

**Training lay people as first responders to reduce road traffic mortalities and morbidities in Ethiopia: Challenges, barriers and feasible solutions.**

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## **List of Acronyms**

BLS: Basic Life Support

DALY: Disability Adjusted Life Years

EFA: Education For All

EMOH: Ethiopian Ministry of Health

EPRDF: Ethiopian People Revolutionary Democratic Front

RTA: Road Traffic Accident

SNNP: Southern Nations Nationalities People

UNECA: United Nations Economic Commission for Africa

## **Vocabulary**

Dergue: Military Junta

Letaf: Over loading

Kebele: District

Kiremt: Winter

Wereda: Sub-city

**Key Words and Phrases:** *Road Traffic Accident, Pre-hospital Trauma Care, WHO, Ethiopia, Addis-Ababa, taxi, commercial truck drivers, bystanders, onlookers. Ethiopian Ministry of health, Addis-Ababa Police Commission.*

## **Executive summary**

Road traffic accidents (RTAs) have become global public safety and development hindrances, especially in the low and middle income countries, where the rate is significantly higher compared to the industrialized nations. The WHO warns, unless action is taken to improve road safety systems, the number of people killed by car accidents will triple to about thirty six million per year, and “RTA will become the world's third leading cause of premature death by 2020”; overpassing cerebrovascular disease, COPD, diabetes mellitus, premature & low birth weight, neonatal infections, diarrheal disease and even HIV/AIDS and be out ranked only by depression and heart disease”. Provided that, one would assume that road traffic accidents, especially in the developing world, would be among the important health burdens worthy of close attention by both international agencies and local governments. But, the effect of trauma and injury, in terms of mortality and long term disability, in the developing countries, is neglected and underfunded due to “emphasis put on malnutrition and communicable diseases”. In the absence of outside help, poor countries, especially where the rate is high, need to come up with innovative and cost-effective ways to deal with this rapidly growing burden.

In 2004, the WHO published a guideline for interventions designed to train lay people as first responders in trauma situations. The goal of the program is to decrease the likelihood of unnecessary death and injury by minimizing the time elapsed from the onset of the accident to trauma care facility. This program entails contacting and notifying the emergency service and providing facilities about the nature and magnitude of the accident, taking action to secure the scene in order prevent the injured and other onlookers from harm that may be caused by other crashes, organizing people and resources” i.e. divide tasks and delegate people who, manage the crowd (disperse if necessary), confront and console relatives of victims, and those who would

apply first aid to the victims and physically transport them to the nearest facility in the absence of ambulance. The initiative has been implemented in some countries such as Ghana, Uganda, Madagascar, Iraq, and India and has proven to be effective.

Despite having low vehicle per population density, RTA rates in Ethiopia are rising. Ethiopia is periodically ranked among the countries with the highest per accident death and injury rates. A number of factors contribute to the high number of road traffic accidents in Ethiopia. These factors that can be categorized into 3 main groups: human factors (e.g. disobeying traffic rules), vehicle factors (e.g. driving old and uninspected cars) and environment factors (poor road and other infrastructure conditions, climate and topography etc.). While these are the determinant factors for car accidents in Ethiopia, the factors that lead to high per vehicle cars death and injury in Ethiopia are undeveloped health and emergency care system i.e. inefficient delivery of primary and emergency care, lack of facilities and resources, over loading, lack of adherence to using in vehicle safety equipment, urbanization and high population density. Although the government is working hard to attenuate the problem, it is clear that there is still more that needs to be done. Among the actions the government can take is applying this intervention and train lay people such as onlookers, bystanders, civil servants, police and other traffic coordinators, and taxi, mini- bus and commercial truck drivers. Successful implementation of the process will, however, require removing socio-cultural, economic and political barriers. The barriers identified in this paper are, socio-cultural factors (religion, literacy, lack of confidence by trainees, fear of contracting HIV/AIDS, economic factors (tendency by trainees to charge for their services and thus only help those who can pay), political factors (lack of political commitment by regional and federal government). With these barriers removed, the intervention can contribute to the reduction of per accident mortality and morbidity rate in Ethiopia.

## CHAPTER 1

### I. Introduction

Road traffic accidents (RTAs) have become public safety and development hindrances, resulting “in an estimated 1.2 million deaths and 50 million injuries worldwide each year”. [1] Given the fact that more cars are driven on the streets of the developed countries than the undeveloped, one may easily assume that the number of people killed per car would be higher in developed nations. However, "compared to high income countries, per vehicle fatality rate is significantly higher in low and middle income countries (LMIC)". [2] This is not only because roads in the developed world are better maintained and safety rules are better adhered to, but also because people in the developed world have the tendency to own multiple cars and the number of occupants per vehicle does not usually exceed the vehicle's capacity. Therefore, in the developed world, “most crashes involve privately owned vehicles with mostly the driver being the main car occupant injured or killed.”[3] Whereas, in the developing world, roads are in bad shape, traffic rules are not respected, and cars and commercial vehicles are loaded with people beyond their limits which results in high damage casualty. Therefore, despite the fact that “the developing world accounts for only about 32% of the global motor vehicles, the road traffic fatality rate is higher in the low and middle income countries (21.5 and 19.5 per 100 000 population, respectively) than in high-income countries (10.3 per 100 000) [4] According to the World Bank, " rates in developing countries are 25-30 per 10,000 vehicles, compared to 1 to 2 per 10,000 vehicles in the developed world". [5] Reports by the WHO also indicate that out of the more than “3000 people killed or injured from road traffic injury globally every day, 85% of the deaths and 90% of the annual disability adjusted life years (DALYs) lost are attributed to the developing world” [5]. Sharma et al. (2000) note that most of the deaths occur before patients arrive at the hospital or other health facilities [6]. And,

“two-third (60%) of the victims are in the age range of 15-44; an economically productive age group that is critically needed the most for the development of any country. [7] Provided that, it could be assumed that road traffic accidents, especially in the developing world, should be among the important health burdens worthy of close attention by both international agencies and local governments. But, the effect of trauma and injury, in terms of mortality and long term disability in the developing countries, is neglected and underfunded due an “emphasis put on malnutrition and communicable disease”. [7] In fact, “road safety is not even featured in the UN Millennium Development Goals (MDGs) and is missing from United Nations and G8 policies and programs for sustainable development” [8]; even though the burden of death/injury attributed to road safety has already become equivalent to that of malaria and tuberculosis and other major infectious diseases. In the words of Rt. Hon. Lord Robertson, Chairman of the Commission for Global Road Safety:

“Road traffic injuries are responsible for a global health burden similar to Malaria and tuberculosis, and as with those diseases, road crashes hit developing countries hardest. Yet, while the fight against malaria and TB justifiably command considerable funding and political and media attention, global road safety is seriously under resourced in all these respects the United-Nations has recently started to pay attention to add non-communicable disease”. [9]

Furthermore, if the trend continues, the WHO warns, the number of people killed by car accidents “could triple to about thirty six million per year and RTA would be the world's third leading cause of premature death by 2020”; [9] overpassing cerebrovascular disease, COPD, diabetes mellitus, premature & low birth weight, neonatal infections, diarrheal disease and even HIV/AIDS and be out ranked only by depression [9] This, as the Pulitzer Center notes, will severely impact developing countries’ abilities to sustain economic growth [10] and “unless action

is taken to improve road safety systems, poor countries will continue to bear the heavy toll of road traffic injuries.” [11]

2004 Diseases/injuries	% of total DALYs	Rank	Rank	% of total DALYs	2030 Disease/injury
Lower resp. infection	6.2	1	→ 1	6.2	Unipolar Depression
Diarrheal disease	4.8	2	→ 2	5.5	Ischemic Heart disease
Unipolar Depression	4.3	3	→ 3	<b>4.9</b>	<b>RTAs</b>
Schematic Heart disease	4.1	4	→ 4	4.3	Cerebrovascular disease
HIV/AIDS	3.8	5	→ 5	3.8	COPD
Cerebrovascular disease	3.1	6	→ 6	3.2	Lower resp. infection
Premature & low birth wt.	2.9	7	→ 7	2.9	Hearing loss, adult onset
Birth asphyxia & Trauma	2.7	8	→ 8	2.7	Refractive errors
<b>RTAs</b>	<b>2.7</b>	9	→ 9	2.5	HIV/AIDS
Neonatal infect. & others	2.7	10	→ 10	2.3	Diabetes mellitus
COPD	2.0	13	→ 11	1.9	Neonatal infect. & others
Hearing loss, adult onset	1.8	14	→ 12	1.9	Premature & low birth wt.
Refractive errors	1.8	15	→ 15	1.9	Birth asphyxia & Trauma
Diabetes mellitus	1.3	19	→ 18	1.6	Diarrheal disease

Table 1. Rank change of ten causes of burden of diseases globally 2004 and 2030

As noted above, the disparity between rich and poor nations in RTA induced fatality and injury rates is quite significant. According to the Commission for Global Road Safety, in addition to the infrastructural and behavioral deficiencies cited above, the disparity also comes from the fact that “the developed world has built a network of cooperation on road safety to guide and inform national actions while the developing countries by contrast operate in isolation, with limited

access to knowledge sharing and mutual support.”[12]. Therefore, it is suggested that “developing countries adopt similar strategy of cooperation and knowledge sharing in order to unlock large-scale funding for road safety from the development banks”.[13] However, this view had been contested by many, including Hills and Baguley (1992), who argue that emulating the developed countries or modifying such standards without fully evaluating the consequences is ill advised and not as easily adoptable and implementable as it seems because “the traffic mix and road usage in developing countries is very different.” [14] Instead, Hills and Baguley (1992), suggest that “developing countries should creatively look for cost-effective remedial schemes.”[14] This begs the question, in the absence of attention and adequate commitment from donors, what can the developing countries do to reduce road traffic injuries and deaths? The answer can be sought from two different approaches: Prevention and mitigation.

