Rural Transport Health and Safety in Sub-Saharan Africa

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Executive Summary

The recent *Global Burden of Disease – Sub-Saharan Africa Regional Edition* report noted that sub-Saharan Africa (SSA) has made progress in improving public health (reduced mortality and extended life expectancy) since 1970. Nonetheless, certain trends such as the increase in motorised travel, especially at higher speeds, have resulted in increased injuries and fatalities resulting from road crashes. Air pollution and the negative health outcomes associated with it (e.g., heart disease, stroke, COPD, lung cancer, lower respiratory infections) remain a burden. In early 2014, the Institute for Health Measurement (IHME) in conjunction with the World Health Organization (WHO) released a report entitled *Transport for Health*. This landmark report represented the first attempt at linking the two major negative health impacts associated with transport: injuries due to road crashes and diseases due to traffic-induced pollution. The *Transport for Health* report and other recent studies have explored these relationships in the context of SSA and admit that there are significant issues with data availability and quality that limit the development of effective solutions. For example, the report notes the widely understood fact that many road crashes in SSA go unreported. Further, when crash data is available, it may be inaccurate, incomplete, and ultimately uninformative with respect to understanding overall public health outcomes. Likewise, data on air pollution attributable to road transport in SSA is quite rare. Indeed, the *Transport for Health* report noted that considerable assumptions were necessary to even estimate relative urban versus rural proportions of air pollution. As a result, the report indicated that it likely underestimates the disease burden attributable to vehicle pollution, especially in rural areas.

Adverse health impacts of crashes and air pollution are universal throughout the developed and developing world. There are two other negative health impacts associated with rural transport peculiar to the developing world, particularly rural SSA. One is spinal injuries and health complications associated with pedestrians transporting heavy loads on top of their heads, a practice referred to in the literature as headloading. Another health impact attributable to increased mobility in SSA, is the spread of communicable diseases concurrent with the development of road networks. Transport and health relationships in places such as rural SSA are further complicated by the fact that there is such potential for positive health outcomes attributable to transport through enhanced access to healthcare, education, commerce, etc. In recognition of such interrelationships and complexities, one of four policy recommendations offered in the *Transport and Health* report calls on the research community to "Systematically account for the health impact of road projects."

The current project was initiated by the African Community Access Programme (AFCAP) to establish a foundation for new research themes aimed at enriching the understanding of how rural transport impacts the health of local communities in SSA. The project focused on the following aspects of transport health and safety in SSA:

- Fatalities and injuries due to road crashes.
- Negative health outcomes attributable to pollution generated from rural transport.
- Need for accesses to healthcare facilities and treatment.
- Health impacts of headloading[1].

After initial scoping and conceptualisation of the project, an exploratory literature review was conducted. The intent of the exploratory review was to gauge what was currently documented in Africa-related transport health and safety related literature. The exploratory review identified an initial set of general themes prominent in the literature that the researchers deemed warranted more detailed investigation. Identifying the initial themes and interrelated issues associated with each also fostered an initial organisational scheme for subsequent tasks.

The general themes set out in the exploratory literature were used as a foundation for a series of field interviews and fact-finding activities conducted in three study countries (Ethiopia, Ghana and Kenya). The three study countries were selected as they all have had active AFCAP programmes over the past six years and, perhaps more importantly, the research team had pre-existing connections in each. The exploratory literature review also aided in the identification of initial contacts for the field interviews. Interviews were conducted with 39 individuals on a convenience basis according to willingness and availability. A more detailed and focused survey of expert opinion was conducted via the Internet. The survey was aimed at providing more specific and quantitative input regarding the general themes and how the respondents viewed various aspects of the themes with regard to research needs. The survey was administered to an audience of AFCAP affiliated professionals and garnered 58 responses. The results of the interviews and surveys were used to direct a targeted second literature review.

The literature revealed that there is strong evidence and consensus regarding the primary issues facing road safety as best expressed in such fact-based policies as the five pillars set out in the *Decade of Action for Road Safety*. The primary road safety issues and the problems associated with them were reaffirmed in both the field interviews and the Internet survey. There was a lack of literature on rural air pollution attributable to transport. Interestingly, however, it was noted as an important issue in both the field interviews and the Internet survey. The concern over limited access to healthcare in SSA was a constant theme throughout the literature reviews, field interviews and Internet survey responses.

[1] The issue of disease transmission in rural SSA via the road network was not covered in this study. The complex set of factors (donor funding, workforce migration, gender issues, cultural norms, etc.) contributing to this issue

The road safety-related research is proposed with the intention of building upon the wealth of previous research documented in the literature and existing strategies in Africa and throughout the global safety community. The proposed research related to rural health and air pollution from rural transport is intended to complement what has been well documented in urban areas throughout SSA.

Specific projects (or project ideas) are offered under both the rural road safety and air pollution themes. There is no attempt to fully develop scopes for the potential projects. Rather, the project concepts and needs are established for future consideration and potential development into new research efforts. There are myriad other potential research themes, projects, initiatives, etc. that could be derived from the work proposed herein. As such, the proposed ideas are in no way intended to be exhaustive. Rather, they represent what is considered to be a thoughtful distillation of the evidence gathered and analysed in this study on which future efforts to improve the understanding of rural transport health and safety can be based.

1. Introduction

The recent *Global Burden of Disease – Sub-Saharan Africa Regional Edition* report noted that sub-Saharan Africa (SSA) has made progress in improving public health (reduced mortality and extended life expectancy) since 1970 (IHME, 2013). Nonetheless, certain trends such as the increase in motorised travel, especially at higher speeds, have resulted in increased injuries and fatalities resulting from road crashes. Air pollution and the negative health outcomes associated with it (e.g., heart disease, stroke, COPD, lung cancer, lower respiratory infections) remain a burden. In early 2014, the Institute for Health Measurement (IHME) in conjunction with the World Health Organization (WHO) released a report entitled *Transport for Health* (GRSF, 2014). This landmark report represented the first attempt at linking the two major negative health impacts associated with transport: injuries due to road crashes and diseases due to traffic-induced pollution. The *Transport for Health* report and other recent studies have explored these relationships in the context of sub-Saharan Africa (SSA) and admit that there are significant issues with data availability and quality that limit the development of effective solutions. For example, the report noted the widely understood fact that many road crashes in SSA go unreported. Further, when crash data is available, it may be inaccurate, incomplete, and ultimately uninformative with respect to understanding overall public health outcomes. Likewise, data on air pollution attributable to road transport in SSA is quite rare. Indeed, the *Transport for Health* report noted that considerable assumptions were necessary to even estimate relative urban versus rural proportions of air pollution. As a result, the report indicated that it likely underestimates the disease burden attributable to vehicle pollution, especially in rural areas.

Adverse health impacts of crashes and air pollution are universal throughout the developed and developing world. There are two other negative health impacts associated with rural transport peculiar to the developing world, particularly rural SSA. One is spinal injuries and health complications associated with pedestrians transporting heavy loads on top of their heads, a practice referred to in the literature as headloading (e.g., Howe, 2001; Porter et al., 2013). Another health impact attributable to increased mobility in SSA, is the spread of communicable diseases along the development of road networks. For example, a recent study presented quantitative evidence confirming the relationship between the development of road networks throughout Africa and the spread of HIV (Tatem et al., 2012).

Transport and health relationships in places such as rural SSA are further complicated by the fact that there are positive health outcomes attributable to transport through enhanced access to healthcare, education, commerce, etc. In recognition of such interrelationships and complexities, one of four policy recommendations offered in the *Transport and Health* report called on the research community to "Systematically account for the health impact of road projects."

2. Purpose and Structure of the Report

The current project was initiated by the African Community Access Programme (AFCAP) to establish a foundation for new research themes aimed at enriching the understanding of how rural transport impacts the health of local communities in SSA. The project focused on the following aspects of transport health and safety in SSA:

- Fatalities and injuries due to road crashes.
- Negative health outcomes attributable to pollution generated from rural transport.
- Need for accesses to healthcare facilities and treatment.
- Health impacts of headloading[2].

The methodology and results of the project are documented in the following sections of this report. After the brief introduction presented above, the Methodology section discusses the project efforts conducted and the rationale of the approach taken. Summaries of the project tasks, literature review and gathering of expert opinions are then presented. The final section of the report proposes potential new research ideas organised into four general themes.

3. Methodology

After initial scoping and conceptualisation of the project, an exploratory literature review was conducted. The intent of the exploratory review was to gauge what was currently documented in Africa-related transport health and safety related literature. In some cases, however, literature not specifically focused on SSA was reviewed in the initial stage if its focus was particularly germane to SSA and the overall study theme. A draft of the exploratory literature review was submitted to AFCAP for review. The purpose of the initial review was to formally establish the project boundaries by identifying key issues raised in recent research literature. The exploratory review identified an initial set of general themes prominent in the literature that the researchers deemed warranted more detailed investigation. Identifying initial themes and interrelated issues associated with each also fostered an initial organisational scheme for the following tasks.

The general themes set out in the exploratory literature were used as a foundation for a series of field interviews and fact-finding activities conducted in three study countries (Ethiopia, Ghana and Kenya). The three study countries were selected as they all have had active AFCAP programmes over the past six years and, perhaps more importantly, the research team had pre-existing connections in each. The exploratory literature review also aided in the identification of

[2] The issue of disease transmission in rural SSA via the road network was not covered in this study. The complex set of factors (donor funding, workforce migration, gender issues, cultural norms, etc.) contributing to this issue were considered outside the scope of the current project which is more aimed at direct health impacts associated with crashes, air pollution, lack of healthcare access and physical injuries from headloading due to lack of other transport means.

initial contacts for the field interviews. The interviews were conducted on a convenience basis according to willingness and availability. Key potential interviewees were contacted up to two weeks in advance of the interviews and, where applicable, appointments with them were set. Other interviewees were identified while research team members were in the field – some were suggested by interviewees and others had their colleagues join them. Additional experts were identified via the literature and by referral from other contacts and interviewed via telephone/Skype.

