This section presents the outcome of the effort to improve the injury surveillance system to cater for the occurrence and distribution of injuries in a geographical space.

**Figure 5.4: Pre and Post Intervention Level of Injury Data Management Capacity**



**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Oct-Dec 2010

After initial training of the staffs of the Records Units of the Ejura Government hospital and the St. Luke hospital, the staff's data management capacity was compared with the baseline record on injury data management capacity as shown in figure 5.4.

Accordingly, knowledge on data entry increased from 67% to 98% while the ability to analyse and interpret injury data increased from 11% to 87%. Skills to present and disseminate injury data registered 51% increase. The outcome of the intervention conformed to the attributes of an active injury surveillance system where relevant injury data is captured, analysed, interpreted and presented.

The sex distribution table (table 5.14) shows that injuries occurred to males much more than females. Men registered 74% injury cases in urban area and 61% in the rural communities. The proportions of females' injuries in urban and rural settlements were 26% and 38% respectively.

**Table 5.14: Sex Distribution**

Sex	Settlement		Total
	Urban	Rural	
Male	37	104	141
	74.0%	61.9%	64.7%
Female	13	64	77
	26.0%	38.1%	35.3%
Total	50	168	218
	100.0%	100.0%	100.0%

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Oct-Dec 2010

Injury patients who visited the Ejura Government Hospital and the St. Luke Mission Hospital at Kasei during the intervention period were of different ages. Table 5.14 shows that, vast majority of the injury patients were between 30 – 39 years age group (28.4%). The proportion of the 60 years and above was 2.8%.

**Table 5.15: Age group**

Age group	Frequency	Percent
0 - 9	22	10.1
10 - 19	27	12.4
20 - 29	50	22.9
30 -39	62	28.4
40 - 49	30	13.8
50 - 59	21	9.6
60+	6	2.8
<b>Total</b>	<b>218</b>	<b>100.0</b>

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

### 5.8.1 Place of Occurrence

**Table 5.16: Place of injury occurrence by Settlement Cross tabulation**

Place of occurrence	Settlement		Total
	Urban	Rural	
Highway	37	103	140
	74.0%	61.3%	64.2%
Home	2	14	16
	4.0%	8.3%	7.3%
Street / Neighborhood	3	15	18
	6.0%	8.9%	8.3%
Bush / Farm	6	30	36
	12.0%	17.9%	16.5%
Work place	2	5	7
	4.0%	3.0%	3.2%
School	0	1	1
	.0%	.6%	.5%
Total	50	168	218
	100.0%	100.0%	100.0%

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

Injury occurred at specific places in the district. The leading place of injury occurrence is the highway which accounted for 64%. The main highway (KumasiEjura-Yeji raod) is the leading place of injury occurrence in both urban and rural communities in the district.

Table 5.16 shows that injuries occurring on urban highways (74%) far exceed highway injuries on the rural roads (63%). The second most frequent place of injury occurrence

is the bush or farm and it accounts for 16.5%. The rural settlement registered 18% of farm or bush related injuries as compared to 12% in the urban communities.

### 5.8.2 Time of Occurrence

The occurrence of injuries was measured in respect to time. Table 5.17 shows that, the period of time with the highest occurrence of injury is afternoon (44%). Majority of injuries in both urban (64%) and rural (38.1%) communities occurred in the afternoon. Thirty- three percent of the rural injuries occurred in the evening. In the urban centres, both morning and evening had equal proportion of 16%.

**Table 5.17: Time of injury occurrence by Settlement Cross tabulation**

Time of occurrence	Settlement		Total
	Urban	Rural	
Morning	8	29	37
	16.0%	17.3%	17.0%
Afternoon	32	64	96
	64.0%	38.1%	44.0%
Evening	8	55	63
	16.0%	32.7%	28.9%
Night	2	20	22
	4.0%	11.9%	10.1%
Total	50	168	218
	100.0%	100.0%	100.0%

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

### 5.8.3 Injury Mechanism and Settlement

Numerous injury mechanisms contributed to the occurrence of injuries. Table 5.18 shows that motorized vehicles were the leading cause of injury mechanism in the district which caused injuries to vehicle occupants through accidents (41.7%),

pedestrian knockdowns (1.4%) and motorcycle crashes (14.7%) etc. Motorized vehicles contributed a total of 57.8% of the injuries reported for treatment at the Ejura Government Hospital and the Kasei Mission Hospital.

**Table 5.18: Injury mechanism by Settlement Cross tabulation**

		Settlement		
		Urban	Rural	Total
injury mechanism	Motor vehicle crash	21	70	91
		42.0%	41.7%	41.7%
	Pedestrian knockdown	2	1	3
		4.0%	.6%	1.4%
	Motorcycle crash	13	19	32
		26.0%	11.3%	14.7%
	Bicycle crash	7	19	26
		14.0%	11.3%	11.9%
	Poison	0	1	1
		.0%	.6%	.5%
	Fall	0	6	6
		.0%	3.6%	2.8%
	Gunshot	0	2	2
		.0%	1.2%	.9%
Burns	0	1	1	
	.0%	.6%	.5%	
Machete / Cutlass	2	31	33	
	4.0%	18.5%	15.1%	
Stab / Hit	5	11	16	
	10.0%	6.5%	7.3%	
	0	7	7	

	Bit / sting	.0%	4.2%	3.2%
Total		50	168	218
		100.0%	100.0%	100.0%

**Source:** Hospital based intervention survey at Ejura & Kasei hospitals, Dec 2010

Machete / Cutlass played a significant role in the occurrence of injuries. Cutlass is the second leading injury mechanism in the rural communities causing 18.5% of the rural injuries. In the urban centres, violent activities resulted in stabbing or hitting individuals with objects accounted for 10% of the urban-based injuries.

Beside road traffic crash which has been recognized as the major injury mechanism in both urban and rural settlements, animal bites, stings (4.2%), fall from trees (3.6%) and gunshot (1.2%) were identified as common rural injuries.

#### 5.8.4 Intentionality of Injury

Injury events were broadly classified into two categories namely, —intentionall and —unintentionall injuries. Injuries which occurred as a result of a deliberate human action is said to be intentional.

**Table 5.19: Intent (Intentionality of Injury)**

Intent	Occurrence
Intentional	6 (2.8)
Unintentional	212 (97.2)

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

On the other hand, unintentional injury refers to an accidental or unplanned event. From table 5.19, it is seen that greater proportion of the injuries which occurred during the intervention period was unintentional (97.2%). Injuries which occurred as a result of

deliberate human action were only 2.8%. The main event leading to intentional injuries was violence.

### 5.8.5 Anatomical Site

Injuries occurred to specific parts of the human body. Some injured persons reported single case while others reported multiple cases. A single case refers to a patient reporting injury on one part of his/her body. On the other hand, multiple cases are conditions under which a patient reports two or more parts of the body with injuries. As shown in table 5.20 nearly 90% of the patients who visited the two hospitals for medical care reported single injury case.