Prevention and mitigation, although linked, are two different aspects of disaster management. By definition, prevention is “an action taken to decrease the likelihood or the occurrence of a disaster” [15], while mitigation is “an action or a step that eliminates or diminishes the loss of life or property damage for events that cannot be prevented.”[15] Thus, although in general, it may be more desired and ideal to take the prevention approach, with unpredictable and inevitable events like car accidents, taking the mitigation approach may be more pragmatic. In light of that, this paper discusses the applicability of a mitigative intervention by WHO that focuses on training lay people. The program is designed to train all qualified people, but especially targets taxi and truck drivers since in countries like Ethiopia, the injured are mostly transported, if in city by taxi drivers, and in the rural areas, by commercial drivers who either are involved the accident or happen to be in route.

As mentioned earlier, the effect of trauma and injury, in terms of mortality and long term disability in the developing countries, is neglected and underfunded. Therefore, in countries like Ethiopia where per car crash death and injury rates among the highest in the world, an intervention that has the potential to contribute to the overall reduction of the effects of the road traffic accidents should be welcomed and encouraged. The question is, can the intervention be successfully implemented in Ethiopia given the severity of the problem, the country's history, culture, climate, topography and contemporary economic, political and social realities? Hence, the paper will

- a) Examine the key determinants and risk factors for RTAs in the country.
- b) Assess the magnitude and severity of RTAs and the status of current emergency care system in Ethiopia.
- c) Evaluate the potential impact the intervention on the country's extremely high fatalities and injury rates.
- d) Explore any barriers and challenge to implementing the intervention and
- e) Recommend feasible solutions to overcome the barriers and challenges.

## **II. Methodology**

There is considerable volume of formal and gray literature published on the necessity of training lay people as first responders. Most of the data used in this study was gathered from databases of Journal of Trauma, Journal of American Medical Association (JAMA), the World Bank, and World Health Organization (WHO), as well as, national studies on Road Traffic Accidents (RTAs). Additional data were collected from various governmental agencies in Ethiopia including the Ethiopian Ministry of Health (EMOH), the Ethiopian Road Transport Authority, the Federal Traffic Police Commission, Addis Ababa Traffic Control Departments, Addis Ababa University and other pertinent organizations. In addition to reviewing literature, information was

also gathered through interviewing government officials, medical personnel and other relevant people both in Ethiopia and in the diaspora. Transcripts from recorded newspaper and blogs were also included- most of them verbatim and a few paraphrased. Communication with interviewees was done via email, phone and Skype and in person. Although the email correspondences were in English, most of the interviews and the transcripts were in Amharic therefore had to be translated into English. These materials were translated by a certified translator and for accuracy were back translated into the original language (i.e. from English back to Amharic) by another translator. Comparison of the two documents showed little difference in words usage but not in the general content. Furthermore, significant amount of time and effort was devoted to gathering information on experiences from other countries with similar economic situation as Ethiopia. This was done to demonstrate the generalizability and applicability of the program in such settings.

### **III. Limitations of study.**

Obtaining up-to-date data, and in some cases even any data at all, was the main challenge of the study. This deficiency/gap was supplemented by interviewing people from pertinent stakeholders: personnel of the Ethiopian Ministry of Health, Ethiopian Road and Transportation Authority, Addis Ababa University, Doctors (domestic and in diaspora) and other hospital employees, Ambulance drivers, Traffic police officers and ordinary citizens. Although several data was gathered through interviewing and electronic correspondence, no anecdotal evidence was used as a concrete data to draw conclusion.

### **IV. Literature Review**

The social and economic costs of road traffic injuries are massive. According to the Foundation for Automobile and Society, “loss to developing country economies, due to road traffic injuries, is estimated at US\$ 100 million. [16] The World Bank estimates the figure to be “about

twice the total official development aid and loans these countries receive.” [16] As said by Jose Luis Irigoyen, a traffic safety specialist at the World Bank.

“The costs associated with these deaths are a poverty-inducing problem. It’s costing on average between 1 and 3 percent of GDP in the LMIC amount that can offset the billions of dollars in aid money that these countries currently receive”. [17]

It should be noted that these cost estimates do not include the social and psychological costs death and disability from road traffic injuries inflict on the victims and their families. Reports from the WHO indicate that “young adults between the ages of 15 and 44 ages are more vulnerable and in fact account for 59% of global road traffic caused deaths.”[18] This, of course, is this the most productive part of any society, therefore loss incurred to this productive group has serious social and economic ramifications. Thus, initiatives such as developing once prehospital system do not only save lives of the accident victims but also help the families they support and the overall national economy.

Prehospital trauma care is defined as “any initial medical care given to an ill or injured patient by a paramedic or other person(s) before the patient reaches the hospital emergency department”. [19] It refers to “any kind of care provide to the injured at the scene and in route to fixed facilities.” [20] Prehospital trauma care entails “controlling bleeding, treating broken bones, managing pain, addressing shock, and treating burns or wounds” [21]. Lieberman and Roudsari (2007) describe prehospital trauma care as “paramount to an effective and efficient system of trauma” [22], in order to be effective, should have certain core administrative and programmatic elements. The WHO traffic injury prevention manual, identifies these key elements as:

- a) Lead national agency-comprised of a legislative, regulatory supervision, and financial systems
- b) Support providing body- to ensure the involvement of communities.

- c) Local administration - to provide administration and supervision at the local level.
- d) Medical direction team - to coordinate care, provide with training and education and ensure pertinent quality improvement and
- e) Political support/funding - to sustain the operational and financial capacity of the system.[23]

Prehospital trauma is a cascade of care provided to injury victims. This cascade of care, as further elaborated by the guideline, is a multi-tiered process consisting of basic and advanced modes of care. Basic advance care, as described by in the WHO injury prevention training manual, is “care given at the community level by those who have taken formal and extensive training in the principles of basic prehospital care, such as, providing basic treatment, scene management, rescue stabilization and the transporting the injured[24]. Whereas, advanced prehospital care refers to the “establishment of complex regional call management centers and highly integrated communications networks as well as the provision of advanced invasive techniques. [25] This paper focuses on the principles of basic prehospital trauma care. Sasser et al. (2005) pointed out, efficient pre-hospital care should entail prompt communication and response and the assessment, treatment, and transportation of the injured. [25] Thus, those trained as first responders, in addition to providing basic first aid care, must also develop the capacity and skill required to recognize an emergency, call for help, and communicate with the advance care unit. However, waiting for an on-scene advance trauma care may not always be possible. In other words, in some situations, hurrying the injured to care facilities may be more beneficial than waiting for care to come to the scene.

Two concepts often raised in the discussion of rescuing the injured are “scoop and run” and “stay and play”. Scoop and run refers to taking the patient without primary treatment and hurrying him/her to the next hospital. Conversely, “stay and play” is the process of administration,

infusion therapy, early intubation and ventilation (i.e. advance pre-hospital care) in order to minimize or even avoid secondary organ damage. [26] Although the choice may be dictated by the nature of the injury and the availability and proximity of a well-equipped facility, this dictum in mode of response (staying or going) has been surrounded by much controversy even in such situations. Smith and Conn have argued “pre-hospital interventions beyond the basic life support (BLS) level have not been shown to be effective and in many cases have proven to be detrimental to patient outcome therefore it is better “scoop and run” than “stay and play”. [27] On the other hand, people like Sefrin (1998) have advocated for stay and play and claimed that it is “not the shorter transportation time but the qualified medical treatment during the critical preclinical period [the golden hour] that is responsible for this significant improvement” [28] Properly trained first responders therefore should be able assess the situation and decide whether to stay and help a=or scoop and run to the nearest facility.

The overall goal of pre-hospital trauma care is to increase the chance of survival and assure better quality of life for the injured. Thus, Bouillon (2014) comments “optimal trauma care should begin at the site of the accident and end with a good rehabilitation program.”[29] This, however, is only possible through the prompt response at each level. Simply stated, time is critical especially during the first hour after an injury or, as referred by those in the field, the “golden hour”. Anand (2013) define the golden hour as a “principle in medicine which specifies that patient’s outcome are improved when they are transported to a designated trauma center within an hour of injury”. [30] Johnson, Carr et al (2000) explain the chance of survival after a trauma can “decrease due to an increase in tissue hypoxia as time passes unless care is provided within this critical time frame”. [31] This denotes the significance of having a well-organized response system especially in an area where advanced prehospital care is scarce and the overall emergency medical service (EMS)

is undeveloped. These conditions define most of the developing world, especially “Sub-Saharan Africa, where the death rate from road traffic accidents is estimated at 32.2 people per 100,000 population, in spite of the fact this region possess only 2% of the world’s registered vehicles”. [32]

As mentioned earlier, about 91% of deaths due to injuries occur in the LMIC and a substantial amount of it is attributed to RTA. [33] The primary reason behind this enormous percentage is the fact that these countries lack well-organized and coordinated prehospital care systems. Hence, substantial amount of lives could be saved by improving prehospital care system. Mock, Jurcovich and et al. (1998) estimate that “one to two million deaths of injury victims in the LMIC could be avoided if simple improvements [like training lay people] to the prehospital trauma care systems were to be made.” [34]

The burden of RTA and its growing trend has been recognized by the WHO for decades. In 2004, the WHO in collaboration with the World Bank, produced a report that intended to “promote the core values of simple, sustainable, practical, efficient and cost-effective way to save lives of road side accident victims while “ recognizing the local needs and the adaptation of best practices accordingly”. [35]. The idea of training lay people as first responders was among the suggestions this report heavily emphasized.