Building on the results of the previous two tasks, a more detailed and focused survey of expert opinion was conducted via the Internet. The survey was aimed at providing quantitative input regarding the general themes and how the respondents viewed various aspects of the themes with regard to research needs. The survey was administered to an audience of AFCAP affiliated professionals.

A more targeted literature review was then conducted. It was intended to identify specific literature supportive of the research themes cultivated through the first three projects tasks.

Finally, a draft report was submitted to AFCAP for review and comment. The additional research and discussion necessary to address these review comments were taken on board to produce the final report which was aimed at proposing a set of research themes and projects to advance the overall understanding of the health impacts of transport in rural SSA.

To the extent that the individual projects efforts were interrelated and built upon one another, the study process can be illustrated by the flow chart provided as Figure 1. Each of the project tasks and their results is presented in the following sections.

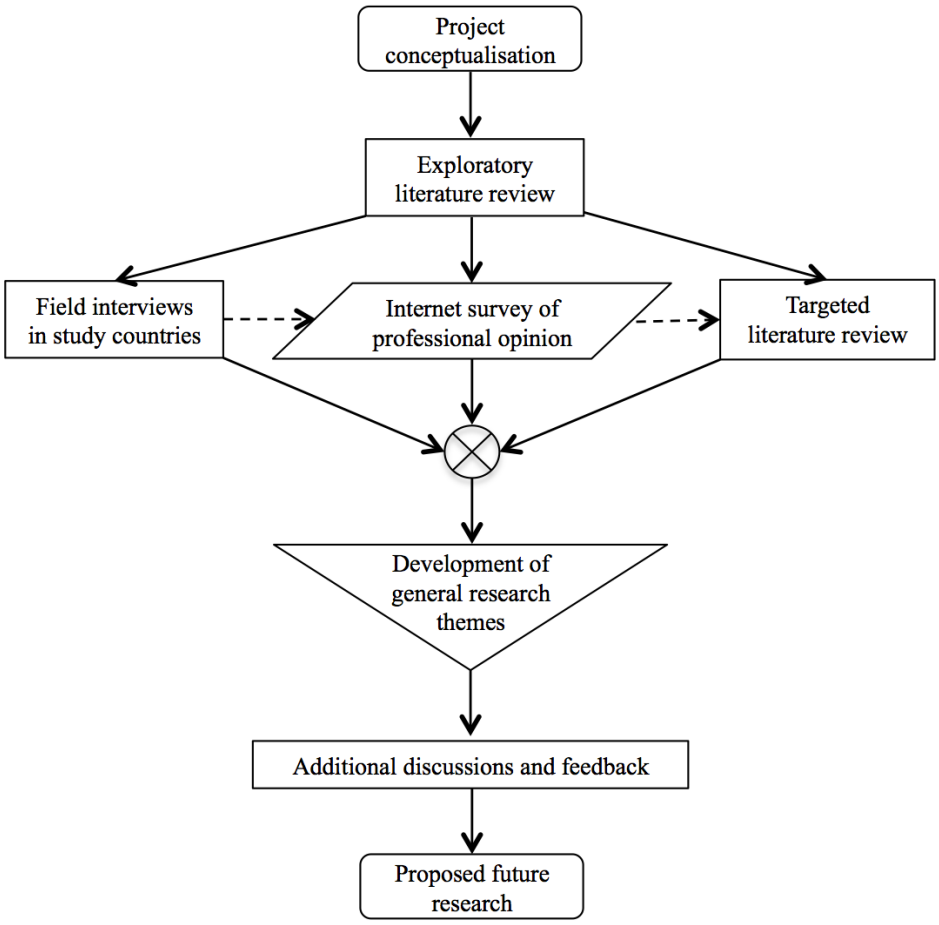

Figure 1. Study Flow Chart.

4. Exploratory Literature Review

Following a brief description of the approach, key observations from the literature are summarised. Transport safety issues are addressed first followed by a discussion of transport-related health impacts. With regard to the transport and health literature, the review is confined to health impacts associated with traffic-induced air pollution as referenced in *Transport for Health* (Global Road Safety Facility, 2014). The relationship between transport and healthcare access is addressed to a limited extent with a view to illuminating some of the key transport-related issues but without a full exploration of this very complex subject involving numerous sociological and economic issues unrelated to roads and transport services. Ultimately, the exploratory literature review results were interpreted so as to inform the field interviews and, ultimately, the overall project objective of identifying productive new research themes to further explore the concepts addressed herein.

The literature review was conducted using Web of Science®, Google Scholar and basic Internet searches. Additional material was obtained through correspondence/requests with personal

contacts. Initially, several high-level documents were obtained and reviewed to help frame the context and scope of the exploratory literature review and identify a preliminary set of keywords on which to begin the searches. Some of the key documents initially reviewed included:

- *Transport for Health* (Global Road Safety Facility, 2014);
- *Global Road Safety Facility Strategic Plan 2013-2020* (World Bank, 2014);
- *The Global Burden of Disease: Generating Evidence, Guiding Policy – Sub-Saharan Africa Regional Edition* (Institute for Health Metrics and Evaluation, 2013);
- *Global Status Report on Road Safety: A Decade for Action* (World Health Organization, 2009); and
- *Health Issues in Transport and the Implications for Policy* (Downing & Sethi, 2001).

In addition to the synthesis presented in the following sections, a detailed annotated bibliography was developed. Each reference listed in the annotated bibliography has been coded with one or more of 16 potential categories labels representing key transport safety and heath related terms. Each term was assigned a unique colour and their respective entries in the annotated bibliography were coded accordingly. The colour coding is shown in Figure 2 and a sample entry is illustrated in Table 1. The complete annotated bibliography is presented in Appendix A[3].

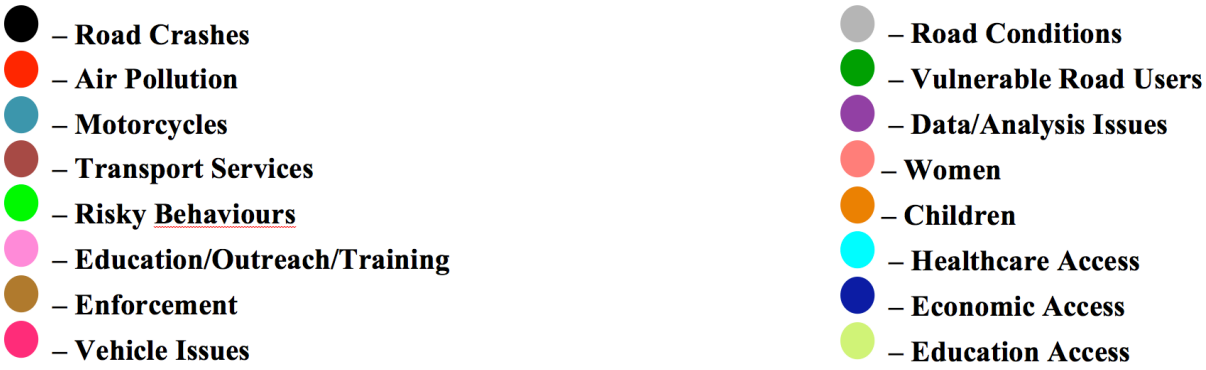

Figure 2. Colour coding of transport safety and health terms identified in annotated bibliography.

[3] It should be noted that the purpose of the annotated bibliography is to provide an organised source for initiating future research in the areas addressed by the current report. As such, there are some references cited in the main body of the literature review for general context but are not included in the annotated bibliography. Documents identified during the target literature review are also organised using the categories in Figure 2 and included in Appendix A.

Table 1. Sample entries from annotated bibliography.

Topic	Citation	Summary
	Nakitto, M., Mutto, M., Howard, A., Lett, R. 2008. Pedestrian traffic injuries among school children in Kawempe, Uganda. *African Health Sciences*, 8(3), 156-159.	Traffic injuries are an important problem in low income countries. In Uganda road traffic is the largest single cause of injury in Kampala; pedestrians, and children are most affected. Pedestrian injury affects school children in Uganda. To determine the overall risk of pedestrian traffic injury among school children in Kawempe, Uganda. A cohort was assembled at 35 primary schools and followed for 3 terms. Ten of the schools had participated in previous injury programs, others were systematically selected. Injuries were recorded by teachers using a questionnaire. Data collected included ID, school, age, grade, gender, incident date, vehicle type, and injury outcome. Demographic characteristics are described and cumulative incidences calculated. The cohort included 8,165 children (49% male) from 35 primary schools. The mean age was 9 years (Sd=2.78). Of the 35 schools, 92% were day; the others mixed day and boarding. 53 children (27girls) were involved in a traffic incident. 25% of the injuries reported were serious and warranted care in a health facility. No deaths occurred. Forty % of incidents involved commercial motorcycles, 41% bicycles, 9% cars, 8% taxis, and 2% trucks. The cumulative incidence was 0.168% each term. Over the 3 terms of the year the cumulative incidence was 0.5 +/- 0.02. There were no gender differences in the cumulative incidence. Each school year about 1/2% of Kawempe school children are involved in a traffic incident. Interventions are necessary to reduce the unacceptably high incidents of pedestrian traffic. Interventions to alleviate this situation including safer routes, teaching skills of road crossing to children as well as better regulation and road safety education to two wheelers could reduce the unacceptably high incidents of pedestrian traffic injury. http://www.ajol.info/index.php/ahs/article/view/7066
	Mustapha, B., Blangiardo, M., Briggs, D., Hansell, A. 2011. Traffic Air Pollution and Other Risk Factors for Respiratory Illness in Schoolchildren in the Niger-Delta Region of Nigeria. *Environmental Health Perspectives*, 119(10), 1478-1482.	Association of childhood respiratory illness with traffic air pollution has been investigated largely in developed but not in developing countries, where pollution levels are often very high. In this study we investigated associations between respiratory health and outdoor and indoor air pollution in schoolchildren 7-14 years of age in low socioeconomic status areas in the Niger Delta. A cross-sectional survey was carried out among 1,397 schoolchildren. Exposure to home outdoor and indoor air pollution was assessed by self-report questionnaire. School air pollution exposures were assessed using traffic counts, distance of schools to major streets, and particulate matter and carbon monoxide measurements, combined using principal components analysis. Hierarchical logistic regression was used to examine associations with reported respiratory health, adjusting for potential confounders. Traffic disturbance at home (i.e., traffic noise and/or fumes evident inside the home vs. none) was associated with wheeze [odds ratio (OR) = 2.16; 95% confidence interval (CI), 1.28-3.64], night cough (OR = 1.37; 95% CI, 1.03-1.82), phlegm (OR = 1.49; 95% CI, 1.09-2.04), and nose symptoms (OR = 1.40; 95% CI, 1.03-1.90), whereas school exposure to a component variable indicating exposure to fine particles was associated with increased phlegm (OR = 1.38; 95% CI, 1.09-1.75). Nonsignificant positive associations were found between cooking with wood/coal (OR = 2.99; 95% CI, 0.88-10.18) or kerosene (OR = 2.83; 95% CI, 0.85-9.44) and phlegm compared with cooking with gas. Traffic pollution is associated with respiratory symptoms in schoolchildren in a deprived area of western Africa. Associations may have been underestimated because of nondifferential misclassification resulting from limitations in exposure measurement. *doi: 10.1289/ehp.1003099*