**Table 5.20: Anatomical Site**

	Frequency	Percent
arm	54	24.8
leg	45	20.6
head	44	20.2
neck	14	6.4
head+	14	6.4
Chest/Abdomen	13	6.0
waist	11	5.0
Other	8	3.7
leg+	8	3.7
arm+	6	2.8
Neck+	1	.5
<b>Total</b>	<b>218</b>	<b>100.0</b>

+ Multiple injuries

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

Under multiple injury cases, the major injury which necessitated the visit to the hospital was considered. However the symbol (+) is used to denote the additional injuries



Discharged with disability	5	2.3
Discharged without disability	139	63.8
Referred	66	30.3
Died	8	3.7
<b>Total</b>	<b>218</b>	<b>100.0</b>

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

The outcome of treatment refers to the condition of the injury patients as at the time of leaving the hospital premises. Majority of the injury cases were adequately managed at the hospitals within the district (Table 5.22). At least Sixty-three percent of the injury patients were discharged without disability, a condition under which the injured cannot perform his / her normal duties due to the injury. The fraction of patients discharged with disability was 2.3% and cases which were referred to higher health institution for specialist care was 30%. Fatal injury cases constituted nearly 4% of the injury cases recorded during the intervention period.

#### **5.8.7 Comparison between Pre and Post Interventions Reports on Injuries**

Before instituting the injury management training (Pre-intervention), the objective of collecting data injuries was to help in ranking injury among the top ten causes of morbidity and mortality in the district. The pre intervention method failed to provide stakeholders with appropriate information to support effective injury prevention policies.

**Table 5.23: Comparing Pre Intervention with the Post Intervention Methods of Injury Reporting**

<b>Variable</b>	<b>Pre Intervention</b>	<b>Post Intervention</b>
Age	?	+
Sex	?	+

Place of Occurrence	?	+
Time	?	+
Mechanism	?	+
Anatomical Site	?	+
Severity	?	+
Outcome	?	+
Ranking (Morbidity)	+	?
Ranking (Mortality)	+	?

**Source:** Hospital based intervention survey at Ejura& Kasei hospitals, Dec 2010

+ Captured

? Not Captured

The intervention method of improving injury reporting provided relevant information on the occurrence of injuries within the study period as shown in table 5.23. The method systematically documented relevant information on injuries such as the sex and age of the injured person, the place and time of occurrence, the injury mechanism and its intentionality. Again, the method considered the anatomical site of the injury as well as the severity of the case and the outcome of treatment. This information meets the primary requirement of an injury surveillance system (Holder et al, 2001). The method is capable of providing stakeholders with the complete information on the occurrence, management and outcome of injuries occurring in the locality. The intervention method provided information on the spatial distribution of injuries and the time of occurrence.

**5.8.8 Linking Injury Data with Injury Prevention Initiatives**

Injury data is the fundamental element of injury prevention and safety promotion in a locality since it provide statistics on the occurrence of injuries, intervention as well as evaluation of injury prevention programmes. Injury data is as well the basis of decisions and planning on safety. In determining the importance of injury reporting among the

injured persons, it was revealed that more than half of the respondents (54.6%) accepted injury reporting as an important public health exercise.

**Table 5.24: Reasons for reporting Injury Data**

<b>Reason</b>	<b>Frequency</b>	<b>Percent</b>
Identification of cause of specific injuries	25	55.6
Identification of risk factors associated with certain injuries	10	22.2
Identify population at risk of various injuries	7	15.5
To guide efforts to address injuries in a locality	3	6.7
<b>Total</b>	<b>45</b>	<b>100.0</b>

**Source:** Field survey, June 2010

Although majority of the injured persons acknowledged the need to document injuries, only 45 respondents representing 6.7% of the sample size were able to give specific need for injury data. In table 5.24, key justification for injury data is that it helps in the identification of the cause of specific injuries in the district (55.6%). Again, injury data is needed to identify risk factors associated with various injuries as well as the population at risk. Finally 6.7% were of the view that injury data is an important tool needed to guide the efforts to address the injury burden in a locality.

During the stakeholders' interview, the police estimated that only 25% of criminal cases and 60% of vehicle crash cases occurring in the district are reported to their unit. Similarly the health authorities estimated the percentage of injury cases managed at the hospital as 20% of domestic injuries and 80% traffic related injury cases.

Although, injury data is necessary for planning implementation and executing injury intervention however stakeholders showed limited knowledge on the overall usage of injury data as seen in table 5.25

**Table 5.25: Awareness of the use of injury data for Planning, Implementation and Evaluation following Injury Interventions**

Injury Intervention	Usage of Injury Data	Yes	No
4 Es	Public Health Education	22(91.7)	2(8.3)
	Product Engineering	4(16.7)	20(83.3)
	Environmental Modification	6(25.0)	18(75.0)
	Enforcement of law on safety	4(16.7)	20(83.3)
Injury Prevention Models	Haddon's Matrix	2(8.3)	22(91.7)
	Epidemiological Model	1(4.2)	23(95.8)

**Source:** Field survey, June 2010

More than 90% of the stakeholders were not aware of the need for injury data to plan, implement and evaluate injury prevention models such as the Haddon's Matrix and the epidemiological Model. Similarly, knowledge on the use of injury data on the application of the 4E's was very low except for public health education on injuries.

**Table 5.26: Have you ever used injury data to Plan, Implement and Evaluate injury intervention through the under listed interventions?**

Injury Intervention	Usage of Injury Data	Yes	No
4 Es	Public Health Education	15(62.5)	9(37.5)
	Product Engineering	1(4.2)	23(95.8)
	Environmental Modification	1(4.2)	23(95.8)
	Enforcement of law on safety	4(16.7)	20(83.3)
Injury Prevention Models	Haddon's Matrix	0(0.0)	24(100.0)
	Epidemiological Model	1(4.2)	23(95.8)

**Source:** Field survey, June 2010

Stakeholders who directly or indirectly compile injury data have minimal utilization of the injury data (Table 5.26). Injury data is mainly used for public health education (62.5%). Other components of the 4E's which complement public health education to achieve maximum safety are not considered adequately. As low as 4.2% of the injury prevention stakeholders utilize injury data to support product engineering and environmental modification programmes as a measure to prevent the occurrence of injuries. Injury data is not used at all to apply the Haddon Matrix (0.0%) concept to address injury occurrence.

Extracts of qualitative data from stakeholders on the importance of injury data are as follows;

*[...] Injury data is needed to identify the cause of various injuries and to determine the contribution of specific injury mechanisms [Staff at the hospital Records Unit...] [...] Injury data again helps in the selection and application of the 4E's (Engineering, Environmental modification, Education on injury prevention and Enforcement of the law ) to address injury situations in a locality [A staff of Ghana Health Service...]*

*[...] Injury data enhances effective injury management since it help in planning the procurement of logistics for injury and trauma care [A Police Officer...]*

*[...] Injury data is needed to assess the strength or weakness of injury intervention through comparing statistics on the occurrence of injuries before and after an intervention is instituted [A Disease Control Officer]*

*[....]The basis of formulating injury prevention policies is the injury data and relevant information from the grassroots hence the decision to address the limitations of the injury surveillance system is laudable [A Director of Health Services]*

Some stakeholders were of the view that improving injury data at the district level is less important. The justification of this notion is that, policies on injury prevention are made at national or regional levels. Again the broader informal healthcare sector could undermine the development and operating a system to improve injury reporting in the district.