As mentioned above, pre-hospital trauma care is consisted of basic and advanced modes and the amalgamation of both modes is critical to having effective system especially in areas where pre-hospital trauma care is either poorly managed, barely or not at all existent. The first step in the chain of rescue can be achieved by training lay people, as first responders. These questions are well addressed by the “guidelines for pre-hospital trauma care” developed by the WHO in 2004. According to the manual, first responders can be onlookers, bystanders, civil servants such as police and other traffic coordinators, taxi, minibus and commercial track drivers. [36] special

emphasis is put on the taxi and truck drivers, since in most of the developing world they are already used to transport the injured.

The training given to lay first responders is basic such as “protecting airway from obstruction or aspiration and control of external hemorrhage, and gentle handling and avoidance of excessive movement of the neck and back during extrication and transport. Although the trainings are similar throughout the world, Mock and Tiska (2002) cautioned training should be “locally devised and tailored for the specific circumstance.”[37]In addition to the medical training, the WHO suggested first responders should also learn to:

- a) Contact and notify the emergency service providing facilities about the nature and magnitude of the accident,
- b) Take action to secure the scene”- in order prevent the injured, themselves and other onlookers from harm that may be caused by other crashes
- c) Organize people and resources” i.e. divide tasks delegate people who, manage the crowd (disperse if necessary), confront and console relatives of victims, and those who apply first aid to the victims and
- d) Physically transport to the nearest facility in the absence of ambulance.
- e) Finally, since the goal is to attract lay people who are naturally going to be reluctant for many reasons including lack of confidence and motivation and uncertainty, especially about their legal liability, the WHO suggest “certain ethical and legal principles must be established and followed” [38] because knowing they will not face “adverse consequences such as legal liability” will empower and reassure the lay first responders and encourage more people to want to participate in the program. [38]

As previously mentioned, the practice of training lay people as first responders when appropriately applied in some developing countries has been proven to decrease RTA induced mortalities and morbidities. However, assessing the effectiveness of this intervention better and in a broader sense would necessitate to look at more success stories i.e. pre and post intervention results obtained from countries in which the program was launched. Following, we will look at case studies done in a few countries in this regard.

In Ghana, the awareness that trauma mortality due to road side traffic accidents was increasing in the absence of a formal emergency medical system persuaded stakeholders to develop a cost effective solution [39]. Since, as is the case in other similar countries, taxis, buses and commercial vehicles are used to transport the injured to hospitals, a pilot study that targeted at giving basic trauma care training to more than 300 commercial drivers was given. The training includes basic rescue, first aid, and transport of injured. After a follow up was conducted for two consecutive years, Mock, Tiska, et al (2002) reported that control of external hemorrhage was quickly learned and used appropriately by the drivers although consistent use of universal precautions and protection of airways were identified as area that need further training.[39]

Another country that adopted the intervention is Uganda. Uganda, similarly to other countries in the developing world, also lacks organized emergency medical and an overall advanced health care system. According to Jayarasaman & Mabweijano (2009), the national referral hospital, Mulago, located in Kampala sees about 6,000 injured patients and an average of close to 4000 severely injured never make it to the hospital for care due to a lack of transportation, proper attendance, on the scene or in route to the hospital, in a timely manner. [40] As is the case in most poor nations, in Uganda, the injured are transported via taxis, buses and even on foot. Thus, following in Ghanaian footsteps, but modifying the program to meet the Ugandan context and

circumstances, “local stakeholders involved in providing health services and informal pre-hospital care assisted in the design of the program”. [40] As Jayarasaman & Mabweijan (2009) reported, 188 out of 307 previously trained police, taxi drivers, and community leaders were followed up for six months during which a cross sectional survey was used to measure retained knowledge and frequency of skill and supply use. As claimed by the researchers, the participants’ “knowledge retention remained high or increased with mean correct score of 92%” and “97% of participants had used at least one skill from the course: most commonly hemorrhage control, recovery position and lifting/moving.” [40]

Similarly, in Madagascar, a training that involved taxi drivers was conducted by responder training program by Geduld and Wallis in 2011. This training drew experiences from previous similar training mainly the one by Mock and Tiska in Ghana. Like the other trainings, this too integrated hands-on training in pre-hospital scene management, bleeding control immobilization and careful transportation of the patient. But, as indicated by the researchers, this program more emphasized “using readily available items, such as the use of safety pins and newspapers for splinting fractures, and participants were encouraged to create their own First Aid kit made of everyday items to keep in their taxis”. [41] According to Geduld and Wallis, one drawback to the program was that “many of the taxi drivers were concerned about how others in the community would react to them when they put their new skills into practice, calling into question the drivers’ perceived self-efficacy and the likelihood that their new skills will actually be put to use.” [41]

From 1997 to 2001, similar training was offered in northern Iraq and Cambodia in which a total of 135 paramedics and 5,200 lay first responders received hands on training on 1,061 trauma victims.[42] This training included teaching lay responder basic life support techniques, “including airway management and how to control bleeding in the absence tourniquets. According

to the researchers, Husum, Gilbert and et al, the trauma mortality rate was reduced from pre-intervention level at 40% to 14.9% over the study period.”[42]This study was a perfect example that significant result could be obtained not only by training paramedics but also ordinary people. A follow up study conducted by Mural and Husum (2010) later discovered that a significance difference (9.8%; versus 15.6%) in mortality rate between those who were cared in-field by first responders and those who did not. [43]

In India, a follow up cross sectional study among a sample group comprised of police, ambulance personnel, taxi and bus drivers, and teachers was done in the southern district of Tumkur from January to March of 2011. The study revealed that “55% had actively participated in helping the injured person among whom 19.7% help mainly by calling for an ambulance, 41.5%, transporting the injured and 14.9%) by consoling the victim. [44]

As the aforementioned examples indicate, the intervention, when applied properly, can yield significant result. They show that reduction in death and injury from road traffic accident can be obtained by training lay people like taxi drivers, bus and commercial truck drivers and other bystanders. However as Tiska MA, Adu-Ampofo M, et al. (2004) suggest better result is obtained if the design is “tailored to the unique needs of the participants and the resources available in the local environment” [45] and puts the culture, history, economy and contemporary ground realities of the country. From this perspective, this research examines the feasibility implementing the intervention in Ethiopia and identify the challenges, barriers, and provide solutions to overcome them.

## CHAPTER 2

### Applicability of the intervention in Ethiopia and feasible solutions to potential challenges.

#### V. Country Background

Located in the far most eastern part of Africa, known as the horn of Africa, Ethiopia is the oldest independent country in Africa, and one of the oldest in the world. [46, 47]. It is the tenth largest and second populous country in Africa, covering 439,580 square miles (1,138,512 square kilometers). [46, 47] Located within the tropics between 3°24` and 14°53` North; and 32°42` and 48°12` [48] and surrounded by Eritrea, (which was part of Ethiopia until 1991) to the north, Sudan west, to Kenya south Somalia and Djibouti to the east,[49]

It is a culturally, ethnically and linguistically diverse country comprised of “more than 80 ethnic groups, each with its own language, and about 200 dialects, culture and traditions”. [50] *Amharic* is the national language while *Orromiffa* and *Tigrinya* are the other widely used languages and English is the most widely spoken foreign language and is the medium of instruction in secondary schools. [50] Believed to have accepted Christianity in the in 333AD, Ethiopia is known as the oldest, and once among the powerful and influential nation in the world. [51] The Ethiopian Orthodox Christian (*Tewahdo*) and Islam, which penetrated the country in the eighth century, are the two dominant religions. [52].

Ethiopia is an agrarian-based society. Agriculture accounts for 83.4% of the labor force, about 43.2% of the Gross Domestic Product (GDP) and 80% of export. More than 80 percent of

its people depend on agriculture and pastoralism for subsistence and heavily rely on rain than [53] using irrigation in spite of the countries possession of the greatest water reserves in Africa. Thus, Ethiopia is “often ironically referred to as the "water tower" of Eastern Africa because of the many (14 major) rivers that pour off the high tableland” [53]. Although this seems to be about to change, to date, in Ethiopia, just 1% of the water resource is used for power production and 1.5% for irrigation. [53]

Other than the brief occupation by Italy from 1936-41, the country has never been colonized and as such had been seen as a “symbol of African independence throughout the colonial period”. [45,35] For centuries, Ethiopia was a monarchy for most of its history [54] This came to an end in 1974 when Haile Selassie, the controversial king that ruled the country for 30 years was toppled by a communist “military junta known as the *Dergue*” [54]: a brutal government under which the country became the poster child of poverty, war and famine. The Dergue was in turn overthrown in 1991.

Today, Ethiopia is ruled under “ethic federation system that gives significant powers to regional, ethnically divided authorities. The federation includes nine semi-autonomous administrative regions with authority to raise and spend their own revenues.”[55] the regions are Afar, Amhara, Benishangul/Gumuz, Gambella, Harari, Oromiya, Southern Nations Nationalities and Peoples', Somali and Tigray; and two chartered cities: Addis Ababa and Dire-Dawa. These powers and mandates are trickled from the regional states, to *woredas*, or district authorities, then to *kebeles*, or village authorities. This system by itself has an implication on the delivery of timely trauma care as it will be discussed in depth later. [55, 56]