In order to ascertain the level of geographical representation in the relevant literature, two sets of uniform Web of Science® advanced searches were conducted for the combined topics (set out as TS in the database) *TS=rural AND TS=road AND TS=Africa* and a separate search using *TS=rural AND TS=pollution AND TS=Africa.* Additional searches using various combinations were subsequently conducted. Results were screened to identify what SSA countries the studies were conducted in or to which they applied. The coverage of transport safety and health related literature across SAA identified in the annotated bibliography is shown in Figure 3.

As might be expected, the majority of literature was related to South Africa. East African countries (Ethiopia, Kenya and Tanzania) were reasonably well represented, as were Ghana and

Nigeria in the west. The results of the exploratory literature review are summarised in the following sections. First a review of safety-related literature relevant to rural SSA is presented and then a discussion of what was found with regard to transport-induced air pollution and its impacts in the rural environment.

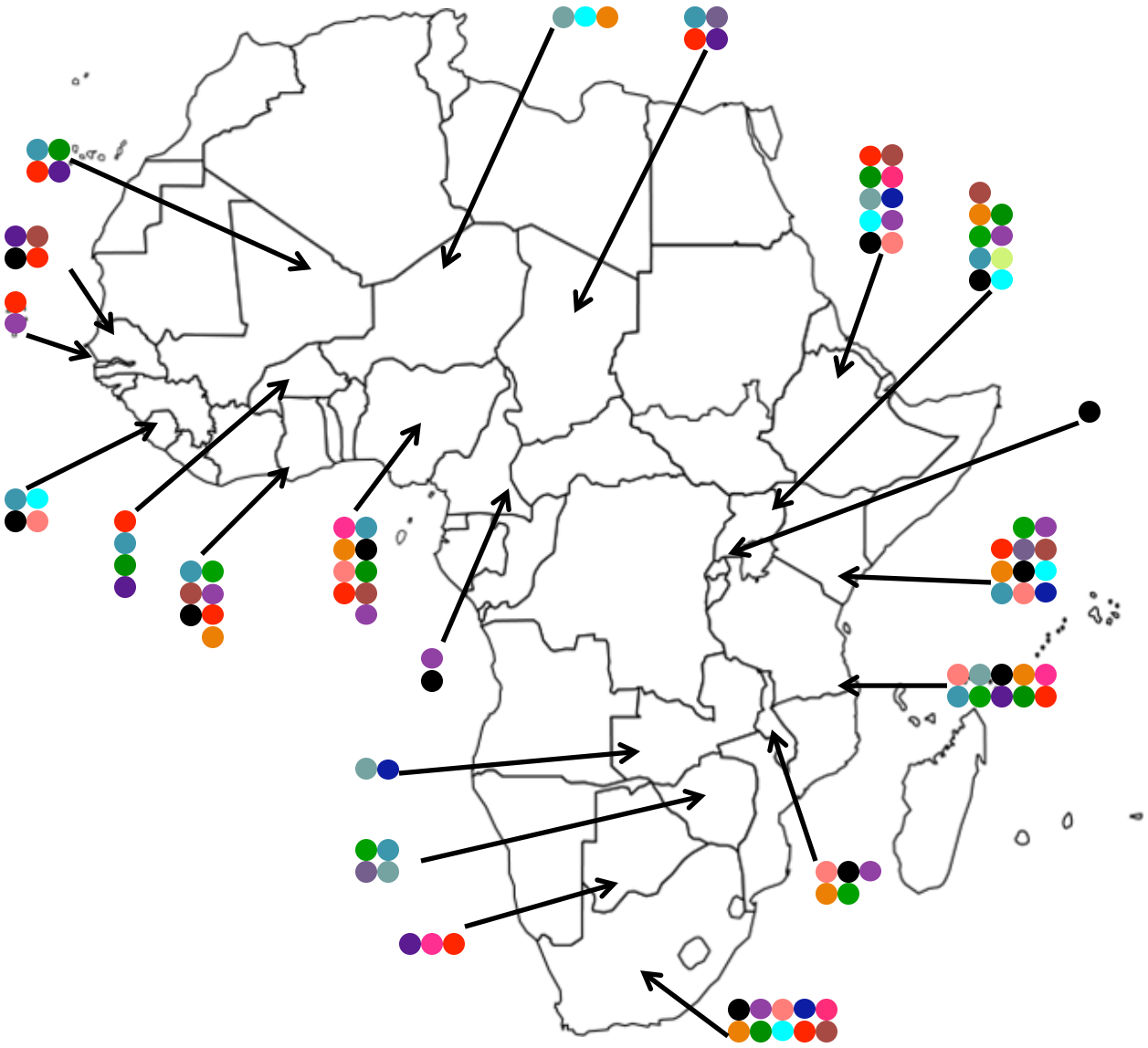

Figure 3. SSA Countries represented in the annotated bibliography.

4.1 General Context

Rural transport provision in SSA is a complicated and often contradictory endeavor. The positive benefits of increasing rural mobility and accessibility are well documented (Howe & Richards, 1984; Ellis & Hine, 1998; Starkey et al., 2002; Starkey, 2007; Starkey & Njenga, 2010; Banjo et al., 2012; Porter, 2014). Even so, there have been difficult lessons learned. There has been considerable focus on road projects in the past to develop inter-city highways that allow traffic to traverse rural areas between urbanised ones, often doing so at high speeds. These major highways are connected to trunk roads and feeder roads all of which provide access to varying levels of human development. In all too many cases, however, these engineered roads provide physical connectivity (a road from here to there) that does not necessarily come with complimentary accessibility (no way to get there). The development gap between provision of rural roads and viable transport services operating on them was first illuminated by Dawson & Barwell (1993). Numerous researchers have since expounded on this concept noting that so much of rural Africa depends on transport services and Intermediate Transports (IMT) modes for basic mobility (e.g., Riverson & Carapetis, 1991; Howe, 1997; Porter, 2002; Bryceson et al., 2006; Mengesha, 2010).

The idea of considering the public health impacts of transport is not a new one. Downing & Sethi (2001) produced a comprehensive report for the UK DfID entitled *Health Issues in Transport and the Implication for Policy.* It addressed crashes as an obvious health issue but also noted road transport as a factor in providing access to healthcare and, conversely, spreading diseases such as HIV/AIDS. It briefly addressed the idea of air pollution and explicitly noted the potential for air pollution from traffic to adversely impact public health. In an analysis of the health impacts attributable to World Bank-funded transport projects, Freeman & Mathur (2008) noted crashes, diseases transmission, air pollution, and promotion of sedentary lifestyles as potential health impacts of transport project development.

4.2 Rural Road Safety

In 2000, the USDOT commissioned a study of road safety in Africa (Jacobs & Thomas, 2000) in response to the formation of the Global Road Safety Partnership (GRSP). The major emphasis of the study was to "to analyze existing data and information on the road safety situation in order to identify the data gaps and priority needs." The authors illuminated the problems with road safety data availability and quality throughout SSA. They attempted to survey 42 African countries on current road safety practices but got only a 10% response rate. Ultimately, data was collected and compiled from national and regional statistics (where available), academic and other research literature and international organisations (e.g., International Road Federation) As a result, the document served as a major international benchmark for the assessment of road safety in Africa and reported important (estimated) country-specific statistics such as: overall crash

rates, proportions of severities, involvement of vulnerable road users, socio-economic factors (age, gender, income), types of vehicles involved in crashes, contributing factors, etc. The authors concluded that "information on road safety practices/situation could not be found for many African countries, and secondly, where information was found, it was often contained in unpublished project reports from donor assisted projects."

African transport and health ministers, meeting at the African Road Safety Conference in Accra in early 2007, agreed to use the *World Report on Road Traffic Injury Prevention* (Peden et al, 2004) as a framework to address road safety (Economic Commission for Africa, 2007a). The report identified five risk factors: 1) use of in-vehicle safety devices (belts, child restraints, etc.), 2) helmet use, 3) intoxicated driving, 4) speeding, and 5) the role of infrastructure. Specific recommendations from the conference included the need to improve the quality and consistency of crash data reporting, especially with regard to fatal crashes. It was believed that improved safety data was essential to developing more robust road safety management programs and needed efforts to harmonise policies across regional and national boundaries. Emphasis was also placed on road safety education and institutional capacities. Of particular relevance to the current study, the conference explicitly identified rural road safety as an area of need (Economic Commission for Africa, 2007b).

Well after the 2007 conference, Mohan (2008) explicitly called out for more focus worldwide on speeding, drink driving and the protection of vulnerable roads users. Onywera and Blanchard (2014) presented a concise summary of general strategies for reducing and preventing road accidents set out by the WHO. The strategies range from those that can be enacted by transport system providers (engineers, planners, public safety agencies, etc.) to needed behavioural changes on the part of system users (e.g., passengers, privately operated services[4]) to improve and ensure their own safety. The research community recognises the importance of developing road safety research (and policy) initiatives that are cognisant of factors such as globalisation, sustainability, livability and overall health in the developing world (Stiijn, 2014).