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## **CHAPTER SIX**

### **6.0 DISCUSSION**

This study has documented various factors affecting injury reporting in rural settlement and some possible means to improve upon the injury surveillance system in the least resourced settings in order to generate reliable injury data to guide the formulation of policies and strategies to control injury and to promote safety in rural Ghana. The findings are presented in sub-sections as per the specific objectives of the study.

#### **6.1 Spatial Distribution of Rural Injuries**

##### **6.1.1 Rural – Urban Distribution of injuries**

Many significant differences were found in the pattern of injuries in urban and rural settlements. Injuries emanating from motorized vehicles were more pronounced in rural environments except pedestrian knock-downs. Close to 66% of motor vehicle crashes occurred on highway sections in rural areas while urban settlements recorded 80% of pedestrian knock-downs. These findings are similar to previous studies in Ghana which found pedestrian collisions occurring more frequently on urban roads than rural roads (Afukaar, 2003). In addition to motor traffic injuries, agricultural related injuries such as machete wounds and agro-chemical poisoning accounted for overwhelming majority of the injuries in rural communities. This finding is consistent

with previous findings in Ghana and other developing countries in the world (Mock et al., 1999a). Related to agricultural activities is the occurrence of gunshot injuries which were wholly recorded in rural environment as a result of mass hunting, especially during the long dry seasons. A study in Nigeria attributed the occurrence of rural gunshots to mistakes in handling firearms and indiscriminate shooting during hunting (Mohammed et al., 2005). Similarly a study in the Kawempe province in Uganda identified gunshot as a significant contributor to the burden of rural injuries (Kobusingye et al., 2001).

Injuries occurring in rural space (63%) were far greater than the cases in urban centres (37%). Contrary to these findings, epidemiological investigations on rural-urban distributions of injuries in Africa found the proportions of injuries occurring in urban centres to be greater than rural cases (Kobusingye et al., 2001). The prominent factor which accounts for the increased rural injury burden in the study area is due to the dominance of agricultural activities in rural communities as this occupation is characterized by the use of simple and crude farming tools which make farmers susceptible to both fatal and non-fatal injuries (US National Farm Medicine Center, Agricultural injury Fact Sheet. 1996).

### **6.1.2 Spatial Distribution of Injury Mechanism**

Although the rural settlements have higher burden of motorized and agricultural injuries than the urban centres yet in the developing world, much attention is given to injuries which occur in urban settings. Apart from the fact that Injury Prevention Practitioners and other professionals from different disciplines operate in the urban areas, there are also limited studies on injury prevention in rural communities in developing countries (Odero et al., 2007, Fatmi et al., 2007, Moshiro et al., 2005). Comparatively, the rural settings in Africa are least resourced in terms of health services such as trauma care,

health services personnel and other vital logistics since the distribution of health facilities is skewed towards the urban areas. For example, in Kenya, it is estimated that only 10% of the country's doctors served rural areas, and some 70% of all doctors were in urban practice, with doctor-population ratios ranging from 1:990 in the cities to 1:70,000 in rural areas (Good, 1987). In Ghana, over 65% of doctors are concentrated in the teaching hospitals, of Korle Bu in Accra, Komfo Anokye in Kumasi and the Tamale teaching hospital. Human resources such as biomedical statisticians, epidemiologist and trauma researchers are lacking hence thorough investigations into the occurrence and distribution of injuries are limited (Krug et al., 2000). These conditions have negative impact on the recognition of the impact of trauma on public health hence there is little public education focusing on injury prevention and safety promotion programmes (Joshi et al., 2003). The lack of injury data has been highlighted as a major barrier to injury prevention in the least and middle income countries (Hofman et al., 2005, Odero et al., 2007). Improvement in the injury data system is therefore needed to provide reliable statistics on rural injuries to support safety policies for effective injury control initiatives in the subSaharan Africa and other developing countries.

## **6.2 Injury treatment options and determinants of choice of injury care**

### **6.2.1 Injury Treatment Options**

Respondents use varying treatment options for injuries. Key injury treatment options were traditional practices and the orthodox health care. Among the primary injury treatment options, the traditional care, either using herbs alone or with supplementary drugs from chemical shops is the commonest injury treatment option accounting for a total of 60.8% of injury care. The treatment options conform to the established trend in injury care in rural Ghana where vast majority of injury conditions cases were managed

under the traditional care This finding exceeds the volume of the injury treatment options in urban Ghana (Spangenberg and Mock, 2006). The trend of the utilization of traditional medicine reflects the extent of patronage in Africa and other developing countries where the level of traditional care ranges from 40% in China to 80% in Africa (W.H.O, 2002). The trend of injury care in rural Ghana indicates an increased utilization of the traditional practice due to various reasons ranging from cost, trust, proximity and severity of injury. The identification of treatment options and determinants of injury care are needed to provide information on where to target specific or general information on injuries in a geographical space in order to establish the platform for generating reliable injury data.

### **6.2.2 Determinants of Choice of Injury Care**

The examination of the determinants of injury care is relevant to design a comprehensive framework to strengthen the injury surveillance system. Paramount determinants of injury care are educational status, income level and injury severity.

There is a statistical difference between educational level and type of injury treatment. The degree of seeking injury care at the orthodox health centres increased from an average of 41% among patients with basic education to 91% of respondents with tertiary education with a corresponding p-value of 0.01. Similarly, economic status of the injured is a significant determinant of injury care as the proportion of those falling within the high income bracket (84%) who utilized orthodox medical services far exceed the corresponding proportion of the middle (47%) and low (40%) income classes of injury patients (P= 0.01). Another determinant of injury care is the severity of injury as a greater percentage of respondents with severe injury (60%) patronized the orthodox care more than the moderate (56%) and minor injury cases (46%). Unlike the level of education, economic status and injury severity, the study found type of

settlement as a weak determinant of injury care ( $p= 0.8$ ). Findings on primary determinants of health care were similar to the outcome of various studies conducted in Ghana and other developing countries where economic status, level of education and the nature of the disease significantly determined the choice of care (Spangenberg and Mock, 2006, Babar and Hatcher, 2004).

Other determinants of choice of injury care are distance and accessibility, the medical cost, relative influence and recommendation and trust based on known achievement in injury care. Longer travel hours and distances to health centers in rural areas constituted barriers to choice of care. A study found that distance is the most important factor that influences the utilization of health services in rural Ghana (Buor, 2003). Longer geographical distance with associated prolonged travel hours due to poor road conditions linking health centres with rural settlements were barriers to health care utilization. It was further derived from the stakeholders' discussions that, it is rather the poor road conditions that often discourage transporting injury cases than long distances since rugged rural roads often compound injury severity. However, improved road network and efficient transportation system could mitigate the distance decay concept and has proven to have a positive influence on health care utilization (Arcury et al., 2005b).