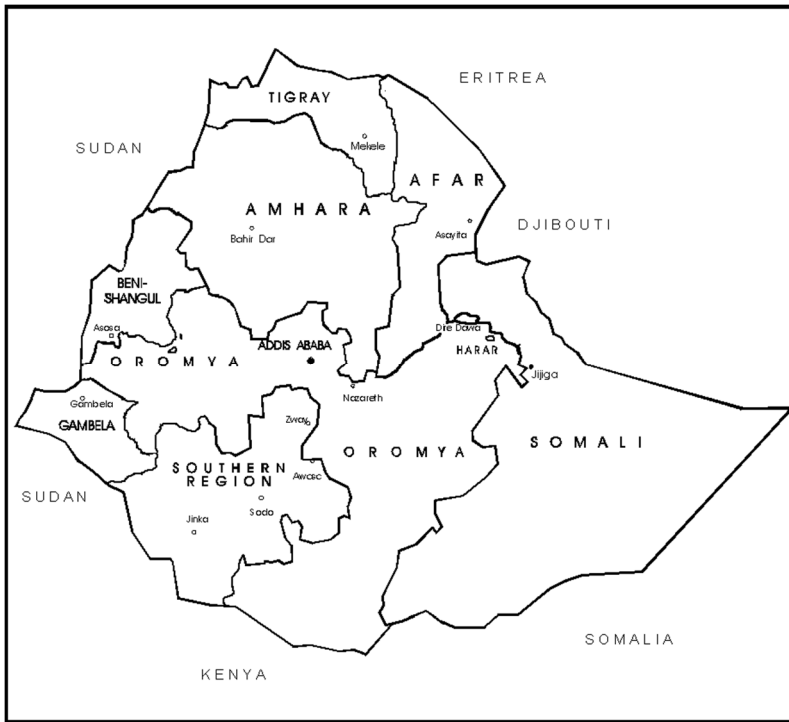


Fig 1. Map of present day Ethiopia and its nine regions. Wikipedia.com

Under the new government, the Ethiopian People Republic Democratic Front (EPRDF) Ethiopia, although still has a long way to go, has begun to show some economic revival. In 2012, Ethiopia was the 12<sup>th</sup> fastest growing economy in the World. [55,56] If the country continues its historically impressive growth performance, it could potentially reach middle income status by 2025.[57] However, the growth is contested by many who refer to it as “growth without development”, indicating the country has made limited progress as measured by indicators such as quality of education and health. A closer look at the progress the country made in terms of human development indeed seems to validate the claim made by the critics. For example, the GDP per capita is \$410, which is low even by Sub Saharan Africa standard.[58] The literacy level is also still among the worst in the world as the country is ranked 126th out of 127 countries in the Education for All (EFA) development index [59] Although the Ethiopian Ministry of Health claims that “health programs including prevention and control of infectious and communicable diseases

such as HIV/AIDS, Malaria and TB, have achieved notable improvements”[60], by its admission, “the health status remains relatively poor as the under 5 mortality rate is high and the life expectancy in Ethiopia is 57; 168<sup>th</sup> lowest out of 194 countries.[60] This includes death caused by non-communicable diseases and injuries especially road those caused by road traffic accident; which according to the Ethiopian MOH has become one of the major national health burdens. But first, it should be emphasized that Ethiopia has one of the highest per accident death and injury rates, not highest the number car accidents. However, since the number of people killed or injured can be influenced by the severity of the accident, it is still important to assess the causes and magnitude of road traffic accidents before discussing the factors that lead to high per crash deaths and injuries and the feasibility of a proposed intervention given the barriers and challenges to implement it.

## **VI. Causes and magnitude of road traffic accidents in Ethiopia.**

As is the case with most developing countries, a number of factors contribute to the high number of road traffic accidents in Ethiopia. These factors can be categorized into 3 main groups:

1. Human factors: Disobeying traffic rules and corruption, pedestrian behavior
2. Vehicle factors: Driving unsafe and uninspected cars
3. Road environment factors: Bad and old roads, climate and topography

According to Eckersley (2009), in Ethiopia, “81% of the total accident is attributed to driver error” [61]. This not only shows the lack respect the drivers have to traffic rules but also puts the competency of the drivers in question. Although common traffic laws like seat belt, speed limit, and drinking while driving are in the books, they are neither strongly enforced nor followed. In fact “speed limit is not respected by many of the drivers, and even police officers, and is not considered as a serious offense” [62]. This coupled with the lack of speed control devices is an

impediment to enforcing the law. Enforcement against driving while impaired on alcohol or khat is also weak due to the absence of measuring devices. However, even those who get caught breaking the traffic rules are often able to get away with it by bribing the traffic police officers. Furthermore, most drivers are inexperienced and unskilled because they are able to obtain their licences without meeting most of the criteria by bribing people who work at the agency despite the fact the Ethiopian driver's license manual states, "the criteria of licensure for motorcycle or vehicles including home automobiles, SUV, light trucks, and taxis, are that applicants must at least complete fourth grade education and be not less than 18 years of age and those wishing to operate buses, tankers and other freight trucks should have at least complete an eighth grade education and be not less than 24 years of age. [62] Furthermore, any person to be eligible for certification license "shall take an integrated theoretical and practical driving training and pass the examination". [62] But instead as said by a traffic police officer in Addis Ababa

"The streets are littered with unskilled and incompetent drivers who got their licenses in illegal ways? So, it shouldn't surprise us that the casualty rate from accidents is high." <sup>1</sup>

Although in Ethiopia, especially in the cities driver negligence takes the lion's share, pedestrians' behavior (little regard to traffic safety measures) is also another major contributor. It not uncommon to see on the streets a mixed flow of cars, people and even animals. In the words of Sergeant Chief Assefa Mezgebu, from the public relations office of the Addis Ababa City Police Commission Traffic Investigation and Control Department:

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<sup>1</sup> Taken from an interview with an Ethiopian traffic police officer conducted on 4/3/14

“People don’t seem to be afraid of cars. On a daily basis people are killed crossing streets even the freeways. They would rather cross the highways in a hurry than using the ubiquitous [over] passes and zebra lines. Animals like cattle and donkeys are also killed on the streets because people walk with their livestock, even on the streets of Addis Ababa.”<sup>2</sup>

Pedestrian death in Ethiopia is common and high. According to Abegaz and Berhanay [2013], “about 74% of the fatal, serious and slight injury accidents happened when pedestrians tried to cross streets”. [63]

Another factor that goes along the aforementioned problem is the presence of uninspected and unsafe cars on the street because people can get clearance to operate them through bribes. In fact, a study by Aklweg, et al. (2011), reveals “vehicles over 5 years were involved in the majority of crashes in Addis Ababa”. [64] An Ethiopian blogger who explained the situation by saying:

”Ethiopia is a country where a car has to be driven for infinite years whether there is rust, dents, scratches, broken glass or faded paint, the cars do not go out of service; rather their purpose is to serve for an unlimited period. This is especially true for public transport, especially taxis and minibuses. Looking at their bad conditions, one wonders how they function. Referring to his experience in a taxi in Addis Ababa, the blogger commented, “One of the worrying aspects of the taxi was that it didn’t have wipers. Creating the question how he is able to drive with this being kiremt (the rainy season). He (the driver) says when it is a slight rain, he use towels to wipe the windshield: when it is heavy he stops by the side of the road. ....Despite this he has this year’s (paper) from the department of transportation that the car has passed inspection.”<sup>3</sup>

Bad roads and weak infrastructures are also blamed for contributing to RTAs in Ethiopia. While not condoning colonialism, one of its unintended legacy are the roads and infrastructures they built in order to “move troops and make their conquest of exploitation and oppression easier” [65]. In this regard, Ethiopia has benefited little since it has never been colonized but briefly

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<sup>2</sup> Taken from an interview with the public relations office of the Addis Ababa City Police Commission Traffic Investigation and Control Department: conducted on 4/4/14

<sup>3</sup> Taken from a blog by an Ethiopian blogger Accessed on 5/18/14

occupied by Italy. Until recently, most of the roads that existed in Ethiopia were built during the brief occupation by the Italian Invaders. Because these roads were only “established to meet the requirements of the military control rather than to promote the overall development of the country and lacked most of the modern location, design and construction features desirable for present day high speed traffic”, [65] they have caused numerous accidents that claimed thousands of lives over the years. Between 1951 and 1973 (the Haile Sellasie era) the total stock of road network was only 6400 km of which 3400 km was asphalt covering urban areas only) and the remaining 3000 km was gravel road. [66] After the Dergue seized power in 1974, the network grew by “6.2 percent per annum has reached to 9160. [66] The current government seems to put “sustained effort to improve the country’s infrastructure of roads. Thus, in 2002, Ethiopia had a total (Federal and Regional) 33,297 km of roads, both paved and gravel. The road network is expected to increase from 49,000 km to 64,500 km by 2015. [67]

On the other hand, accident rates have not shown much improvement in both rural and urban areas, where the roads are supposedly better. In fact, according to the Ethiopian Ministry of Transportation and Communication “significant amount of traffic accidents in Ethiopia occurs on the three main routes of Addis Ababa-Djibouti, Mojo-Awassa, and Addis Ababa- Bahir Dar where the condition of the roads is up-to-the-standard, as well as in Addis Ababa city where such modern concrete asphalt motorways have been expanded”[68]. Road improvement has become a contributor to the problem because drivers are becoming over confident and more erratic thinking the new or improved roads are safer than the old ones.



FIG 2. Absence of traffic signals in Addis Ababa. Courtesy of Addisfortune.net

In addition to having old and unsafe roads and highways, the fact that Ethiopia is a mountainous country with capricious climate makes driving on those already weakened infrastructure more dangerous. Although the “average annual rainfall is around 1,200 mm (47.2 in), and some areas like Addis Ababa which lies at an altitude of 7,546 feet (2,300 meters) at the foot of Mount *Entoto* and forms part of the watershed for the Awash river [69] and where “an estimated 60% of car accidents in the country occur” [69] do get more rain than the average which heavily affects what is already dangerous driving in the city. The *Semen* Mountains, found in in northern Ethiopia, Gondar and Tigray provinces in the Amhara and Tigray regions respectively, and the Bale Mountains in the south eastern Ethiopia, in Bale province, in Oromia region, are dangerous to drive on not only because of the elevation, but also a great portion of the roads on these mountains are unpaved and lack barriers. No empirical data was found to support this claim but an interview with a personnel of the Ethiopian Tourism Commission revealed that;

“The rate of accidents on the roads of these mountains is especially high because they are among the tourist attractions”<sup>4</sup>.

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<sup>4</sup> Taken from an interview with a personnel of the Ethiopian Tourism Commission employee conducted on 4/7/14



Fig 3 major highways in Ethiopia.