Nantulya & Reich (2002) reported that 85% of global deaths from road crashes occurred in developing countries and that 96% of the children killed in road crashes were in developing countries. They reported that the poor disproportionately bear this burden and specifically called out the impact among vulnerable road users (i.e., pedestrians and cyclists) and passengers of buses and minibuses. The need for improved road safety in Africa is not a new concern but it is a growing one. For example, Mock et al. (2005) reported a 384% mortality attributable to injuries from road crashes just in Botswana over the period 1975 to 1998. As of 2010, Africa was

[4] Reflects the extent to which most transport services throughout rural Sub-Saharan Africa are provided by privately owned and operated entities that make use of available infrastructure and are beholden only to operating and safety standards/guidelines set out by themselves and to a lesser extent transport service organisations.

reported as home to 4% of the motor vehicles in the world yet exhibited more than 10% of the world's traffic-related fatalities (Cehn, 2010).

The fact of the matter is that the problems surrounding road safety in SSA are well understood. The following is a list from a recent WHO fact sheet (WHO, 2013):

- "The African Region has the highest road fatality rate of all the world's regions.
- Young men are the most vulnerable road users.
- Pedestrians, cyclists and persons traveling on motorised 2- and 3-wheelers are at great risk of death and injury on the roads.
- Most countries still lack policies for protecting vulnerable road users and promoting investment in public transportation.
- Most countries are yet to enact comprehensive laws concerning the major risk factors of speed control, drink-driving, helmet use, seat-belt use, and child restraint.
- Even where comprehensive laws are in place, poor law enforcement renders the laws ineffective.
- Post-crash care is inadequate or lacking in many countries."

The international consensus on the set of road safety problems facing Africa is best expressed by the *African Road Safety Action Plan 2011-2020* and its promulgation of the five pillars from the *Decade of Action for Road Safety*: 1) Road Safety Management 2) Safer roads and mobility 3) Safer vehicles 4) Safer road users 5) Post-crash response. Indeed, the United Nations Road Safety Collaboration has produced myriad comprehensive reports (including *Transport for Health*) and guidance documents such as safety manuals for decisions-makers and practitioners on pedestrian safety, data systems, drink-driving, helmet use, etc. Other documents have been aimed at specific groups to empower them in addressing the road safety problems – e.g., two manuals published in 2012: *Advocating for road safety and road traffic injury victims: a guide for nongovernmental organizations* and *Youth and road safety action kit* (World Health Organization, 2014). The following sections summarise a review of relevant literature from the field of transport planning and engineering, public health, and development communities. The focus of the review was to identify areas where additional research work is needed (fill in knowledge gaps, resolve contradictions, introduce new ideas, etc.) and could enhance the overall understanding of rural transport safety in SSA.

4.2.1 General Impressions

In a study of national police data from 1993 through 1998, Afukaar et al (2003) concluded that more than 60% of fatalities and 52% of injuries from road crashes in Ghana occurred in rural areas. In fact, 58% more people died on rural roads than urban ones during this period. Mock et al (1999) reported that road crashes accounted for 16% of total injuries in urban areas of Ghana

and 10% of those occurring in rural areas. Bicycles crashes were the most common injury mechanism followed by motor vehicle crashes, 83% of which were identified as commercial vehicles (e.g., minibuses and buses). Rural crashes were reported to be more severe than ones occurring in urban areas and more often result in fatal and serious injuries as a result of higher speeds and lack of trauma care (Kmet & Macarthur, 2005).

Some 36% of injuries reported at a rural hospital in Cameroon were related to road crashes (Mefire et al., 2013). Of the 395 road injury cases examined that contained detailed information, 53% involved cars, 60% involved motorcycles with the remaining spread among buses, trucks, bicycles, pedestrians and carts (both human and animal-powered). The majority of the injury crashes reported involved a car and a motorcycle. Ogendi & Aysis (2011) reported data from a provincial hospital in western Kenya that indicated crashes comprised 28% of some 15,000 emergency room visits and were the leading cause of hospitalisation and also represented more than 40% of the injury-related deaths observed in the study. Similarly, the highest frequency of deaths reported in the rural Rufiji district of Tanzania from 2002 to 2007 were attributable to road crashes (A-Ngibise et al, 2012).

Interestingly, Guyavarch et al (2010) reported relatively little occurrences of traffic-related injuries in three rural areas of Senegal. Crash-related deaths were relatively low (1.9 deaths per 100,000 inhabitants in Niakhar, 3.0 in Bandafassi and 2.0 in Mlomp) when compared with injury types not associated with development such as falls (8.6 deaths per 100,000 inhabitants in Niakhar, 15.1 in Bandafassi and 23.3 in Mlomp). The assumption was that the locations were sufficiently removed from development that other injuries (e.g., snakebites) associated with remote locations in Africa were the dominant injury type. On the other hand, Hulme (2010) reported that road traffic accidents were responsible for more than 64% of the 490 traumas investigated at a rural hospital in northwest Uganda during 2007. Snakebites accounted for only 3.6% with assaults and falls accounting for 16.5% and 6.7%, respectively. As a result, low cost initiatives to prevent speeding and reduce drink-driving were recommended as among the most effective means of reducing serious traumas in the region.

In 2010, individuals aged 1 to 19 years old comprised 12% of the 5.1 million injury deaths globally. Individuals 15 to 19 years old were a little more than twice as likely to die of injuries 1 to 4 year olds. Injuries incurred in road crashes among 15 to 19 year olds were much more frequent sources of death from other unintentional injuries such as burns, drowning, and falls (Alonge & Hyder, 2013). Others have reported on the prevalence of road crashes as a primary source of injury and death in developing countries, especially those in SSA (Odero et al., 1997; Ameratunga et al, 2006; Al-Kharusi, 2008; Chandran et al, 2010; Onywera & Blanchard 2014) while others have explicitly documented the tragic effect on children (e.g., Nantulya & Reich, 2002; Burrows et al, 2010; Kiser et al, 2012). Odero et al (2003) made a stronger point, stating that 75% of road crashes impact Kenya's economically productive youth.

4.2.2 Impact on Children

Kiser et al (2012) report that road crashes contributed to 9.7% of some 7,000 injuries to children (age 0 – 16 years) in Malawi between 2008 and 2010. Although the study reflected urban data, Burrows et al (2010) showed that injuries sustained from road crashes are the leading cause of fatalities among children in South Africa. Fatality rates were shown to be significantly higher for pedestrian-related crashes involving children than when children were involved in crashes as vehicle passengers. Adesunkanmi et al (2000) examined 324 cases of injured children in an emergency medical department serving rural communities in western Nigeria. The results indicated that most of the victims were pedestrians but that those sustaining the most severe injuries were passengers in some form of motor vehicle. A population based study of some 6,000 individuals injured in Dar es Salaam indicated that 93% of children within the population were injured as pedestrians and were more likely to be struck as a pedestrian on small, unpaved side streets (Zimmerman et al, 2012.).

Okeniyi et al (2005) reported that more than half of 263 children treated for injuries at a semi-urban area in Nigeria were involved in motorcycle crashes – in most cases being struck by motorcycles (these children were reported as being struck while traveling to and from places like school, church, work, and play). Interestingly, however, the majority of the children struck by motorcycles were engaged in street hawking. Schoolchildren from 35 primary schools on the outskirts of Kamapala, Uganda were observed over a period of three terms. During this time, 53 children were involved in crashes, the majority of which involved commercial vehicles (minibuses and especially motorcycle taxis). The study recommended enhanced education for the children on road crossing and increasing awareness of the dangers associated with two-wheelers (Nakitto et al, 2008). Although no safety statistics were cited, Amoako-Sakyi and Owusu (2011) reported that bicycle usage (mostly errands and recreation) among children in rural communities in Ghana was much higher than bicycle ownership levels would predict. The study noted bicycle usage among young boys was significantly higher than among girls. It was noted that parents' perception of safety were an important factor in the extent to which children used bicycles. A study of some 23,000 injuries treated in a tertiary Malawian hospital concluded that 10% involved pedestrian victims between the ages of 6 to 10 years old, the majority of which were female. On the other hand, Burrows et al (2010) reported higher crash-related fatality rates among male children in South Africa. Odhiambo et al (2013) used data from a demographic surveillance system in addition to verbal autopsy reports to ascertain the causes of trauma-related mortality in rural Kenya. The results indicated that road traffic injuries comprised 15% of deaths among males and 13% among females from a population of 11,000 observed from 2003 to 2008.

4.2.3 Risky Driving Behaviour

Driving while intoxicated is an unfortunate risky behaviour that is involved in all too many rural crashes and alcohol, particularly, has been recognised as a major contributor during the last half century (e.g., Kobus, 1980). Since then, numerous traffic safety and public health researchers have investigated the problem. For example, Odero (1998) and Ordero & Kibosia (1995) illuminated the association of drink driving and crashes in rural Kenya (using data from a hospital in the town of Eldoret in western Kenya). The data showed nearly a quarter or crash patients had some blood alcohol content (BAC) and more than 12% were officially intoxicated. Not surprisingly, males were shown to be twice as likely to be involved in an alcohol-related crash as women. The data also showed that while most (60%) of drink-related crashes involved drivers, a third were pedestrians and 8% were cyclists. Alcohol is also reported to be a major contributor to road crashes throughout Nigeria (Ogazi & Edison, 2012). Damsere-Derry et al (2008) documented a comprehensive speed study on 15 different inter-urban corridors in Ghana. The results confirmed suspicions of problematic speeding that is suspected of contributing to elevated crash and fatality rates in rural areas of Ghana.