The cost component of injury care is another important determinant of the choice of care. Less than a fifth (17%) of respondents alluded to the fact that cost of care deters them from seeking care from the orthodox as against the 14% who seek care from alternative sources of care. An attractive component of the cost of injury care under the traditional practice is that, it accepts both cash and kind as a form of payment for the services. The mode of payment is also flexible as payment for the services could be deferred to favourable period such as harvest time or cocoa season. Cost component

determines the degree of utilization, the extent of substituting care as well as entirely seeking alternative care. There are similarities in the findings in Nigeria where it was found that, the higher the total cost involved in seeking healthcare from government hospitals, the more the respondents will show preferences for self- care treatment than orthodox care (Awoyemi et al., 2011). The level of trust in the source of injury care is also vital in determining where to manage injury case. A little over a third (32%) of respondents sought traditional care while 36% supplemented traditional medicine with drugs from patent drug sellers (peddlers) which was solely based on trust in the traditional services. Due to trust in various injury cares, people often recommended specific treatment options to the injured or the caretakers. Based on relatives' recommendations, almost 30% of the injury patients decided to supplement hospital treatment with traditional treatment. In Ghana, the Ghana Medical Association code of ethics prohibits members including orthopedic, traumathologist and plastic surgeons who have specialized in injury care from advertising their services. The traditional practice, however, enjoy unlimited freedom to publicize their services and sometimes exaggerate their injury care capacity to the general public to win trust among the populace. Plural medical care strives on the perception that injury is managed effectively under the traditional practice where the physical and spiritual aspects relating to the injury are addressed. However, the weaknesses associated with the traditional services are effectively addressed by the formal health care which employs modern medical techniques in caring for injury conditions (Solagberu, 2002). The availability of modern health technology such as X-ray, CT- Scan and MRI makes it convenient and effective to manage severe injury conditions at the orthodox centres. The finding is a reflection of studies in Ghana and Nigeria which documented the traditional practice and orthodox health care as the leading injury management options.

However, the most patronized choice is the traditional practice (Ogunlusi et al., 2007, Mock et al., 2001).

### **6.3 Injury data sources**

The usual sources of injury data in the developing countries include the hospital data, vital statistics and the police accident and violence reports (Robertson, 1998). The absence or limited documentation of procedures involved in injury care has resulted in the neglect of the informal injury management practice as a potential source of injury data. However the traditional centre was identified as the principal custodian of injury data in the Ejura-Sekyedumasi district. The distribution of injury data showed that 60%, 33% and 7% of the injury cases were reported to the informal centers, the formal institutions and the police respectively. Traditionally, morbidity data is obtained through utilization of specific injury care hence injury management centers with high level of utilization command greater volume of injury data. The volume of injury cases which sought care at the informal sector under this study is slightly higher than the volume of injury cases which were reported to the traditional practitioners under previous studies in rural and urban Ghana (Spangenberg and Mock, 2006). The distribution of injury data sources in the study area however substantiates the findings of an epidemiologic survey on injuries in Ghana which found low patronage of health services by the injured. Hospital and other health services records therefore are limited in providing full statistics on injuries (Salifu and Mock, 1998). It is therefore imperative to explore avenues to regularize injuries reported to the traditional injury management system to provide supplementary statistics on injuries to maximize the volume of injury data to promote injury intervention initiative in rural Ghana.

#### **6.4 Appropriate methods of strengthening the injury surveillance system**

Strengthening the injury surveillance system involves addressing the social and institutional challenges which are undermining the injury reporting initiatives in a locality. Various studies in Ghana and other developing nations have identified several factors which constitute challenges to the maximum utilization of the orthodox medical services. These include distance to the health facility, the cost of utilizing the medical services and overhead expenditure and as well as the economic status of the injury patient (Buor, 2003). This study however found lack of trust as a leading challenge to the utilization scientific medicine as a potential source of injury care. Alternatively, the high level of trust in the traditional medicine as the ultimate cure for injuries is seriously undermining the injury reporting initiatives since several injury conditions are managed outside the formal medical facilities which are the principal custodian of general health data. Compounding the above mentioned social challenge is the limited knowledge on centres where injury could be reported as 45% of the injured respondents had no idea on injury reporting centres in their localities. Again, injury reporting was seen as a less important exercise among 45% of the injury patients. The cost of injury treatment comprising direct and indirect cost was identified as a significant factor which deters people from reporting injuries to the formal health centres. By law, all injury conditions emanating from violence, motorization and criminal activities must be reported to the police. However, only 20.5% of the road traffic crashes were reported to the police. Similarly the police recorded 20% of gunshot cases. Respondents deliberately ignored reporting their injury conditions to the police in order to avoid unreasonable and indirect charges as well as lengthy bureaucracy at the police stations.

In localities where health care utilization is faced with challenges such as inability to meet the cost of care, difficulties in transporting injury cases due to poor road

conditions, low knowledge level on the capacity of the orthodox medical practice in terms of handling injury cases as well as the existence of cultural beliefs that favour seeking a local healer before consulting a nurse or physician, a public health education is advocated as appropriate strategy to improve service utilization. In effect, the quality of surveillance in developing countries could be improved if a communitybased initiative is established to address the weaknesses and the challenges arising from the underutilization of the formal health services (Ndiaye et al., 2003).

The Geneva Declaration on violence injuries advocates an ‘integrated’ injury surveillance system which operates with composite institutions which contribute directly or indirectly to the management of all injuries occurring in a locality. Contributing institutions may include the medical institutions, community centres, law enforcement, courts, and morgues (Geneva Declaration Secretariat, Geneva 2009). Discussions with stakeholders yielded an idea to establish a Community-based injury reporting desk (C-BIRD) within the communities to handle injury data irrespective of the choice of care. The overwhelming stakeholders’ willingness to support the injury reporting services together with assurance of voluntary services from 52% of injury patients indicates the possibility of establishing community-based injury reporting desk at the barest minimum cost. The services of the Village Health Committee and the Community-based Surveillance Volunteers could be expanded to collate information on injuries at community levels on behalf of the Ghana Health Service. Like many voluntary services, managing injury reporting system on voluntary basis could improve injury reporting. Appropriate knowledge and awareness of the importance of health services have shown to be positive with services utilization in developing countries where community volunteers have been used (Buor, 2003). To encourage public patronage of injury reporting, there is the need for informal public

education on the importance of injury data in injury control. Media advocacy has become an established health promotion strategy, partly due to the influence of the World Health Organisation's 1986 Ottawa Charter for Health Promotion. It has become common to seek a 'partnership' or 'shared agenda with the mass media in communicating health information to the public, particularly in the area of prevention and risk reduction (Razak, 1992).