While the above mentioned factors are among the likely causes of vehicle accidents in Ethiopia, the determinant factors for the high per accident deaths and injuries, thus the basis of this paper, are, as will be discussed next, more alarming but easier to avoid.

## VII. Determinants of high per vehicle accident death and injuries in Ethiopia.

Ethiopia is among countries that periodically rank at the top of the list of countries with high mortality and morbidity rate from RTA. According to the WHO, although, it has been disputed, in “2011 road traffic accidents deaths in Ethiopia has reached 22,786 or 2.77% of total deaths. The age adjusted death rate was 37.83 per 100,000 of population”. [70] But, there are reports that estimate it to be as high as 136/10,000. [71] If the estimate holds true, Ethiopia may still very well be at the top of the list. To give it a local perspective, in one crash, the number of people killed or injured in Ethiopia is about 30 times higher than in the US”. [71] But, as it is the case with most undeveloped countries, the number is believed to be greater than what is actually

showed by the official statistics. The Sudan Tribune, citing the director of transport policy and research at the Federal Transport Authority of Ethiopia , Alemayoh Welde, reported that, “this year alone (2013), 3,360 people died on road in 26,000 car accidents across the country.” [72]

“In Ethiopia, there is a high tendency for underreporting bad fact and exaggerate good ones. Many people die every day. Thirty, sixty or even one hundred deaths for every ten thousand crashes is a joke. It is much, much more than that.”<sup>5</sup>

A study from the Lund University in Sweden also suggests, the numbers could be "in excess of 100 fatalities per 10,000 vehicles". [73] Nonetheless, even if we go by the “official estimates”, the number is still high even by the “sub-Saharan Africa standard where the average fatality rate is 60 per 10,000”vehicles, according to the WHO. [74]

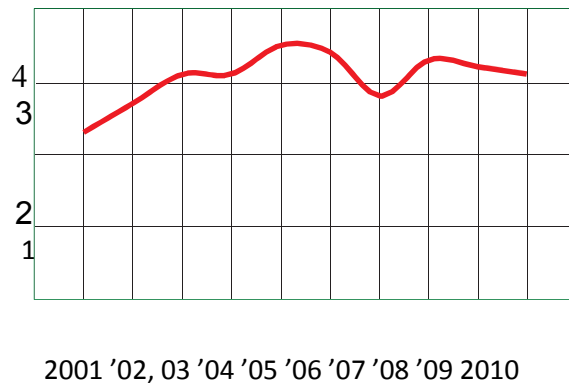


Fig4. Trend in road traffic death in Ethiopia. Source: Review of Road Safety Management Capacity of Ethiopia, June 2010 – GRSF.

Many factors can be attributed to why Ethiopia has among the highest death and injury rates per a given accident. The most noteworthy factors identified by the study are:

<sup>5</sup> Taken verbatim from a phone conversation with a personnel from the Ethiopia Bureau of Statistics conducted on 3/10/14

1. Undeveloped health and emergency care system:
2. Lack of facilities and resources: well-equipped ambulance, shortage of trauma hospital and doctors.
3. Urbanization and high population density: increase in motorization mixed traffic flow system.
4. Over loading, and lack of adherence to use in vehicle safety equipment.

Poor health coverage is also of particular concern in rural Ethiopia, where access to any type of modern health institution is limited at best. Among the crucial socio-economic determinants of poor health or elevated rates of fatalities and injuries from accidents in a despondent country like Ethiopia, is the inefficient delivery of primary and emergency care. Such was the common theme among the countries that successfully applied the intervention discussed above. The quality of health care in Ethiopia is, if not worse, similar to those countries. According to Earth the Institute at Columbia University, “Ethiopia's health care system is among the least developed in Sub-Saharan Africa and is not, at present, able to effectively cope with the significant health problems facing the country. [75] The Ethiopian Ministry of Health stated that “despite major strides to improve the health of the population in the last one and half decades, Ethiopia’s population still face a high rate of morbidity and mortality and the health status remains relatively poor. [75] Although many human development indicators show that the country is making progress, the reality is there is still a lot to be done.

According to information obtained from the Ministry of Health, “the infant mortality rate is 69 per 1000 live births, the child mortality rate is 104 per 1000 live births, maternal death rate is 470 per 100,000 live births, and life expectancy at birth is only 53.4 years for male and 55.4 years

for female.”[75] Evidentially, “preventable communicable diseases and nutritional disorders still continue to be major health issues.”[76] This problem is likely to continue as the country’s population is growing at an alarming speed and, judging by the ongoing trend, is forecasted to grow to over 210 million by 2060. [77] In terms of injury, Fikre, Bailiglign and et al (2012) stated the reason Ethiopia has such high fatality rate from accidents is because “Ethiopia does not have the facilities, equipment and human resource with the essential skills to support a coordinated emergency medical care system and as such lacks the basic infrastructure for delivering emergency care.[78]

According to the Ministry of Health, the health service system in Ethiopia is federally decentralized along the nine regions. Structurally, it is divided in to three tiers. The first level comprises primary hospital (with population coverage of 60,000-100,000 people) health centers (1/15,000-25,000 population) and their satellite health posts (1/3,000-5,000 population) that are connected to each other by a referral system. The second level in the tier is a general hospital with population coverage of 1-1.5 million people; and the third is a specialized hospital that covers population of 3.5-5 million [79]. However, as efficient as the structure appears, it had drew criticism for three reasons. One, because the government’s health expenditure is so low that not enough money is allocated to the regions thus little is trickled to those on the woreda level. Two, due to the fact the regions are independent, the health care in the country is not uniform or is unequal. And three, the system does not leave enough room for the private sector [80]. Furthermore, the ground reality in Ethiopia is the health facilities are under-equipped. For example, “the total number of hospital beds is in the entire country 13,922, which means that there is about 1.9 numbers may beds per 10,000 population, which compares to 9 beds per 10,000 population average for Sub-Saharan Africa and 27 beds per 10,000 population globally”.[81]

According to the World Health Organization, health coverage is characterized by three interrelated limitations: (1) limited availability of health resources, (2) overreliance on direct payments at the time people need care, and (3) inefficient and inequitable use of resources. These limitations are certainly more apparent in Ethiopia. In terms of limited availability of resources for instance, Health expenditure, “private (% of GDP) in Ethiopia was 1.97 as of 2011. Its highest value over the past 16 years was 2.28 in 2010” [82]-again lower than the Sub-Saharan average. With such low expenditure, therefore, user fees are required from patients, even the poor.

Absence of organized and coordinated emergency system is also another problem, Girma (2009) points out, emergency care system in Ethiopia is extremely underdeveloped because the country lacks “facilities, equipment and human resource with the essential skills to support a coordinated” [83] such a system. The magnitude of death and injury resulting from the absence of basic and timely emergency care is more prominent in Addis Ababa where about 60% of the accidents are believed to occur. A study by Tsegay et al (2010), reveals that “out of a total of 2985 fatalities registered in one hospital in Addis Ababa, majority 1715 (81.4%) of the victims did not receive post-crash care at any level either pre-hospital or hospital/health facility.”[84] Although the situation is slowly improving under the current government, Pozner, Bayleigne et al (2003) argue “there is still a high burden morbidity and mortality in resource-limited areas in Ethiopia (including Addis Ababa the capital) that lacks a responsive and time-sensitive EMS system.[85] In the absence of developed EMS system, of course, injury victims in Ethiopia are evacuated from the crash site by anyone motorists and non-motorists, who have no training in prehospital care for the crash victims. Research from Addis Ababa University Black Lion Referral Hospital reports that “prehospital care and ambulance service is below 5 percent of estimated need. In fact, “as of 2013, there were only 27 available ambulances for emergency calls in Addis Ababa, 7 of which

were owned by *Tebita* Ambulance [86]: a privately owned ambulance company. The rest (government owned ambulances that run in the country), are not equipped with even basic first aid supplies let alone trained EMTs. Today, there are 42 ambulances in Ethiopia and no record was found how many belong to *Tebita*. In an informal interview an ambulance driver in Ethiopia says:

“These [ambulance] are not different from taxis or other vehicles that transport the injured to the hospital. The only difference is may be these [ambulance] have more room and flat beds. We cannot treat people. We are not trained. All we do is take the [the injured] to the hospital”.<sup>6</sup>

As the table below indicates, shortage of ambulances is experienced throughout the nine regions. Furthermore, because distribution of coverage, health facilities, and resources among and within regions is uneven, most areas in the country more often do not get to benefit from the ambulances.

REGION	POPULATION	NO. AMBULANCES
Addis Ababa	3,041,002	42
Afar	1,602,995	46
Benisangul	982,004	29
Dire Dawa	387,000	8
Gambella	385,997	20
Harare	210,000	7
Oromo	31,294,992	417
Somali	5,148,989	103
Debub Hizboch/Southern people	17,359,008	230
Tigray	4,929,992	78
Special Enumerated Zones	112,999	---
Total	84,320,987	1244

Table 2. Allocation of ambulances by region.

<sup>6</sup> Taken verbatim from a conversation with an ambulance driver in Ethiopia. 4/27/14

Dearth of specialized doctors including orthopedic and neurosurgeons the country experiences from time to time is another contributing factor. Ethiopia is among the countries that loses its medical and surgical doctors to the western world: at the ratio of one physician for 56,000 and one nurse for 3000 people. [87] In the words of Keseteberhan Admassu, Ethiopia's minister of health:

“There are now more doctors working in Chicago than in Ethiopia.”<sup>7</sup>

Therefore, with no enough doctors to treat the injured who, to begin with, don't receive emergency care on their way to the hospital, chances of survival are very low.