4.2.4 Vehicle Condition

Speeding was shown to be a major contributor on a major inter-urban motorway in Cameroon along with hazardous overtaking. More than a quarter of the crashes, however, were attributable to vehicle defects and mechanical failures (Sobngwi-Tambekou et al, 2010). Risky and untrained driving, poor road conditions and inadequate enforcement were suggested as major contributors to road crashes in Kenya (Manyara, 2013). A comprehensive study of crash data obtained from accident response units in the Gauteng Province of South Africa highlighted major issues relating to mechanical problems and overloading of minibuses. The report indicated that up to 40% of the vehicles operating in suburban locations had some type of mechanical defect and nearly 30% of those operating on inter-urban motorways (i.e., with relatively high speeds) did so as well (van Garenne et al, 2001). Vehicle failures due to defects and lack of maintenance, untrained drivers and poor road conditions were cited as being the primary contributors to crashes on rural roads in Burkina Faso (Lord et al, 2003). Starkey et al. (2013) noted that regulators in Tanzania rated buses safety compliance as low (2 of 5 starts) and motorcycles as being particularly poor (1 of 5 stars). Starkey and Njenga (2010) noted the potential complication of enforcing vehicle safety compliance as it may result in higher transport costs and less frequent services. Numerous researchers have alluded to the importation of motorcycles from China and the transference of other vehicles from urban to rural service as they age, become less expensive to purchase and ultimately less safe and reliable. Lamont (2012) offers an anthropological perspective on fatal crashes in Africa as being a product of "an ongoing but exceptional industrial catastrophe [that] is analytically advantageous insofar as it reintroduces road safety as both capitalist ideology and state-effect." Akloweg et al (2011) takes

this assertion a bit further and call for increased responsibility among the global automobile trade to be more proactive in ensuring the serviceability of cars (especially used cars) that enter the African market as an effort to address the role mechanical failures play in road crashes across the continent.

Tule et al (2013) examined police crash reports across Ethiopia from 2005 – 2011. Of the more than 14,000 fatalities reported during this period, more than half were recorded as pedestrians while much of the remaining fatalities were vehicle passengers (many in minibuses and other commercial vehicles). Additional evidence from Ethiopia supports the disproportionate risk associated with being a passenger – some 30 times more likely to be killed as a passenger in Ethiopia as in the U.S. (Persson, 2008). Osman et al (2003) showed that 60% of traffic-related injuries observed in rural northwest Ethiopia were associated with commercial vehicles including minibuses and other transport services vehicles. Further examination into this issue identified poor vehicle condition as a major contributor along with a lack of compulsory vehicle insurance and effective safety enforcement.

Akukaar et al (2003) reported that the majority of crash victims across Ghana from 1994 through 1998 were passengers in buses and minibuses. Although the study derived data on traumas from an urban hospital in Nairobi, Saidi & Kahoro (2001) indicated that 70% of crash injuries were vehicle passengers, many were minibus (matatu) passengers. All other factors constant, the expected proportion of minibus injuries would be higher in rural areas as the mode share of passenger cars is lower and speeds are typically higher on rural paved facilities and/or road conditions are poor on unpaved roads. Odero et al (2003) reported that the majority of fatal crashes in Kenya involved buses and matatus and that the majority of passengers killed in these were on inter-urban motorways traversing rural areas. Starkey et al. (2013) noted that rural travellers in Tanzania did not express particular concern over the safety of transport service vehicles (although they were documented as often operating grossly overloaded). They did, however, perceive motorcycles to be relatively unsafe.

4.2.5 Motorcycles

Safety concerns over an increasing motorcycle population in Africa have been documented since the 1980s (Dall, 1983). A comprehensive study of rural transport safety in Tanzania recently outlined, in great detail, issues related to the increased use of motorcycles as taxis (Guerrero et al., 2013). A recent study from a hospital in rural Nigeria indicated that most (54%) injuries coming into the emergency department were motorcycle-related while 34% were bus and car passengers. Males were more than three times likely to be injured in a crash as females and crash injuries accounted for 25% of all deaths in the emergency department (Madubeze et al, 2011). Some 98% of vehicles registered in northern Ghana between 2004 and 2008 were motorcycles. As expected, motorcycle crashes have increased proportionally with increased

ownership and usage. It was reported that these crashes have cost the region about $1.2 million over the same period. About half of the estimated economic loss is from property damage and administration and administration while the remainder is associated with medical costs and lost productivity. Indeed, the author of the study commented that these motorcycle crashes are disproportionately affecting young working-age men in the region (Kudebong et al, 2011).

Ackaah & Afukaar (2010) reported on the impact of motorcycle crashes in northern Ghana (Tamale region) and commented on the lack of helmet usage exacerbating the injury severities. In a recent, study, motorcyclists and their passengers in rural areas of Ghana were shown to be seven times less likely to wear a helmet than those observed in urban areas (Akaateba et al, 2014). Similarly, some 95% of 363 motorcycle crash victims recorded at three hospitals across Nigeria were shown to not be wearing helmets (Oluwadiya et al, 2009). Helmet usage among bicyclists was reported to be non-existent in Malawi (Kraemer et al, 2012).

Among the many studies reporting on motorcycle crashes in Nigeria (refer to Appendix A), Solagberu et al (2006) revealed crash mechanisms in which 40% involved the motorcycle and another vehicle while a quarter involved a motorcycle striking a pedestrian. A separate study in Nigeria showed that 15% of motorcycle crash victims in urban areas were pedestrians while only 6.5% in rural areas were pedestrians. Most rural motorcycle crash victims were riders (50%) or passengers (41%) (Oluwadiya et al., 2009).

Motorcycle taxis are becoming an increasingly important means of mobility throughout rural Africa for example: Uganda (Bryceson et al, 2003), Tanzania (Porter et al, 2013), Nigeria (Olubmehin, 2012), in general (Kumar, 2011). At the same time, they are being resisted and, due to safety concerns, in some cases officially banned (Egbunike, 2012; BBC, 2013; Porter, 2014).

4.2.6 Data/Analysis Issues

Regardless of the victim demographics, crash severities or contributing factors, there are serious data related challenges limiting the study of road safety in the developing world. Even at the most sophisticated levels of data collection and management capabilities, Sauerzapf et al (2010) documented problematic differences in data maintained by the World Health Organization and similar data administered by the International Road Federation. There are examples of researchers accessing national level crash databases to conduct descriptive analyses and trend identifications (Ackaah, 2010; Aderamo, 2012).

A comprehensive study of road crashes and injuries in Kenya used police data and health data from the National Vital Registration System to develop an understanding of relationships between crashes, injuries and fatalities. In addition to reporting details regarding victims ages, transport modes involved, etc., the study discussed the problems associated with inaccurate and

incomplete data and called for efforts to develop more sustainable data collection protocols and management systems (Abdulgafoor et al., 2012). Chokotho et al (2013) documented numerous data quality problems, including missing and duplicated data in addition to significant underreporting in police data, as part of an assessment in the Western Cape Province, South Africa. Samuel et al (2012) proposed a new data collection method to address crash-injury data availability/quality issues found in Malawi. They proposed a capture-recapture method that involved police data and hospital registries to compensate for errors such as police over reporting crashes involving males or those involving more than one vehicle.

Lack of quality, comparative data hinders development of uniform safety management policies (Al-Kharusi, 2008). New data collection, maintenance and analysis techniques are needed. For example, Beshah et al (2012) explored various machine learning techniques to overcome serious gaps and quality issues among the available crash data in Ethiopia.

If SSA countries are going to develop safety management processes and systems, data will be needed to support scientific road safety analyses such as those set out in the *Highway Safety Manual* to predict crashes/crash severities and prioritise countermeasures (AASHTO, 2010). In limited cases (e.g., South Africa), sufficient data has been available to pilot the *Highway Safety Manual* (HSM) techniques (Roodt, 2012). The HSM is quite data intensive and many transport agencies in the US are experiencing difficulties providing sufficient data to conduct meaningful application of the techniques. Furthermore, the crash prediction tools described in the HSM (safety performance functions) typically rely on traffic volume as the primary crash predictor. The statistical rigor required by the Empirical Bayes methods in the HSM not only requires a great deal of data, the low (sometimes extremely low) traffic volumes on many rural roads in addition to the relative rarity of crash occurrence in these areas may result in the HSM being inapplicable in many cases. Crash prediction models for rural roads developed in Australia and New Zealand have been suggested as foundations for conducting crash modeling studies in SSA (e.g., Tziotis et al., 2006; Turner et al., 2009) Other researchers have reported epidemiological approaches to predict road traffic injuries and prioritise potential intervention strategies in SSA (e.g., Matzopoulos et al., 2008; Chisolm et al., 2012).

Road safety management tools such as the International Road Assessment Programmed (iRAP) have been used in developing countries including several in SSA, although not in rural and remote areas (e.g., Mumford et al., 2013). iRAP has been used to develop risk factors for road condition and crash type. The iRAP risk factors indicated that poor road conditions increased the risk of both run-off-road and head-on crashes due to loss of vehicle control by about 50% for both 4-wheeled vehicles and motorcycles. Similar results were reported for the risk of bicyclists or pedestrians being struck (i.e., 50% more likely to be hit on a poor road than on one with a good surface). The risk factors, however, are based on data from rural Australia and may not be representative of the range of road conditions present in rural SSA nor the operating conditions

of vehicles and lack of education, training, regulation and enforcement of driving behaviours (iRAP, 2013).

4.3 Rural Air Pollution

Early focus on the pollution costs of road transport in Africa can be traced back to the mid-1990s (Mwase, 1996; Tanimowo, 2000). As set out in the *Transport for Health* report, currently the primary health impacts attributable to transport derived air pollution are associated with fine particulate matter (PM) (Global Road Safety Facility, 2014). The air pollution and health literature typically refers to solid particulate matter that is smaller than 2.5 microns in diameter as PM2.5 while some literature also refers to larger particulate matter PM10 (i.e., smaller than 10 microns in diameter) as also having deleterious health effects (Smith, 1993; McMichael, 2000; Colvile et al., 2001; Anenberg et al, 2010; Rao et al., 2012). In some cases, PM can be suspended in air with liquid particles in which case it is referred to as an aerosol. There are other potentially harmful pollutants associated with traffic emissions such as carbon monoxide, nitrogen dioxide, volatile organic compounds, lead and polycyclic aromatic hydrocarbons (Han & Neaher, 2006) not addressed in the *Transport for Health* report. In most cases, these pollutants are not found in rural environments in sufficient quantities as to be considered directly dangerous to human health (e.g., Finkelstein et al, 2004, Zhang & Batterman, 2013). PM, however, can be a very localised traffic emission as it is associated with exhaust from combustion engines, mechanically generated dust (e.g., brakes), chemical laden dust entrained from roadways and even fugitive dust disturbed along the roadways themselves – especially unpaved ones (Mkoma et al, 2009). Greening & O'Neill (2010) reported data from a US study that estimated 40% of fugitive atmospheric dust is attributable to unpaved roads and another 8% from paved roads. They cite a separate US study that attributes 15% of fugitive PM2.5 and 50% of fugitive PM10 to roads and traffic.