For some reasons, several injury reporting institutions in developing nations face various challenges which hamper full coverage of injury cases. For instance, an investigation on the extent of coverage of injury cases in Ghana found only 10% of pedestrian injuries covered by the police statistics (Salifu and Mock, 1998). Several health institutions lack human resources with skills to handle injury data in conformity to international standards resulting in weak or 'dysfunctional' health information systems (Holder et al., 2001). Investigations into staff capacity to handle injury data revealed that only 11% can effectively analyse interpret and present injury data as per the World Health Organization's standard. The system of injury reporting was passive and injury cases were ranked together with cause of morbidity, mortality and admissions. Vital information on the occurrence and distribution of injuries were lacking as a result, the basis of planning and decision on injury prevention were problematic. Following this, this study implemented an intervention to improve staff injury reporting capacity and the outcome showed a tremendous improvement. The capacity to analyse injury data increased from 11% to 87% while dissemination and presentation of injury data improved from 9% to 60%. The injury management training further equipped the staff to identify key variables on injuries to provide relevant data on injuries in conformity with the World Health Organization's score minimum data on various injury cases (Holder *et al.*, 2001). The achievement of the intervention partly

corroborate the outcome of similar study to improve injury reporting in urban Ghana through training of staff to upgrade record keeping on injury related deaths at an urban tertiary hospital in Ghana (London et al., 2002).

Unlike the previous study which trained staff from different units to improve injury reporting at the mortuary, this study trained regular staff of the records unit and further funded provisional study to assess the extent of improvement in staff capacity to manage injury data. The outcome of the assessment of the provisional study showed a tremendous improvement in the development of staff capacity to handle injury data in respect of internationally accepted protocols.

#### **6.5 Procedures involved in translating injury data into safety**

Injury data is relevant to identify patterns and types of injuries in a locality. Based on injury surveillance, more in-depth epidemiologic investigations could be conducted to control the occurrence of injuries. It is therefore imperative to establish a solid linkage between injury data with injury prevention and safety promotion initiatives in a locality. The lack of credible mortality and morbidity data in developing countries limits the ability of governments and other stakeholders to understand fully the scope and scale of violence, and the impact of injury on communities. Limited data on injuries has diminished the scope of injury prevention and safety promotion initiatives in rural Ghana. With respect to the application of various injury interventions, only 4.2% of the stakeholders have ever based on injury data to prompt environmental modification to address road traffic crashes. With the exception of public health education, stakeholders have limited or no knowledge on various tools for injury prevention and safety promotion in a locality. The lack of injury data has translated into limited application of potential tools to address public health problems emanating from injuries and trauma.

A credible injury data is therefore needed for better treatment of injuries which could help achieve three of the UN's Millennium

Development Goals, namely the reduction of child mortality, improving maternal health and promoting gender equality with respect to access to health-care services (Gosselin and Heitto, 2008).

To effectively address injury problems in rural Ghana, injury data should be readily available, free from questionable reliability and under-reporting. Stakeholders overwhelmingly acknowledged the role of injury data in injury prevention such as the identification of injury risk factors, assessment of the strengths and weaknesses of an interventions as well as evaluation of strategies to address injuries in a locality. Reasons behind low utilization of injury data were due to the fact that the injury surveillance system was active since Police injury data is analysed by the Building and Road Research Institute. The health institutions provide aggregate data on clinical conditions including injuries; hence stakeholders and the general public are constrained with reliable injury data to take the required action to address injury prevention and safety issues in the district.

## **CHAPTER SEVEN**

### **7.0 SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS**

#### **7.1 Summary**

Injury surveillance system is a crucial issue in the development, implementation and evaluation of strategies for injury prevention and safety promotion in rural space. In rural Ghana, most injury reporting institutions lack the capacity to observe the core injury surveillance protocol as per the World Health Organizations standards. Again, many injury patients do not patronize and report injury conditions to the formal medical

centres hence full statistics on injuries are not available to guide public health decisions and policies to prevent the occurrence of injuries. In view of this background, the specific objectives of the study were to examine the spatial distribution of injuries and the extent of injury reporting among rural and urban communities. The study also investigated the injury treatment options and determinants of choice of injury care with the view of quantifying the magnitude of under reporting of injury data in the Ejura-Sekyedumase district. Further investigations were carried on the various injury data sources to identify weaknesses and strength of the injury reporting centres to facilitate capacity building to improve the injury surveillance system. Finally, the study examined the possible procedures to strengthen the injury surveillance system and to translate injury data into safety to accomplish the ultimate objective of an injury surveillance system in a rural settlement.

Procedures involved in achieving the specific objectives of the survey include a household survey among six hundred and fifty (650) injured persons, key informant interview with 24 stakeholders in the field of injury prevention and safety promotion and an implementation of an intervention through training of health staff on injury surveillance procedures. Methods used for data collection included interviews based on questionnaires and open discussion with stakeholders. The capacity of the main custodian (Health Institutions) of the injury data to manage injury data was assessed through pre and post staff capacity assessment on injury data management. Statistical tools employed in the analysis of injury data include percentages, cross tabulation, frequency and charts with the help of the SPSS software.

The investigations into the spatial distribution of injuries showed that rural and urban environments have various degrees of specific injuries. Common injuries in urban areas were motor accidents and pedestrian knockdown whilst agricultural activities were the

major contributor to rural injuries. Streets and roadways in urban communities were the common places of injury occurrence while majority of rural injuries occurred on farm yards. Urban injuries were slightly reported to the injury reporting centres than the rural injuries.

The main injury treatment options were the traditional centres and the orthodox medical practice. The traditional injury care was much patronised than the orthodox medical services. Small fractions of injuries (11.2%) were managed by means of dual care, a situation under which injury is initially managed at a traditional centre and ended up at the orthodox care and vice versa.

Educational and economic status of injury patients were identified as primary determinants of the choice of injury treatment. Injured persons with secondary and tertiary education managed injuries at the orthodox institutions much more than people with no formal education or basic education. Injury patients with appropriate educational background were knowledgeable about the scientific methods which the orthodox medical system employ to handle injury conditions. Secondary determinants of health care among injury patients were the cost of treatment, distance and trust in a specific medical system. The cost of injury treatment at the traditional centres was said to be very attractive since the cost of injury care at the traditional centres could be bargained, be paid in cash or in kind or deferred to favourable period such as harvest season.

An aspect of distance which hinders effective injury care and reporting is the condition of the road rather than the length. Transporting severe injuries on deplorable roads often complicate the condition of the injured person hence the decision to resort to alternative medicines within the vicinity. Respondents were however willing to transport the

injured over long distances with good road conditions than shorter deplorable farm roads. Trust plays a major role in seeking injury care. Trust is based on individuals' experience and information on successful injury cases managed by specific practitioner.

The main injury data sources in the Ejura-Sekyedumase district could be categorized into informal and formal sources. The informal injury data source is mainly the traditional injury management centres comprising the bone setters and the herbalist. The formal injury data source includes the orthodox medical institutions, the police Criminal Investigation Department (CID) and the Police Motor Transport and Traffic Unit (MTTU). Although the traditional sector manages a larger proportion of injury cases occurring in the study area, the practice however does not contribute to the compilation of injury data.