Other factors to which the high RTA related fatality and injury can be attributed is urbanization as it can lead to increased motorization. As it was commented the fatalities and injuries due to road traffic crashes in developing countries are rising, fueled by rapid growth in motor vehicle numbers. Therefore, as the Ethiopian economy grows so is the level of motorization. In 2012, the United Nations Economic commission for Africa UNECA, reported that this rapidly increasing mobility has created some unique road safety concerns. According to the report “out of all the accidents registered in Ethiopia, Addis Ababa accounts for 60% on average.”[88] The population Addis Ababa, according to a 2007 survey was 2.7 million people (about 4%of the total population). Today, it is estimated to be over three million [89] Many of the traffic congestions and road safety problems in Addis Ababa may be attributed to inefficient use of road networks, weak enforcement capability and poor design of roads that cannot accommodate the growing number of cars that share them with pedestrians and livestock.

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<sup>7</sup> Taken from a speech by the Minister at Harvard School of Public Health given on 8/29/12



Fig. 5 mixed traffic in Addis Ababa: photo Courtesy of Backpackingman.com

People's idea of safety in the developing countries is quite different. Passenger ferrying buses, minibuses and trucks are frequently involved in crashes, with several people killed or injured in a single crash because passengers have no safety belts. Moreover, “the heavy metal works used to construct passenger seats for open trucks are a grave safety risk to the passengers in a crash.”[90] The probability of sustaining severe injury or death in these vehicles in a crash is thus quite high in the world. If Ethiopia continues this impressive growth, it could reach middle income status by 2025. [91] But, many are concerned “human capital development has not kept pace with the massive expansion in physical capital being undertaken today” [92] and this has manifested in many ways including people’s (both motorists and non-motorists) safety maintenance behavior.

Over loading is also another major problem. It is not uncommon to see city and long distance commuter buses, minibuses and even regular taxis carrying passengers beyond their capacities. *Letaf* is the local term used especially by long distance truck drivers to describe the illegal practice of adding additional load, mostly people for discounted fare once they leave city premises. Those people are usually placed on top of loaded freight trucks with no safety means. It

is also practiced by taxi and minibus drivers even in the cities where it not uncommon to see those carrying passengers beyond their capacities:

“If you want me to give you a reason to why we have such high causality rate, it is this (*Letaf*) when a car or a truck carries more people than it increases the chance of the number of death that can be encountered from a single accident. Sometimes we see 10-20 deaths from one accident. Not too long ago a driver of minibus (taxi) carrying school children added more people on his way to drop off the kids. Unfortunately, they encountered an accident and lots of kids died and got injured. This tragic loss didn't have to happen.”<sup>8</sup>

Insurance is one issue that has a direct impact on the rate of death and injury from a road traffic accidents in Ethiopia. According to the US Bureau of Transportation Statistics, almost all countries in Africa are believed to have mandatory third party insurance requirements for motor vehicles. Eritrea and Ethiopia are two exceptions. [93] The absence of third party insurance and inability to pay for care upfront are among the primary reasons the injured in Ethiopia do not get care beyond the initial visit at the facility.

#### **VIII. Who should be trained and how should the training be given?**

As mentioned earlier, pre hospital trauma care is consisted of basic and advanced modes and the amalgamation of both modes is critical to having effective system especially in areas where prehospital trauma care is either poorly managed, barely or not at all existent. The first step in the chain of rescue can be achieved by training lay people, as first responders. These questions are well addressed by the “guidelines for prehospital trauma care” developed by the WHO in 2004. According to the manual, first responders can be onlookers, bystanders, civil servants such as police and other traffic coordinators, taxi, minibus and commercial truck drivers.[94] With an overall unemployment rate of 25% (23% in Addis Ababa) [95] accident sites in Ethiopia are most

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<sup>8</sup> Taken from a conversation with an Addis Police Commission personnel conducted on 4/3/14

commonly congested by onlookers and bystanders. Thus, this project will be ideal for Ethiopia. However, even if the program was limited to just taxis and truck drivers, it would still have significant impact because according to Gebeyehu M and Takaono (2007) 14,083 taxis were operating in Addis Ababa [96]. With the vehicle ownership growing at about 7.0% per annum on average [97] the number of taxis in Addis Ababa today should be much higher than what it was over a decade ago. Furthermore, according to the EMOH, “significant amount of traffic accidents in Ethiopia occurs on the three main routes of Addis Ababa-Djibouti, Mojo-Awassa, and Addis Ababa- Bahir Dar” [98] and the country relies on these highways for over 60% of its ground freight transportation. [99] Therefore, training this segment of the society (Addis Ababa Taxi drivers and freight truck drivers along the three highways) alone can have a significant impact.

The training given to lay first responders is basic such as “protecting airway from obstruction or aspiration and control of external hemorrhage, and gentle handling and avoidance of excessive movement of the neck and back during extrication and transport. Although the trainings are similar throughout the world, Mock and Tiska (2002) caution training should be “locally devised and tailored for the specific circumstance.”[100] In addition to the medical training, the WHO suggested first responders should also learn:

- a) Contacting and notifying the emergency service providing facilities about the nature and magnitude of the accident,
- b) Taking action to secure the scene”- in order prevent the injured, themselves and other onlookers from harm a may be caused by other crashes
- c) Organizing people and resources” i.e. divide tasks delegate people who, manage the crowd (disperse if necessary), confront and console relatives of victims, and those who could apply first aid to the victims and

d) Physically transporting the injured to the nearest facility in the absence of ambulance.

Since, accident victims are mostly transported, if in city, by taxis and if the accident occurs in the urban areas, by commercial trucks, the training is usually designed to train cab and truck drivers. However, as done in Uganda, traffic police can also be included.

## **IX. Barriers to the feasibility of the intervention**

1. Socio-cultural factors. Religion, literacy,
2. Economic factors.
3. Political factors. Lack of commitment

As discussed earlier, Ethiopia is a culturally mosaic country. Although in general this is considered a positive thing, as an interviewee from the ministry of health put it:

“There is potentiality for cultural diversity to be a limiting factor.”<sup>9</sup>

According to her, the idea of training uneducated or little educated ordinary people to be involved in a sophisticated health care system may not “register well” or may not be perceived as attainable equally among the different cultures. In her words:

“There are many cultures and subcultures in Ethiopia. We can’t say they are all equally developed. Some are advanced and some are still backward. Therefore in those least involved cultures, convincing people to learn to participate in health care practices is going to be challenging to say the least.”<sup>10</sup>

Religious issues was also another factor associated with being a barrier. As mentioned above, the two major religions in Ethiopia are Orthodox Christianity and Islam. Although both religions are found in the ethno-linguistically divided nine regions, some regions like the Oromiya and Harari regions are dominated by Muslim communities. And:

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<sup>9</sup> Taken from an interview with the Ethiopian Ministry of Health personnel. Conducted on 4/4/14

<sup>10</sup> Taken from an email exchange with a professor at Addis Ababa University. 2/10/14

“There are elements within this communities that hold the belief that women cannot be touched by men other than their husbands, brothers or close relatives. Plus gender role is also an issue in those communities. Women are not encouraged to do many things men do. I think this qualifies as task for men. So if we train people in these communities to be first rescuers, women are not going to benefit much.”<sup>11</sup>

While interviewing people to identify the potential barriers to adopting the intervention of training lay people as first responders in Ethiopia, literacy was the factor that was cited the most. Given the high illiteracy level in the country, it is easy to understand why that is so. As summarized by one of the people interviewed:

“Many Ethiopians are still uneducated, especially those in the rural. And this raining is going to require some level of literacy. People in the city, since most not all, at least read and write may find it easy to participate. But those in the rural areas may not.”<sup>12</sup>

Confidence people would have in terms of participating in the program was also another factor considered as a barrier by the same person:

“And we have to realize uneducated/uninformed people are naturally reluctant about participating in programs they have difficulty understanding. If we try to train people who for instance have limited knowledge about how HIV is transmitted, imagine how hard it will be to have them trained as first responders to help injured people that most likely will be bleeding”.<sup>13</sup>

Two other potential impediments identified were poverty and lack of political commitment. Poverty was identifies as such for many reasons. One, since the majority of the people that will be trained will be consisted of taxi drivers and other bystanders, the concern, as expressed by one interviewee, was that those people my use their training as a “source of income”- meaning they may start using to charge people for their services. His reasoning was that

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<sup>11</sup> Taken from an email exchange with a professor at Addis Ababa University on 2/10/4

<sup>12</sup> Taken from an email exchange with a professor at Addis Ababa University on 2/10/4

<sup>13</sup> Taken from an email exchange with a professor at Addis Ababa University on 2/10/4

Taxi and minibus drivers do it any way. They charge people (the injured) for taking them the hospital. Such training will give them (the drivers) more incentive to charge more money.”<sup>14</sup>

Lack of political commitment was also another barrier mentioned by a few. In general, most programs in Ethiopia get much success when they are backed by international funding. In the absence of such funding, their success is not guaranteed. As put by an official from the Ethiopian Road Authority:

“For this program to be successful, since it is not funded by NGO’s, it is going to need strong commitment from the government. In a country where the needs are so many, it will be difficult to bring such a program into priority”.<sup>15</sup>

The above were among the potential barriers to the feasibility of the intervention as identified by people interviewed for the research. Although they are barriers worthy of consideration, it appears that they can be overcome. In the words of an Ethiopian Emergency Dr. in diaspora:

“This will be a positive move to decrease the mortality and morbidity rate caused by car crashes in Ethiopia. It may be challenging but it is achievable. I don’t see the barriers as impediments that can’t be overcome. However, for this to happen, the trainings should be tailored to the specific cultural norms and available resources of the different areas.”<sup>16</sup>

## **X. Conclusion.**

Ethiopia has experienced poverty for long and as a result had a laggard health care system that affected the lives of many including road traffic accident victims. In recent years, the Ethiopian economy has shown major improvement and according to the UNCAP 2012 report, the country has “one of Africa’s fastest growing non-oil producing economies. [101] However, it needs to be noted that in spite of fast growth, Ethiopia is still one of the very poorest counties in the world. The GDP per capita is one of the lowest in the world, and the economy faces a number of serious