Despite the emphasis on PM, carbon monoxide (CO) can also be a very dangerous pollutant associated with traffic emissions. Linden, et al, (2008) measured significant CO levels (as well as PM10) in Ouagadougou, Burkina Faso at the roadside locations with and without traffic present. The roadside CO levels attributable to the traffic emissions were shown to be up to 20 times higher than urban background levels indicating significant localised emissions. Although the measurements were conducted in urban Nigeria, Efe (2006, 2008) and (Abam & Unachukwu, 2009) both showed harmful levels of PM directly attributable to traffic emissions.

4.3.1 Air Pollution Sources

Most of the literature focused on transport-related PM pollution in Africa deals with urban areas. Background levels of PM and other emissions form traffic are highly variable in the rural environment. Van Gemert et al (2011) and Musafiri et al (2011) have documented the serious health impacts associated with PM pollution in rural Africa. Most of the studies, however, attribute these negative health impacts to biomass burning and, especially, to indoor wood fires used for cooking and heating (Titcombe et al., 2011; Jagger & Shively, 2013; Zheng et al., 2014). Kinney et al (2011) showed PM2.5 concentrations at a rural site outside of Nairobi as much lower than five urban monitoring sites. Jagger and Shively (2013) note the acute respiratory infections attributable to fuel wood burning as a significant source of illness in women and children in rural households in Uganda – results that agreed with those reported by van Gemert et al (2013). Vehicle emissions were shown to be a significant source of aerosols at urban and some semi-urban sites around Dar es Salaam but not in outlying rural areas where the main sources were sea spray and long-range transport of industrial emissions (Mmari et al, 2013).

Rooney et al (2012) confirmed the presence of both PM 2.5 and PM10 from wood fires in four areas around Accra (Asylum Down, East Legon, Jamestown and Nima). Although the measurements were conducted in an urban environment, PM2.5 measurements on dirt roads in the area were shown to be substantially higher than those on paved roads. Understanding that the unpaved roads, even in an urbanised area, carry lower levels of traffic than paved roads, the results support the assertion that there is potential for substantial PM emissions from unpaved road in rural areas. Arku et al (2008) reported similar results in a previous study of the Jamestown and Nima areas of Accra.

4.3.2 Traffic-generated Air Pollution

The risk of wheezing was shown to increase in occupants of homes within 150m of the road in Jimma, Ethiopia (Venn et al., 2005). The result was especially interesting, as the overall traffic volumes in Jimma were considered relatively low and more representative of what might be expected in a rural setting (37 – 2640 vehicles over a 12-hour period). Children have been shown to be particularly susceptible to negative health impacts (e.g., coughs, wheezing when exposed to PM from traffic emissions (Schwartz, 2004; Pierse et al, 2006). Children in Warri, Nigeria were shown to have elevated occurrences of coughing and wheezing attributable to PM emissions, much of which can be traced to two-stroke engines on two-wheelers and large diesel-powered trucks associated with the local oil extraction and processing industries (Mustapha et al., 2011).

There is considerable concern about the exposure to traffic emissions by all road users (van Wijnen et al, 1995; Adams et al, 2001; Rank et al, 2001; Kaur & Nieuwenhuijsen, 2009; Nasir & Colbeck, 2009; Zuurbier et al, 2010). Similar results have been reported for various cities in the developing world (e.g., Han & Naeher, 2006; Saskena et al., 2007; Saskena et al, 2008). Ekpenyong et al (2010) specially addressed traffic pollution exposure among taxi drivers and motorcyclist in Uyo, Nigeria. Motorcyclists were most impacted from exposure to the traffic pollution. Further evidence of potential harm from traffic pollution in the roadside environment was documented as increased coughing, chest pain and other symptoms occurring in street sweepers exposed to road dust in Calabar, Nigeria (Nku et al, 2005). Recognising the prevalence and, indeed, importance of roadside commerce in SSA, it is worth noting that Kinney et al (2011) discussed traffic emitted PM exposure for street vendors in Nairobi. Similar results have been reported regarding health impacts to roadside vendors in Asia (Jones et al, 2008). Greening & O'Neill (2010) discussed various dust (i.e., PM 2.5 and PM 10) exposure pathways in the rural roadway environment in Africa. They specifically cite high exposure rates for people travelling in minibuses, on motorcycles, on animal carts, walking, cycling, in the back of trucks, etc. They also note that rural residents in developing countries often build houses close to roads to foster access to passing trade and to reduce their own access times when travelling. Finally, Adenyi & Owoade (2011) reported that soil samples taken near several bus stops along the Lagos-Badagry Expressway showed elevated levels of petroleum-derived hydrocarbon and heavy metal pollutants, all of which are associated with negative health impacts.

As indicated by Greening & O'Neill (2010) and others, passengers are exposed to pollutants while traveling in vehicles. Busses are repeatedly reported to be a significant source of in-vehicle exposure to PM2.5 (Tartakovsky et al, 2012). Commuters traveling in public transport vehicles in Jakarta, Indonesia were reported as being exposed to higher levels of PM pollution than those traveling in private cars (Both et al, 2013). Tartakovsky et al (2012) also report higher levels (some 2.5-3 times) of PM in buses than in passenger cars. The PM levels on-board the buses were measured on two urban and one rural route on which the buses operated with closed windows. The study showed that on-board PM came from 1) penetration through on-roof ventilation, 2) flushed in ambient air periodically coming in through the bus doors at stops, and 3) PM re-suspended from the bus seats and passengers' clothing. African transport service vehicles often do not have functional air conditioning and thus would be expected to exhibit higher on-board PM levels due to open windows in addition to the three sources described above. Mtawali (2010) noted that dust generated form rural roads was a major source of air pollution in houses and that the traffic-generated dust also has deleterious effects on local water sources and nearby vegetation. Significant negative impacts to agricultural production attributable roadside dust reported by Greening & O'Neill (2010) include: reduced photosynthesis, increased incidences of pests, hindered pollination, reduced crop yields, health problems among livestock, etc. – all of which can lead to economic losses that can indirectly contribute to negative health outcomes. Interestingly, pollution induced by heavy traffic levels in rural areas has, in some

cases, been shown to be a source of pollutants (e.g., lead) in vegetables essential to the local dietary intake (Mor & Ceylan, 2008).

4.3.3 Other Air Pollution-related Issues

Ultimately, there are many air pollution related challenges ahead for SSA. Pending impacts of climate and urban air pollution garner much of the attention of the research and policy communities. Nonetheless, some of the specific challenges noted by Hap & Schwela (2012) apply to rural areas as well as urban ones throughout the continent:

- "[Air Quality Management] policies are still ad hoc in most countries
- Public awareness of air pollution is poor
- Stakeholder participation is poor
- Baseline air quality data does not exist
- Awareness of the impacts of air pollution on human health, risk perception and communication are poorly developed
- Short-term and long-term studies on health impacts of air pollution are lacking."

4.4 Healthcare Access

Chimbindi et al (2013) report average travel times to and from a rural health clinic in South Africa even accounting for 58% of patients traveling by minibus. The finding is interesting because that is a long time spent in a minibus in the rural road environment for patients that are reported as seeking care for respiratory-related diseases. Similar barriers to healthcare access were reported in rural Niger where 90% of the roads are unpaved and some remote regions require walking in excess of 4 hours to access facilities (Blanford et al, 2012). The issues surrounding rural healthcare access are myriad and complex (as summarised by Porter, 2014). An epidemiological study in rural (Kilifi District) Kenya, however, did not find a correlation between child mortality and distance (i.e., ability to readily access) to rural healthcare (Moisi et al, 2010). On the other hand, a recent comprehensive study of maternal health issues in rural SSA showed considerable positive correlation with the accessibility of various levels of care (TRANSAID, 2013). Allegri et al. (2011) reported similar positive associations of care-seeking and accessibility distances among pregnant women in rural Burkina Faso. Another recent study in Sierra Leone reflected positively on the use of motorcycle ambulances (Bhopal et al, 2013). It should be noted, however, that both the drivers and the motorcycles themselves used in such ambulance schemes are not typical of the average motorcycle/driver operating throughout rural SSA. Another study that tracked trauma patient care in a hospital in rural Kenya emphasised the importance of access to positive treatment outcomes for injuries, 52% of which were a result of road crashes (Otieno et al. 2004). A study in rural Kenya on the effect of road construction projects on healthcare access showed them to have a more positive impact on wealthier residents.

It was found that other factors (e.g., treatment costs, religious and cultural issues) affected the choice to seek healthcare as much as the relative ease of physical accessibility (Airey, 1991). Berhanu et al. (2008) documented the adverse health effects associated with limited and unsafe transport access to critical healthcare in rural Ethiopia. The study noted that women, children, and the elderly were disproportionately affected by the lack of healthcare access. The report and another from rural Ethiopia (Muleta & Ababe, 2008) echoed the particular concern over lack of access to maternal and pre-natal care. Maganya et al. (2008) noted the difficulties that extreme terrain (mountains, island) and even wild animals place on healthcare access in remote areas of Kenya. Benegusenga (2008) reported on the role of the local means of IMT, the *ingobyi* (basically a stretcher constructed using traditional basket making techniques and carried by up to four individuals) in providing healthcare access in rural areas of Rwanda.