The orthodox medical practice plays a leading role in injury surveillance system however; the records sections of the health institutions lack the skills to manage injury data to meet the minimum standards of the World Health Organization. Again, the level of public patronage of injury care provided by the formal medical system is comparatively low. Injury data generated by the formal health medical services sometimes fail to give accurate and reliable statistics on the burden of injury in the district.

Utilization of injury data in injury control was very low. Majority of the stakeholders responsible for injury prevention in the district have adequate knowledge on the role of injury surveillance and injury data on injury prevention. However, the level of knowledge on the various injury prevention models such as the Haddon's matrix and epidemiologic triad were very low. Greater majority of the stakeholders (95%) lack the skills to utilize injury data to control the occurrence of injuries. The level of application

of injury data in injury prevention was very low as only 4.2% of the stakeholders admitted ever used injury data to initiate an intervention to prevent injury.

Effective translation of injury data into injury prevention strategies hinges on education and training programmes to equip stakeholders with the skills and knowledge to undertake injury interventions initiatives in a locality especially on various injury prevention models such as the Haddon's matrix and the 4Es in injury prevention and safety promotion.

## **7.2 Conclusion**

The study has contributed significantly to the efforts of improving injury surveillance system in rural environment as per the study objectives. The research critically examined the distribution of injuries in a geographical space and the extent of reporting in order to guide the development of an injury surveillance system with respect to specific or general injuries which are common with specific types of settlement. Although rural and urban settlements have different injury patterns yet the level of reporting were relatively at the same magnitude hence the two geographical areas may require the same magnitude of public health education and technical support to improve upon the level of injury reporting.

Major challenges facing the injury surveillance system partly emanates from the choice of injury treatment. Vast majority of the injury cases were managed at the traditional centres where case documentation is not a mandatory aspect of the practice. Injury cases which were managed solely under the traditional practice accounts for the magnitude of under reporting in the injury data. Key determinants of the choice of injury care were the level of educational and economic status of the injured person. As an individual's educational status increases the level of knowledge on the scientific methods employed

by the orthodox medical practices advances hence the willingness to manage injuries under the orthodox medicine. Economically active persons also were found to be reporting injuries more than the low income people. This was based on their capacity to meet the full cost of injury care under the orthodox medical services. Poor road conditions were found to affect injury reporting negatively. Similarly, low public knowledge on the role of injury data in injury prevention was found to have adverse effects on injury reporting. The study concludes that efforts to strengthen the injury surveillance system in rural environment should be focused on public health education to encourage mass utilization of the orthodox medical services. Again the rural communities could be empowered economically to effectively meet their health needs through the provision of soft loans and agricultural input under subsidized conditions. The national health insurance scheme could be improved and expanded to cater for the full cost of injury care. Conditions of feeder roads and access to villages and hamlets in the hinterlands could be improved through regular maintenance and upgrading to enhance accessibility and efficient transportation network.

The utilization of the traditional injury care was found to be inevitable since the patronage was based on traditions and beliefs irrespective of the level of income, economic status and type of settlement. Injured persons with various backgrounds patronize the traditional services either fully or blend it with the orthodox medicine in the form of dual medical care. The study therefore recommends incorporating the traditional practice into the injury surveillance system through formally recognizing the local chapter of the Ghana National Association of Traditional Practitioners in order to encourage documentation of injury cases managed under the traditional care. Non members of the association could be invited to voluntarily contribute to the injury

reporting in a locality. There is also a corresponding need to explain the role of injury data to the traditional practitioners as well as provide training on compilation of core minimum injury data to the informal medical practitioners. This calls for a debate to find sustainable procedures to incorporate the informal medical practice into the injury reporting protocol in a rural community.

Again a community-based injury registry could be established at community levels under the supervision and management of the Village Disease Surveillance Volunteers to document injuries occurring in the communities irrespective of the place of management.

The various institutions contributing to the injury surveillance system were functioning to provide statistics on injury periodically. However, the existing performance was below the WHO standard. This was due to lack of staff capacity to handle injury data in respect of appropriate standards. A training programme instituted to equip the staff with the requisite skills on injury data management yielded a significant improvement in the provision and release of reliable and accurate statistics on injuries. Obviously, staff training on injury data management is a very important aspect of improving injury surveillance system.

The culture of utilizing injury data in the formulation of policies on safety and injury prevention was virtually absent. Stakeholders lack knowledge on the various injury prevention models and their application to establish safety in a locality. Effective transformation of injury data into safety may require introducing stakeholders to injury prevention models and the applications. Decentralization on policies to control the occurrence of injuries to the grass root levels is necessary to empower personnel at the

district to utilize injury statistics to formulate policies to address specific injury burden within the rural environment.

### **7.3 Policy Recommendations**

Injured persons and stakeholders for the survey contributed immensely to the efforts of strengthening the injury surveillance system through raising constructive suggestions such as creating public awareness on the role of an injury data in the development of policies to control the occurrence of injuries in a locality, improving accessibility to health centres through rehabilitation of roads to settlements in the hinterland, empowering the people economically to meet their health needs adequately through the provision of soft loans and subsidizing the cost of agricultural inputs. Establishing an injury reporting desk at community levels was emphasized to facilitate the registration of all injuries in the community. Staff training on the principles of injury data management was seen as an essential aspect to empower personnel to effectively and efficiently manage injury data to meet international standards. As per the findings from this study and the contribution by the stakeholders, the under listed recommendations were identified as potential strategies to mitigate the social, economic and institutional challenges facing injury reporting in order to pave way for smooth injury reporting to enhance reliable injury surveillance system in a rural space.

#### **7.3.1 Instituting Community Health Educational Programme**

The study revealed that there is association between injured persons' background characteristics and treatment seeking behaviour in respect of the choice of injury treatment. It is recommended that public health education is needed to provide the populace with adequate knowledge and skills to have absolute command to prevent the occurrence of injuries. Effective public health education is again necessary to guide the decision on the choice of injury care and rehabilitation. The investigation on the

distribution of injuries showed that greater majority of the injuries could have been prevented outright if victims had the basic knowledge in injury prevention. Education has shown to be an indispensable tool in injury prevention as well as the extent of injury reporting. Public health education could enhance knowledge on the methods employed by the various injury care institutions to guide the decision on the selection of effective injury treatment. This public health educational task could be handled solely by the District Directorate of Health Services in collaboration with the school of public health of a recognized educational institution or with a nongovernmental organization or Ghana National Association of Traditional Medical Practitioners. This approach will contribute significantly to the eradication of the ageless notion that injuries are synonymous with accidents, hence are not preventable. It will as well sensitize the rural populace to adopt preventive strategies to avoid or minimize the occurrence of injuries through adherence to safe behaviours.