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<sup>14</sup> Taken from a conversation with an Addis Ababa resident conducted on 4/3/14

<sup>15</sup> Taken from an email exchange from an Ethiopian Road Authority employee on 2/16/14

<sup>16</sup> Email-exchange with an Ethiopian Dr. in the diaspora. 6/9/14

structural problems. Simply stated, the problems that plagued the country for years are still in existence. In spite of the government's diligent effort, many infrastructures and social programs like health care are still underdeveloped and most goals set to reduce poverty and improve life standards of citizens have not been met. Among the goals was one set in 2010 to "cut traffic death tolls in the country by 80%." [102] The Sudan tribute reports "Ethiopia lags behind in setting this goal" [103]. The study from Lund University also discovers that inadequate communication to immediately inform officials and hospital emergency services about traffic accidents in rural areas continues to be a problem. [104] The situation in the urban areas is not that different. In fact, the Ethiopian road authority has reported that as a result of the economic growth "car ownership in Ethiopia has grown rapidly at about 7% per annum on average. [105] With that, the number of accidents (thus the number of people who die or get injured) from car accidents in the urban areas has increased. The WHO found out that, in spite of the fact that only 16% of the population live in the urban areas, the areas account for majority of the accidents the death toll from motor traffic accidents is still high and strong government commitment is needed. [106] To attenuate this burden and achieve the fatality and injury reduction target, stakeholders, governmental and the private sector to work in Unisom. Implementing the intervention should be among the factors considered as significant contributors to achieving the goal.

The intent of this study was not to present training lay people as a panacea to Ethiopia's struggle with lowering the rate of road traffic accident deaths and injuries. Rather, it was to evaluate the practical implementation of the intervention in spite of the countries peculiar geography and history and if applied whether it will have an impact on mitigating this increasing health burden. Judging by how successfully the intervention was applied in countries that are in similar economic stratum as Ethiopia, it can be concluded that adopting the intervention can yield

positive outcome in Ethiopia as well. However, this can only be possible when the potential impediments are addressed. Therefore for the program to be successfully implemented in Ethiopia:

1. The health care system, including the emergency care system needs to be improved. For this to happen, first the government has to increase its health expenditure and has to make sure regional authorities allocate funds equally to all woredas and kebeles. Second, the private sector has to be given more chance to be included in the country's health care delivery system. Third, as suggested, facilities, equipment and human resource with the skills to support a coordinated emergency medical care system has to be put in place. For it is only, when these preconditions are met, the injured in the more deprived areas, especially the rural, will get the opportunity to be taken to an adequate care facility in a timely manner.
2. It needs to be recognized that realistically, no matter how many people are trained, they will always be outnumbered by the injured- meaning in most areas, the ratio of the injured to care givers is going to be higher. This can only be balanced out if conditions that reduced the number of causalities are met in the first place. To name a few, conditions of roads have to be improved and safety measure like pedestrian crossings, road markings and crash barriers must be placed, traffic rules such as the usage of seat belts, drinking and driving, overloading have to be properly strictly enforced and adhered, vehicles have to be operated by skilled drivers, people (drivers and pedestrians) have to be educated about proper road usage behavior, awareness and road safety education must be encouraged, vehicles have to be periodically checked and those deemed unsafe have to be removed.
3. Cultural, religious, political and economic barriers have to be removed. People's fear and reluctance to participate in the training out of fear of contracting HIV/AIDS has to be addressed, people have to be encouraged to have confidence on themselves to acquired such a skill and put it

in to a practical use. But above all, both regional and the federal government should recognize the benefit of the initiative and show strong commitment to implement it.

## REFERENCE

1. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004.
2. Hyder A, Peek-Asa et al: The Global Burden of Unintentional Injuries. *Epidemiology Rev.* Apr 2010; 32(1): 110–120. Published online Jun 22, 2010. doi: 10.1093/epirev/mxq009
3. Persson A 2008. Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. *Advances in Transportation Studies an international J*, 15: 5-16.
4. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004.
5. World report on injury prevention Summary. WHO publication, 2004
6. Anand L, Singh M, Kapoor D. Prehospital Trauma Care Services. Available at <http://www.apicareonline.com/?p=1772>
7. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004.
8. Make Roads safer: A new priority for Sustainable Development. Commission for Global Road safety. Available at [http://www.who.int/management/programme/health\\_promotion/MakeRoadsSafe.pdf](http://www.who.int/management/programme/health_promotion/MakeRoadsSafe.pdf)
9. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004
10. Road Deaths Predicted to Rise in Developing Countries. Available at <http://web.worldbank.org/>
11. Giles L, Hayes E, and Rosenberg, M. Road Traffic Injuries: A Global Epidemic. Obtained from <http://www.cyberounds.com/cmecontent/art276.htm>.
12. Road kills: The toll of traffic is rising in poor countries (2005) Available at <http://www.makeroadssafe.org>
13. Global Plan for the Decade of Action for Road Safety 2011-2020: Available at <http://www.roadsafetyfund.org>.
14. Hills, B L & Baguley. Engineering approaches to accident reduction and prevention in developing countries. In: Proceedings of the Seventh REAAA Conference, Singapore, 22-26 June 1992
15. Emergency Management. Available at <http://en.wikipedia.org>.
16. World report on injury prevention Summary. WHO publication, 2004
17. Road kills: The toll of traffic is rising in poor countries. Available at <http://www.makeroadssafe.org>.
18. Ten facts on global road safety. Available at <http://www.who.int/features/factfiles/roadsafety/en/>
19. Guidelines for Essential Trauma Care: Available at [http://www.who.int/violence\\_injury\\_prevention/publications/services/guidelines\\_trauma\\_care/en](http://www.who.int/violence_injury_prevention/publications/services/guidelines_trauma_care/en)
20. The different types of Prehospital Trauma care. Available at <http://www.wisegeek.net/what-are-the-different-types-of-prehospital-trauma-care.htm>
21. Guidelines for Essential Trauma Care: Available at [http://www.who.int/violence\\_injury\\_prevention/publications/services/guidelines\\_trauma\\_care/en](http://www.who.int/violence_injury_prevention/publications/services/guidelines_trauma_care/en)
22. Lieberman M, Rouser B. Prehospital trauma care: what do we really know? Department of Surgery, Montreal General Hospital, McGill University. 2008 13(6):691-6 [PUB MED]
23. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004.

24. Mohan D, Tiwari G, Khayesi M, Nafukho FM. Road Traffic Injury Prevention Training Manual. Geneva: World Health Organization, 2006
25. Prehospital Trauma Care Systems. WHO. 2005. Available [whqlibdoc.who.int/.../2005/924159294x.pdf](http://whqlibdoc.who.int/.../2005/924159294x.pdf)
26. Gold CR. Prehospital advance life support vs. “scoop and run” in trauma management. *Ann Emerg. Med* 1987; Jul; 16(7):797-801 [Medline]
27. Smith RM Conn AK. Prehospital care - scoop and run or stay and play? *Injury*. (2009) 40 Suppl 4:S23-6. doi: 10.1016/j.injury.2009.10.033. [Pub Med]
28. Sefrin Anand K. Review Article Prehospital trauma care services in developing countries. Available at <http://www.apicareonline.com/?p=1772>
29. Bouillon B. Prehospital Trauma Care. *European Manual of Medicine* 2014, pp 19-24
30. Anand K. Prehospital trauma care services in developing countries. Available at <http://www.apicareonline.com/wordpress/wp-content/uploads/2013/05/16-Prehospital-trauma-care-services.pdf>
31. Jonson, Carr et al Characteristics and outcomes of injured patients presenting by private vehicle in a state trauma system. *American Journal of Emergency Medicine* 2013 | 31 | 2 | 275-281
32. Marquez P. Death on Wheels” in sub-Saharan Africa: How to prevent it? Available at <http://web.worldbank.org/ ,00.htm>
33. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. World report on road traffic injury prevention. Geneva: World Health Organization, 2004.
34. Charles Mock, Abantanga F. Strengthening care of injured children globally. *Bull World Health Organ*. May 2009; 87(5): 382–389
35. Persson A 2008. Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. *Advances in Transportation Studies an international J*, 15: 5-16.
36. Mohan D, Tiwari G, Khayesi M, Nafukho FM. Road Traffic Injury Prevention Training Manual. Geneva: World Health Organization, 2006.
37. Mock CN, Tiska M, et al. Improvements in Prehospital trauma care in an African country with no formal emergency medical services. *The Journal of Trauma* 2002; 53:90-97
38. Mock C, Lormand JD, Goosen J, Joshipura M, and Peden M. Guidelines for essential trauma care. Geneva, World Health Organization, 2004
39. Tiska MA, Adu-Ampofo M, et al. A model of Prehospital trauma training for lay persons devised in Africa. *Emergency Medicine Journal* 2004; 21:237-239
40. Jayaraman S, Mabweijano JR, et al. First Things First: Effectiveness and scalability of a basic Prehospital trauma care program for lay first-responders in Kampala, Uganda. *PLoS ONE* 2009; 4(9):e6955
41. Geduld H, Wallis L. Taxi driver training in Madagascar: the first step in developing a functioning Prehospital emergency care system. *Emergency Medicine Journal* 2011; 28:794-796
42. Husum H, Gilbert M, Wisborg T. Training pre-hospital trauma care in low-income countries: the ‘Village University’ experience. *Medical Teacher* 2003; 25(2):142-148
43. Murad M, Husum, H Trained Lay First Responders Reduce Trauma Mortality: A Controlled Study of Rural Trauma in Iraq, (2010). Available at [http://munin.uit.no/bitstream/handle/10037/5440/paper\\_2.pdf?sequence=4](http://munin.uit.no/bitstream/handle/10037/5440/paper_2.pdf?sequence=4)
44. Practice and Perception of First Aid among Lay First Responders in a Southern District of India. *Arch Trauma Res*. 2013 1(4) 155-160.
45. Mock CN, Tiska M, et al. Improvements in Prehospital trauma care in an African country with no formal emergency medical services. *The Journal of Trauma* 2002; 53:90-97