4.5 Headloading

Headloading is an essential means of goods transport in SSA. For example, water and firewood for household use are transported daily (e.g., Blackden & Wodon, 2006; Matinga, 2008; Porter et al., 2013). As early as the 1950s, researchers were aware of the importance of headloading to rural agricultural economies in Africa (Johnston, 1958; Hine, 1993; Platteau, 1996; Sieber, 1999). While headloading has long been practiced and is often necessary due to lack of other, more practical means of transporting goods, it is associated with potentially severe health problems such as musculoskeletal injury (both chronic and acute) and impacts to other bodily systems and organs (e.g., Bao, 1989; Echarri & Forriol, 2005). Headloading is also quite strenuous and, as such, expends significant human energy that could be devoted to other tasks (e.g., Lloyd et al., 2011). In the context of rural SSA, women (and to some degree children) have been reported to disproportionately bear the burden of headloading (Barrett & Browne, 1993; Matinga et al., 2013; Porter et al., 2012; Porter et al., 2013).

The reasons of enduring headloading are complex - basically there is an absence of any viable means of alternative transport. The lack of alternatives may be a result of an inability to afford motorised transport or the inaccessibility of areas to motorised transport due to road conditions (e.g., seasonal issues) or a complete lack of facilities in remote areas (Starkey et al., 2002). Similarly, IMTs may not be viable due to an inability to afford the basic transport components (carts, animals, etc.) or an inability to house, feed and care for animals for the purpose of transport (Dennis, 1993, Wendroff, 2002; Wendroff, 2010). In other cases, modes such as bicycles may not be viable due to affordability, cultural reasons limiting access to them, or the simple fact that bicycles may be impractical for transporting some types of goods (e.g., Andreski, 2005).

5. Field Interviews

Expert interviews and fact-finding activities were conducted in the three study countries (Ethiopia, Ghana and Kenya) from 2 – 13 June, 2014. Table 2 summarises the field activities. The field interviews were semi-structured dialogues and, in some cases, were conducted with more than one interviewee present so there was considerable discussion. Potential interviewees were generally categorised as being able to provide input on Rural Road Safety and/or Rural Air Pollution.

Table 2. Organisations Participating in Field Interviews.

Country	Organisations Representation
Ethiopia	National Road Safety Council, Ministry of Transport
	Non-Governmental Organization (NGO)
	Transport Authority, Ministry of Transport
	Research and Development, Ethiopian Roads Authority
	Planning and Programming Management, Ethiopian Roads Authority (two individuals)
	Ethiopian Federal Police Commission
	Traffic Safety, Oromia Police Commission (two individuals)
	Addis Ababa Institute of Technology (two individuals)
	Ministry of Environment and Forestry
	World Health Organization, Ethiopia
	Ministry of Health
	Private Consultant
Ghana	Building and Road Research Institute (four individuals)
	Kwame Nkrumah University of Science and Technology, Department of Roads and Transportation
	National Road Safety Commission (two individuals)
	Department of Feeder Roads (three individuals)
	Private Consultant
	University of Ghana, College of Public Health
	Ghana Health Service
	Ghana Highway Authority
	Environmental Protection Agency (two individuals)
Kenya	University of Nairobi, Dept. of Civil and Construction Engineering (three individuals)
	University of Nairobi, Institute of Development Studies
	African Development Bank, Nairobi
	International Forum for Rural Transport and Development, Nairobi
	Private Consultant
	Traffic Police
	Police Statistics Office
	Ministry of Transport and Infrastructure

As described in the methodology section, the initial themes identified in the exploratory literature were used to guide the field interviews. For example, the transport modes most commonly discussed in the literature were listed as prompts around which to frame the safety discussions. Similarly, the common points noted in the pollution literature served as the foundation for the discussion with air pollution and public health experts. Specifically, these themes formed the

basis for sample dialogue interview guides (Figures 4 and 5). The interview guides served as a reference to the interviewers as they led the dialogues but did not (nor were they intended to) comprise a step-by-step survey. The questionnaires (wording, tone, etc.) suggested by Starkey (2007) were used as a guide for the developing the interview guides.

Rural Transport Safety – Dialogue Interview Guide

Our initial literature review indicated the following as key rural road safety concerns in Kenya. *We realise that there is overlap among the items in the list below. Nonetheless, these represent distinct areas of emphasis for targeted safety programs and future research.*

1. What do you perceive to be the primary rural transport **safety issues** (e.g., driving behaviors, road conditions, vehicle operating conditions) associated with the following?
    a. Motorcycles
    b. Buses
    c. Mini-buses
    d. Bicycles
    e. Pedestrians

2. What do you perceive to be the primary rural transport **health impact/issues** associated with the following?
    a. Motorcycles
    b. Buses
    c. Mini-buses
    d. Bicycles
    e. Pedestrians

3. What do you perceive to be the primary **accessibility issues** associated with rural transport?

4. What do you perceive to be the primary **policy issues** associated with rural transport?

5. What do you perceive to be the primary **threats (or potential threats)** to rural transport?

6. Which of the following do you perceive to be the most critical issue with regarding to rural transport safety? Feel free to rank them in order of priority.
    a. Motorcycles
    b. Transport Services (Buses & Mini-buses)
    c. Vulnerable Road Users (Bicycles & Pedestrians)
    d. Risky Driving Behavior
    e. Enforcement
    f. Data availability/quality

7. ***What do you see as the most pressing research needs in the area of rural road safety?***

8. Other thoughts/comments

Figure 4. Sample Guide for Field Interviews with Road Safety Experts

Rural Air Pollution – Dialogue Interview Guide

We know that there are serious issues with ambient pollution in urban areas. Attention is needed in rural areas as well. Our initial literature review indicated that in the rural environment, the primary transport related pollution issues are associated with particulate matter (e.g., PM2.5) associated with dust from unpaved roads and fugitive dust from vehicles. *We realise the list below is not exhaustive but we would appreciate any input you might have regarding these key items.*

1. What do you perceive to be the primary **threats (or potential threats)** to rural air quality?

2. Which of the following do you perceive to be the most critical issues warranting research with regard to transport-related air pollution in rural areas? Feel free to rank them in order of priority.

    a. Estimation of the volume of dust generated from unpaved roads
    b. Measurement and chemical speciation of traffic dust generated
    c. Health impacts to road users (pedestrians, cyclists, motorcyclists, hawkers, etc.) exposed to pollutants
    d. Health impacts to individuals living and working in the roadside environment exposed to pollutants
    e. Health impacts to individuals traveling in vehicles (i.e., buses and minibus) exposed to pollutants
    f. Impact and extent of damage to nearby agriculture
    g. Contribution to roadway crashes due to limited visibility
    h. Contribution or impact on vehicle operating costs
    i. Overall environmental impacts
    j. Data availability/quality

3. ***What do you see as the most pressing research needs regarding transport-related air pollution in rural areas?***

4. What do you perceive to be the primary **policy issues** associated with air pollution in rural areas?

5. Other thoughts/comments

Figure 5. Sample Guide for Field Interviews with Air Pollution Experts

As the dialogue interviews were semi-structured there was considerable variability in the extent and intensity of interaction. Interviews typically lasted between 30 – 60 minutes although a few lasted considerably longer. The field interviewers generally followed the line of questioning presented in Figure 4 and 5 but allowed the interviewees to follow their on lines of thought as they expounded on initial reactions to the dialogue prompts. The interviewers participated in the conversations, asking follow on questions and gradually steering the sessions back to the interview guides – this allowed each interview to produce its own unique contributions while maintaining consistent themes across different interviewees representing the various organisation types represented. Some interviewees chose to engage more directly with the interview guide and directly answer questions (e.g., indicating priorities among the issues listed) while others maintained a much more conversational approach. Throughout the interactions, the interviewers took notes and later transcribed them into a consistent format that summarised the discussions and highlighted specific points raised. In some cases, the interviewers attempted to write down

direct quotes during the interviews in order to provide specific context for the issues addressed. It is understood that quotes were transcribed as accurately as possible during the course of the interviews, but nonetheless there may be some minor inaccuracies. Therefore the unique perspectives offered by individual interviewees are provided in the following section as *indirect quotes*.[5]

5.1 Safety-oriented Interviews

In many ways, the results of the dialogue interviews reinforced findings from the exploratory literature review. As expected, the responses reflected the interviewees own knowledge and experience in relation to his or her country. For example, one of the interviewees from Ethiopia ranked motorcycles as the lowest among the safety issues and then went on to explain in detail that motorcycles were not common in most of the country except in the border regions. Conversely, multiple interviewees from Ghana cited the prevalence of motorcycles, especially in the north of the country, and ranked them as the most important rural transport issue and provided detailed insight:

> *Rural Ghana can also be divided into three groups with distinct characteristics. The northern sector, middle belt and the southern sector. Bicycles are more predominant in the northern sector, and extensively used as personal transport. (Researcher, Building and Roads Research Institute, male, mid-60s, interviewed 27-5-2014, Kumasi)*

> *Another emerging trend in the North is the use of motorised three wheelers as passenger transport. They are common in Tamale, Wa Bolga and Bawku areas. They fill the gap in transport supply, carrying up to about 15 passengers exclusively, sitting on benches or about 5 passengers sitting on their goods. The three wheelers are often operated by unlicensed individuals, posing safety risks to the occupants and other road users. Their operation needs serious regulation. Their safety concern is so bad that a whole ward at the Tamale teaching hospital is dedicated to motorcycle and three wheeler casualties. The motorcycle problem is lack of compliance with helmet use. Especially in the North where the temperatures are normally high, making the helmets uncomfortable to wear, even by those who have it (Professor, Kwame Nkrumah University of Science and Technology, male, mid-40s, interviewed 27-5-2014 in Kumasi).*

The discussions sometimes revealed interesting information on a particular topic but that was not explicitly tied to road safety or pollution-induced health impacts. For example the quote below from an interview in Ghana provided interesting insight.

[5] Sources are not directly named but general characteristics from quoted interviewees are presented to provide further context for the perspective offered.

In conflict areas like Bawku in the North, motorcycles are used for assaults. The motorcycle is banned for men in the Bawku area (Engineer, National Department of Feeder Roads, male, mid-40s, interviewed 3-6-2014, Accra).