### **7.3.2 Establishment of a Community-based Injury Reporting Desk (C-bIRD)**

Some impediments to injury reporting were found to be the difficulties involved in transporting injury cases on bad roads, the cost involved in utilizing the orthodox medical services and the trust in the informal injury care which do not observe documentation in the clinical procedures. Some fraction of respondents failed to report their injury conditions in order to avoid possible arrest and prosecution. The findings postulate that the provision of services that could address the challenges facing the willingness to report injuries among the users of the alternative injury care could encourage injury reporting in the rural communities. In Ghana, the Community Based Surveillance (CBS) system contributed significantly to the success of the Village Guinea Worm Eradication Programme. The study recommends the creation of a Community-based Injury Reporting Desk to record injury cases free of charge

irrespective of where the injury was managed. The register will maintain high level of confidentiality in respect of information on injuries especially to criminally related injuries in order to encourage respondents who deliberately avoid reporting their injuries for the fear of arrest and prosecution. Injury reporting in rural settlements could be encouraged if the reporting services are brought to the door step of the injured. The feasibility of the community-based injury reporting desk will depend on the acceptance of Ghana health services to expand the services of the disease surveillance volunteers to cover injuries. The services could as well be supported by other non-governmental agencies which have been supporting health services like the World Vision International, the Adventist Development and Relief Services (ADRA) and United Nations International Children's Emergency Fund (UNICEF). Voluntary support could be derived from injured persons who express the willingness to offer voluntary services to support an initiative that could address the burden of injuries in their localities. The injury reporting desk would significantly improve the statistics on all injuries to reduce the volume of under reporting and incompleteness in injury data.

### **7.3.3 Staff Training**

The availability of injury data without appropriate skills to transform the injury data into meaningful statistical information capable of guiding decisions to establish safety could be meaningless. The lack of skills to transform the existing injury data into meaningful statistical inferences hinders the efforts to develop, implement and evaluate safety intervention in the district. The intervention programme in the form of training on the use of epi data for data entry and SPSS statistical softwares for data analysis showed an improvement in injury data management and reporting. Criticisms raised against the intervention is that, all clinical information are periodically collated at a central point for analysis and findings are disseminated nationwide. It is therefore

irrelevant to train staff at the district levels to manage injury data. The intervention was however justified on the basis that, the centralized procedure takes into accounts all injuries occurring across the country and generalization is made on the burden of injuries. The centralized system sometimes fails to provide solution to specific burden of injury in the rural communities. This leads to the neglecting of specific injury conditions that may contribute significantly to the injury burden locally but may be insignificant at the national scale. It is important to emphasize the need to permit the staff at the district and even at the community levels to process injury data locally to meet the exact challenges facing the efforts to control the occurrence of injuries.

#### **7.3.4 Transforming injury data into safety**

The extent of transforming injury data into safety was very limited since stakeholders and the principal custodians of the injury data were not knowledgeable on the basic injury prevention models such as the Haddon's matrix and the epidemiologic triad etc. Effective transformation of injury data therefore requires training programme to educate stakeholders in the field of injury prevention on the application of the injury prevention models to address the occurrence of injuries. It is recommended that the District Administration teams up with the District Directorate of Health Services, the Police and other stakeholders mandated for injury prevention to arrange to participate in the periodic injury research workshops organized by Fogarty Injury Prevention and Research Team of the Department of Surgery, Kwame Nkrumah University of Science and Technology and the Harbourview Injury Prevention and Research Centre of the University of Washington. Again, Government and Non-Governmental Organizations could sponsor individuals from injury prevention institutions to pursue a course in epidemiology of injury prevention and safety promotion to acquire the skills of transforming injury data into injury control.

### **7.3.5 Establishment of an Injury Surveillance Committee**

The smooth coordination of the activities involved in an injury surveillance system requires a credible committee. The injury surveillance committee may be selected from the various agencies that contribute directly or indirectly to injury prevention and safety promotion in the district. Based on the findings of the study, main custodians of injury data are the traditional injury management centres, the orthodox medical institutions and the police. The core members of the committee may constitute personnel from the Ghana Health Service, the Mission and Private health centres and the Police. Although the traditional medical practice command more than 60% of the injury data, the inclusion of this sector into the committee is however debatable since some of the practitioners do not document clinical cases hence, the difficulty in keeping and releasing injury data to the injury surveillance system. In addition to the primary injury data sources, other organizations which could contribute to the membership of the injury surveillance committee are the Ghana

National Disaster Management Organization, the District Assembly and the Ghana National Fire Service etc. The inclusion of these organizations into the injury surveillance committee is based on the fact that, they contribute to injury prevention and safety in diverse ways. Prominent traditional and religious leaders such as queen mothers, priests and Imam could be given the mandate to become members of the committee due to their role in socio-cultural development in the society.

Some injury patients established that, their willingness to contribute to safety initiatives will depend on the level of understanding of the concepts of injury prevention. This implies that, the objectives of the injury surveillance committee should clearly be state and explained to the understanding of all members of the committee in respect of their respective educational status. It remains an ultimate objective of an injury surveillance

system to promote safety through the compilation, analysis, interpretation and dissemination of injury data to support injury interventions. Members of the committee could contribute through the provision of primary injury data, technical services, logistics and advocacy for public participation in injury prevention initiatives.

### **7.3.6 Areas for future research**

For more improvements in the injury surveillance system, the following are recommended for further studies:

- ❖ An investigation into the feasibility of the establishment, management and sustainability of the C-bIRD. This may include strategies to explore avenues of community and stakeholders commitment to support safety programmes in a community.
- ❖ An exploration into the avenues to establish the concept of documenting basic injury information to pave way to incorporate data on injury cases managed under the informal sector into the main injury data stream.
- ❖ A study to examine the various public health education approaches to identify methods which are suitable for the rural communities with regards to matters relating to injury prevention and injury management.

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## APPENDIX 1

### QUESTIONNAIRE FOR DATA COLLECTION

Department of ` **Geography and Rural Development, College of Art and Social Sciences Kwame Nkrumah University of Science and Technology Kumasi – Ghana.** *Strengthening the injury surveillance system in rural Ghana as a measure of developing appropriate injury prevention strategies.A case study in the Ejura - Sekyedumase District (ESD) in the Ashanti Region of Ghana.*

**Questionnaire for Injured Persons**

*Interviewer's Code No* \_\_\_\_\_

**A. Demographic Characteristics**

Name -----H/No----- Town -----

**1.Sex:** Male  Female  **2.Age** \_\_\_\_\_ **3.Settlement type** 1. Urban 2. Rural

**4.Education:** 1. None 2. Primary 3.Middle/JHS 4.Secondary / SHS/ Voc

5.Tertiary 6.Other \_\_\_\_\_

**5.Religion:** 1. None 2. Orthodox, 3.Pentecostal / Charismatic 4. Islam,

5. Traditional 6. Other \_\_\_\_\_

**6.Occupation:** 1. Unemployed 2. Farmer 3.Petty Trading 4. Artisan

5. Construction 6. Civil/ Public service 7. Transport 8.Mining /

Quarrying 9.Logging 10.Other \_\_\_\_\_

7. Estimated income level? GHC \_\_\_\_\_ (Monthly)

**B. Geography of Rural Injuries**

**1.** Have you or your relative ever experienced injury in the past one year? 1 Yes 0 No

**2.** Where did the injury occur ?

1. Highway	3. Home	5. Water body	9. Other ( State)	
2. Street / Town	4. Farm / Bush	6. Work place	7. Recreation site	8. School,

**3.Date of occurrence** (Day / Month /Year)

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#### 4. Time of Occurrence

1. Morning	2. Afternoon	3. Evening	4. Night	5. Not known
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#### 5. What caused the injury (Mechanism)?