46. Ethiopia: people and culture.  
[http://en.wikipedia.org/wiki/Wikipedia:WikiProject\\_Ethiopia/People\\_and\\_culture](http://en.wikipedia.org/wiki/Wikipedia:WikiProject_Ethiopia/People_and_culture)
47. Culture of Ethiopia. Available at <http://www.lonelyplanet.com/ethiopia>
48. Introducing Ethiopia. Available at <http://www.lonelyplanet.com/ethiopia>
49. Ethiopian Economy. Available at <http://www.gcao.gov.et/index.php?option=com>
50. Introducing Ethiopia. Available at <http://www.lonelyplanet.com/ethiopia>
51. History of Ethiopia. Available at [http://en.wikipedia.org/wiki/History\\_of\\_Ethiopia](http://en.wikipedia.org/wiki/History_of_Ethiopia)
52. Ethiopia: people and culture. Available at  
[http://en.wikipedia.org/wiki/:WikiProject\\_Ethiopia/People\\_and\\_cultur](http://en.wikipedia.org/wiki/:WikiProject_Ethiopia/People_and_cultur)
53. Ethiopian Economy. Available at <http://www.gcao.gov.et/index.php?option=com>
54. History of Ethiopia. [http://en.wikipedia.org/wiki/History\\_of\\_Ethiopia](http://en.wikipedia.org/wiki/History_of_Ethiopia)
55. Politics of Ethiopia. Politics of Ethiopia. Available at [http://en.wikipedia.org/wiki/Politics\\_\\_](http://en.wikipedia.org/wiki/Politics__)
56. The federation includes nine semi-autonomous administrative regions with authority to raise and spend their own revenues.
57. States of Ethiopia. Available at <http://statoids.com/ueth.html>
58. Ethiopia Economic Update – Laying the Foundation for Achieving Middle Income Status. (2013). Available at <http://www.worldbank.org/en/news/press-release/2013/06/18/ethiopia-economic-update-laying-the-foundation-for-achieving-middle-income-status>
59. Ethiopia Overview. Available at <http://www.worldbank.org/en/country/ethiopia/overview>
60. The Education for All Development Index. Available at  
<http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/ED/GMR/pdf/gmr2010/gmr2010-annex-01-edi.pdf>
61. Federal Ministry of Health. Available at <http://www.moh.gov.et/home>
62. Eckersley W Salman R and Gebru M. Khat, driver impairment and road traffic injuries: a view from Ethiopia. WHO. 2010 88(3) 235-236
63. Abegaz F, Berhany Y et al .Effectiveness of an improved road safety policy in Ethiopia: An interrupted time series study. BMC public health (2014), 14:539
64. In Tulu G, Washington S et al Characteristics of Police-reported Road Traffic Crashes in Ethiopia over a Six Year Period. Available at  
[http://eprints.qut.edu.au/63884/1/Revised\\_Characteristics\\_of\\_Police.pdf](http://eprints.qut.edu.au/63884/1/Revised_Characteristics_of_Police.pdf)
65. Mamdani M. Citizen and Subject: Cotemporary Africa and the Legacy of Late Colonialism.pp16-23
66. Worku, Ibrahim(2011) ‘Road Sector Development and Economic Growth in Ethiopia’ EDRI Working Paper 4, Ethiopian Development Research Institute, Addis Ababa, Ethiopia
67. History of Road Building in Ethiopia in Brief. Available at  
<http://www.era.gov.et/LinkClick.aspx/fileticket>
68. Available at [http://nazret.com/blog/index.php/2008/06/28/90\\_](http://nazret.com/blog/index.php/2008/06/28/90_)
69. Available at [http://en.wikipedia.org/wiki/Addis\\_Ababa](http://en.wikipedia.org/wiki/Addis_Ababa)
70. Ethiopia has the highest rate of fatalities per vehicle in the World” World Report on Road.(2004)
71. Persson A 2008. Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. Advances in Transportation Studies an international J, 15: 5-16.
72. Available at <http://www.sudantribune.com/spip.php?article47830>
73. Available at <http://www.irinnews.org/report/94165/ethiopia-government-moves-to-address-road-accident-toll>
74. African Road Safety review Final Report. Available at

- [https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/africa\\_road\\_safety\\_review/pdf/entire.pdf](https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/africa_road_safety_review/pdf/entire.pdf)
75. Federal Ministry of Health. Available at <http://www.moh.gov.et/home>
  76. The Earth Institute at Columbia University, Center for National Health Development in Ethiopia. Available at <http://cnhde.ei.columbia.edu/healthsystem/index>. Html
  77. World Population project. 2012. Available at [http://www.unfpa.org/webdav/site/global/shared/documents/news/2013/KEY%20FINDINGS%20WPP2012\\_FINAL-2.pdf](http://www.unfpa.org/webdav/site/global/shared/documents/news/2013/KEY%20FINDINGS%20WPP2012_FINAL-2.pdf)
  78. Girma F. Baililign T et al. Emergency medicine development in Ethiopia: Challenges, progress and possibilities. *Medicine Volume*, March 2013, pp 3–9
  79. Federal Ministry of Health. Available at <http://www.moh.gov.et/home>
  80. Available at <http://www.who.int/profiles/information/index.php/Ethiopia:AnalyticalSummary-Health-System-outcomes>
  81. [http://www.nationalplanningcycles.org/sites/default/files/country\\_docs/Ethiopia/ethiopia\\_hsdp\\_iv\\_final\\_draft\\_2010\\_-2015.pdf](http://www.nationalplanningcycles.org/sites/default/files/country_docs/Ethiopia/ethiopia_hsdp_iv_final_draft_2010_-2015.pdf)
  82. Ethiopia health expenditure. Available at <http://www.indexmundi.com/facts/ethiopia/health-expenditure>
  83. Girma F. Baililign T et al. Emergency medicine development in Ethiopia: Challenges, progress and possibilities. *Medicine Volume*, March 2013, pp 3–9
  84. Tsegaye k, Abdella E et al. Pattern of Fatal Injuries in Addis Ababa, Ethiopia: A One-year Audit. In *East and Central African Journal of Surgery*, Vol. 15, No. 2, July-December, 2010, pp. 10-17
  85. Pozner C N, Bayleygne T M, Davis M A et al. Emergency medical services capacities in the developing world: preliminary evaluation and training in Addis Ababa, Ethiopia. *Prehosp Emerg Care*, 7 (3) (2003), pp. 392–396
  86. Tebita Ambulance and Pre-Hospital Emergency Services, Ethiopia. Available at <http://www.healthenterprise.org/awardees/tebita-ambulance-and-pre-hospital-emergency-services-ethiopia/>
  87. Federal Ministry of Health. Available at <http://www.moh.gov.et/home>
  88. In Tulu G, Washington S et al Characteristics of Police-reported Road Traffic Crashes in Ethiopia over a Six Year Period. Available at [http://eprints.qut.edu.au/63884/1/Revised\\_Characteristics\\_of\\_Police.pdf](http://eprints.qut.edu.au/63884/1/Revised_Characteristics_of_Police.pdf)
  89. Available at [www.ethiodemographyandhealth.org/AddisAbaba.html](http://www.ethiodemographyandhealth.org/AddisAbaba.html)
  90. Afukaar, Francis K. Speed control in developing countries: issues, challenges and opportunities in reducing road traffic injuries. *Injury Control and Safety Promotion*, Volume 10, 2003, pp. 77-81(5)
  91. Available at [www.worldbank.org/.../Ethiopia-economic-update](http://www.worldbank.org/.../Ethiopia-economic-update).
  92. Available at <http://planusa.blogspot.com/2014/03/tackling-wicked-problems-in-ethiopia.html>
  93. US Bureau of Transportation Statistics. Literature review. Available at [http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/africa\\_road\\_safety\\_review/html/appendixC.html](http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/africa_road_safety_review/html/appendixC.html) transportation
  94. Mohan D, Tiwari G, Khayesi M, Nafukho FM. *Road Traffic Injury Prevention Training Manual*. Geneva: World Health Organization, 2006
  95. <http://hornaffairs.com/en/2013/04/17/addis-ababa-unemployment-rate-decreased/>
  96. Gebeyehu M and Takaono S. *Journal of Public Transportation*, Vol. 10, No. 4, 2007
  97. In Tulu G, Washington S et al Characteristics of Police-reported Road Traffic Crashes in

Ethiopia over a Six Year Period. Available at  
[http://eprints.qut.edu.au/63884/1/Revised\\_Characteristics\\_of\\_Police.pdf](http://eprints.qut.edu.au/63884/1/Revised_Characteristics_of_Police.pdf)

98. Available at [http://nazret.com/blog/index.php/2008/06/28/90\\_](http://nazret.com/blog/index.php/2008/06/28/90_)

99. Available at [www.businessenvironment.org](http://www.businessenvironment.org)

100. Mock CN, Tiska M, et al. Improvements in Prehospital trauma care in an African country with no formal emergency medical services. *The Journal of Trauma* (2002); 53:90

101. Available at <http://www.africaneconomicoutlook.org>

102. Available at <http://www.nationalplanningcycles.org/docs/Ethiopia>. 2010

103. Available at <http://www.sudantribune.com/spip.php?article47830>

104. In Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, et al. WHO, 2004

105. In Tulu G, Washington S et al Characteristics of Police-reported Road Traffic Crashes in Ethiopia over a Six Year Period. Available at <http://eprints.qut.edu.au>

106. Available <http://www.academia.edu/1643043/road-traffic-accident-a-leading-cause-of-the-global-burden>. \_