1. Motor vehicle crash	4. Bicycle crash	7. Poisoning	10. Burns	13. Bite/sting
2. Pedestrian knockdown	5. Hanging	8. Sexual assault	11. Stab / Cut / Hit	14. Other
3. Motor cycle crash	6. Drown	9. Gunshot	12. Fall	15. Electricity

6. What is the spatial environment? 1. Rural 2. Urban

7. What were you doing when the injury occurred?

1. Travelling	3. Domestic duties	5. Swimming	7. Playing	9. Other ( State)
2. Walking	4. Farming	6. Working	8. at School	

8. Anatomical site of injury (part of the body affected)?

1. Head	3. Chest	5. Arms	9. Hand / Fingers	Other
2. Neck	4. Abdomen	6. Thigh / Leg	7. Foot / toes	

9. Injury Severity: a. Severe b. Moderate c. Minor

#### C. Injury Treatment Options / Determinant

1. Were you given first aid? 1. Yes 0. No

2i. If yes, at where? \_\_\_\_\_

2ii. What kind of first aid were you given?

1. Traditional Medicine 2. Scientific Medicine 3. Both

3a. By what means were you transported to the centre for treatment ?

1. On foot	3. Motorcycle	5. Car	
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2. Bicycle	4. Tractor	6. Animal	9. Other
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**3b.** Where did you seek primary treatment?

1. Health Post	3. Hospital	5. Herbalist / Bone setter
2. Clinic	4. Faith Healing	6. Other

**3c.** Did you seek additional treatment? 1. Yes .No

**3d.** If yes to Q3c, where did you seek additional treatment

1. Health Post	3. Hospital	5. Herbalist / Bone setter
2. Clinic	4. Faith Healing	6. Other

**3e.** What were the reasons for choosing your primary treatment?

1. Cost	3. Trust	5. Relatives influence
2. Distance	4. Recommendation	6. Other

**3f.** What were your reasons for choosing additional treatment?

1. Cost	3. Trust	5. Relatives influence
2. Distance	4. Recommendation	6. Other

**3.** How did you pay for your medical bills?

1. NHIS	3. Relatives / Friends	5. Free	7. Other
2. Self financing	4. NGO/Church / Charity	6. Samaritan	

#### **D. Injury Data Sources**

**1.** Do you consider it as important to report all injury cases to the health institution

1. Yes 0. No

**2.** If no, which types of injuries should be reported?

1. Severe, 2. Moderate 3. Minor 4. No idea

**3.** If yes, what are some of the reasons why injury should be reported?

1. Help prevent injuries.	4. For Insurance purpose
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2. For counting purpose	5. No idea
3. For Arrest	6. Other

4. What are some of the centers where injury cases could be reported in this district?

1. Health institution, 2. Police, 3. Herbal Center, 4. District Assembly

5. No idea 6. Other \_\_\_\_\_

Did you report your injury condition?

1. Yes 0.No

If yes, where did you report it 1. Health institution, 2. Police, 3. Herbal Center, 4. District Assembly

### E. Strengthening

What factors prevent people from reporting injuries to the orthodox institutions?

1. Cost	3. Lengthy bureaucracies	5. Non availability of centre	7. Treatment option	9. No Idea
2. Ignorant	4. Bad road conditions	6. Long distance	8. Reporting is less important	10. Other

5a. Would you accept to report your injury condition to a designated officer in your community? 1. Yes 0. No

5b. If no, give reason \_\_\_\_\_

6. Would you advise an injured person to report injury conditions to a centre in your community? 1. Yes 0. No

7. What are some of the reasons why some injured persons failed to report their injuries to the reporting institutions?

1. Cost	3. Lengthy bureaucracies	5. Non availability of centre	7. Presence of dual care	9. No Idea
2. Ignorant	4. Bad road conditions	6. Long distance	8. To avoid arrest	10. Other

8. Would you volunteer to assist in compiling injury cases in your locality? 1. Yes

0. No

If No. give reason

*Thank You for your participation*

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## APPENDIX 2

### INTERVIEW GUIDE FOR STAKEHOLDERS

Department of Geography and Rural Development

College of Art and Social Sciences

Kwame Nkrumah University of Science and Technology Kumasi - Ghana

*Strengthening the injury surveillance system in rural Ghana as a measure of developing appropriate injury prevention strategies. A case study in the Ejura - Sekyedumase District (ESD) in the Ashanti Region of Ghana.*

**Interview guide for stakeholders from Injury Reporting Institutions**

#### **A. Demographic Characteristics**

1. Sex
2. Age
3. Rank / Position
4. How long have you been working at this section?
5. What is your highest academic qualification?
6. What is the staff capacity of your unit?

- 7i. Are you computer literate?
- 7ii. If yes, what is your IT knowledge level?
- 8. Are you knowledgeable in Data management?
- 9. If yes which data management programmes are you conversant with?
- 10. Have you ever attended workshop on data management?

**B. Assessment of the Capacity of the Injury Reporting Institutions**

- 1. What is the jurisdiction of your institution?
- 2. Does your unit compile information on injuries?
- 3. By what means do you compile data on injuries
- 4. What is your institution's Primary responsibility?
- 5i. Does your centre perform detailed analysis on injuries
- 5ii. Does your unit interpret and disseminate information on injury
- 5iii. What type of injury surveillance does your institution operates?
- 6. On the average how many injury cases does your unit record annually? (over the past 1 years)
- 7. What difficulties does your unit face in compiling information on injuries?
- 8i. Is your unit able to capture all injury cases within the catchment area?
- 8ii. What are the reasons why your centre is not able to capture all injury cases in your area?
- 9. What are some of the reasons why some people fail to report injury cases to your center?
- 10. Apart from your centre, which other places do injured people report injury cases to?
- 11. Is there any collaboration between your centre and other institutions that compile injury data?

12i. Is there any central institution in charge of compiling injury data?

12ii. Is there any means of assessing the overall injury burden in your locality?

13. How does your unit assess the overall injury burden over a given period of time?

14. What are some of the benefits of an injury surveillance system?

### **C. Linking Injury Data with Injury Prevention**

1. By what means do you think an injury surveillance system could be well patronized / sustained in the ESD?

2i. Have you ever used injury data to control the occurrence of injury before?

2ii. If yes, mention the type of injuries you used injury data to control.

3. What are some of the challenges you are facing with the use of injury data in injury prevention?

4. Suggest methods to improve the state of injury data in your locality

5i. Do you know any injury prevention model?

5ii. If yes Name the model

6. Have you ever applied any of the injury prevention models to prevent the occurrence of injuries in your locality?

7. What are some of the challenges involved in using an injury prevention model in your locality?

8. What are some possible strategies to overcome these challenges?

***Thank You for your participation.***