All of the information gathered in the interviews contributed context for understanding the overall rural transport health and safety issues and, ultimately, contributed to the formulation of proposed research. The results of the interviews are summarised in the following sections. Specific points raised in the interviews are presented in tables organised by subject matter and the country in which the input was obtained is given – elsewhere general summaries of the interviews and ensuing discussions are offered. Where specific points from the interviews are presented, they are taken from the interview transcripts and reflect as closely as possible the ideas as expressed by the interviewees.

Among the key findings from the exploratory literature review were the myriad issues surrounding the use of motorcycles, both for personal transport and as for-hire services. Table 3 presents sample motorcycle-related points raised during the interviews.

Table 3. Selected Excerpts from Safety Dialogue Interviews – Motorcycles.

	Comments/Observations/Issues
Ethiopia	Motorcycles: very common transport means near the border areas. Almost all motorcycles in this area are imported to the country illegally. More than 8,000 motorcycles in Borena zone (border with Kenya). Very dangerous driving behaviors, unlicensed and untrained drivers.
	Motor-cycles: common and considered unsafe modes for transport services, considered safety threat because most motorcycle crashes can be fatal very easily.
	Motorcycles are not very common in rural areas yet and mainly being used as personal purposes. At times used as emergency transport service to health care access.
	Motorcycles: driver behavior is an issue (no helmet use, unlicensed, untrained, often over speed). For example in Region 1 (Kilil 1), there are more than 3,000 motorcycles without plate in the rural areas.
	Motorcycles are not common transportation means yet since the road condition (unpaved surface) in most rural areas is not inviting. In places where they manage to operate, they are not a safe transport means. In some areas they are being used by employees of Ministry of Health and/or other health care providers to reach rural areas to provide vaccination and/or other HIV/health related services. This by itself is creating safety issues since the motorcycle drivers are not trained or licensed. Also, there is almost no helmet use.
Ghana	In Northern Ghana the usage of 2 and 3-wheelers is very high, about 50-60%. The 3-wheelers are slow and the speed variability between variability between them and motor vehicles leads to safety concerns.
	In the rural areas motorcycles are used as private modes, and are more readily affordable for rural folks. Also in remote villages not accessible by motor transport, the motorcycle comes in handy. They maneuver along footpaths and are even used to transport the sick. It is useful in addressing the mobility needs of the rural folks and should be encouraged. The only problem is the non-compliance with helmet use, and that many of the motorcycles are not licensed.
	Generally motorcycle safety is more of an urban problem. The cycles rather provide accessibility in the villages. So for now they are a welcome mode in the villages, but helmet compliance must be addressed
Kenya	The biggest threat to rural transport safety in Kenya today is motorcycle operation and management.
	Motorcycles are the greatest safety issue in rural transport. More than half of hospital bed occupancy in rural district hospitals is motorcycle crash victims.
	The riders are not well trained. Most of the riders get their licenses through corrupt means without passing the riding test. Most people who initially owned bicycles end up buying motorcycles. Further, they end up operating the motorcycles with the same skills used for bicycles.
	People riding motorbikes do not use safety equipment comprising reflective jackets and helmets.
	It is recommended that use of motorcycle in public transport services should be done via associations or an organization who takes an overall responsibility for driver training and skills acquisition.
	Motorcycles particularly overload both passengers and goods. Matatus and taxis alike overload. A combination of overloaded vehicle or motorcycle and speeding always ends up in a crash. This scenario is common in rural transport.
	Motorcycle drivers and public vehicle drivers are inadequately trained. The drivers do not attend driving schools; however, they end up getting driving licenses through "backdoor" means. Majority of victims in this category are motorcycle drivers and passengers.
	Most motorcycle riders are inexperienced, young and aggressive on the road.
	Removal of import duty on motorcycles in addition to cheap supply from China has lowered the market price of the motorcycle, hence many young people are able to purchase them.

The two issues that seem to dominate Table 3 are the lack of training/regulation of motorcycle riders and the lack of helmet use. Some of the comments in Table 3 and, indeed, the tone of many discussions reflected the positive aspects of the relatively affordable and flexible mobility offered by motorcycles. The tone sometimes, however, was one of resignation (or inevitability) of motorcycles remaining an important rural transport mode, especially in remote areas.

The interviewees were asked to identify what they deemed to be issues worthy of future research. With regard to motorcycles the suggestions echoed the larger discussion themes. For example,

the issue of helmet usage (barriers towards, means of increasing, etc.) was identified as a potential research topic. Other suggestions echoed the sense that motorcycles will continue to be an important means of rural accessibility and proposed themes to better understand their overall impact:

> *How to mitigate the negative effects of the motorcycle as a rural transport mode while encouraging it as an alternative mode for rural transport (Engineer, National Department of Feeder Roads, male, mid-50s, interviewed 3-6-2014, Accra).*

> *Study motorcycles as a source of income and affordable transport services to the rural communities in Kenya (civil engineering professor, University of Nairobi, male, early-60's, interviewed 3-6-2014, Nairobi).*

In some cases, the recommendations were more along the lines of policy needs rather than research statements:

> *Unemployment in the rural community forces the young high school graduates to resort to motorcycle as an immediate employment in public transport. Job opportunities should be created to absorb high school graduates to contain the rate of growth of motorcycle in public transport (Chief Inspector, Traffic Police, male, mid-40s, 13-6-2014, Nairobi).*

Other recommendations tended more towards safety management topics such as assessing the financial impacts (e.g., hospital fees, productivity losses, net worth estimates of injuries and fatalities) associated with motorcycle crashes. It was noted that such detail is needed to fully appreciate the true benefit (accessibility) versus costs (including financial impacts of crashes) of rural motorcycle transport.

The exploratory literature review (and general professional opinion) identified safety issues related to rural transport services (i.e., buses and minibuses) as a major concern in SSA. The majority of the discussions around transport services focused on the lack thereof. Statements such as the ones below were typical.

> *Since the roads are bad they are not attractive to vehicular transport. But the provision of roads should be equaled with the availability of modes as a policy issue (Researcher, Building and Roads Research Institute, male, mid-60s, interviewed 27-5-2014, Kumasi).*

> *There needs to be a policy able to integrate the works of the infrastructure provider and the transport service provider. Providing access without ensuring the transport service isn't much different than not having the access itself (Executive Director, NGO, male, early 60s, interviewed 6-6-2014 in Addis Ababa).*

In fact, the lack of adequate transport services was cited as a primary reason for the rise in the motorcycle population (along with the ability of motorcycles to access remote areas) and its use as a taxi and even for medium to long distance rural trips in lieu of minibuses. The discussions however, yielded some interesting insight into the specific safety issues related to rural transport services. Some of the key points are transcribed in Table 4.

Table 4. Selected comments from Safety Dialogue Interviews – Transport Services.

	Comments/Observations/Issues
Ethiopia	Most rural areas have roads (most of them all weather) but the big issue is there are no transport services. Vehicular services are limited and sometimes available only during market day service providers. Because of low demand, it is not cost effective for public transport providers to provide proper service.
	There needs to be a working policy to assure the availability of transport services once the roads are open to public.
	Mini-buses and Mid-buses: speeding, mainly driving overnight under influence (alcohol, chat, coke/coffee mix) with overloaded passengers and/or goods to avoid being caught by police enforcement officers
	Existence of rural road access by itself doesn't connect villages or doesn't solve the lack of rural transport issue faced by the people on a daily bases. Even with the presence of road access, people still don't have a safe transport means to access health care services and markets. This in fact has created unsafe condition whereby passengers are being forced to be transported on the mini-buses and small trucks that come to pick up goods after opening of the road. This negative effect in part is the result of the lack of transport policy in the country. There is no policy at the country level let alone at rural level. This is a huge problem.
	There is low demand in rural areas, most roads are bad, and therefore don't attract regular motorized service providers. Mixing goods and passengers is normal.
Ghana	The main safety concern on rural roads is goods vehicles being used to convey passengers. People sit on top of goods and travel on bad roads. So in the event of a crash, they are thrown out and is a very unsafe way of traveling.
	For the lack of transport, people are compelled to accept unsafe transport modes.
	Non-availability of transport modes. Limitation in the modes results in captive usage and unacceptable travel behaviors like riding on the roof of vehicles, and on top of goods, which otherwise should be considered dangerous behavior.
	The lack of vehicles causes people to wait for long hours to travel. From Brong-Ahafo to the North the 3-wheeler is fast becoming the mode that fits in the gap, because they are more readily affordable. But these modes are not safe. They have high casualty rates. Some carry goods and the passengers sit on the goods unsafely
	Goods vehicles are transporting passengers and this poses safety problems.
	Lack of organised rural transport affects productivity as the women are limited by what they can carry to market centers for sale.
	Goods vehicles are used in all regions of the country to transport where people sit on goods in unsafe manners on bad roads.
Kenya	There are no organised public transport companies in the rural communities. Public transport services are provided by individual vehicle owners who do not follow any rules or regulations.
	Overloading is the main issue in safety of buses and minibuses. Driver behavior and non compliance to safety rules and regulations worsens the safety situation for this category. Majority of victims ends up being passengers.

When it comes to accessibility issues, providing access doesn't solve the problem. The access needs to be followed by a reliable and safe transportation service. The government should try to facilitate the transportation means at least at the beginning so that private transport providers can start serving the rural areas. This can be done by making it easier to access credit purchase for new owners, or through some form of tax incentives or

subsidization to current transport providers. (General manager, private consultancy, male, early 60s, interviewed 9-6-2014, Addis Ababa).

Table 4 indicates that the lack of dedicated passenger transport services encourages the unsafe haulage of passengers along with goods movements results in very unsafe travelling conditions. One interviewee in Ethiopia offered the following insight:

Mini-buses and Small trucks are very common during market days. They penetrate through the remote rural areas to access crash crop areas. Crops, Chat, Leather products and coffee are commonly transported to the nearest big town or market. The most dangerous drivers are the ones engaged in Chat delivery. Chat consumption has increased immensely in all major cities of Ethiopia. These drivers of Mini-buses and Small trucks drive overnight to deliver fresh Chat to the cities by early morning. They are the main causes of accidents at night. They over speed and they drive intoxicated. They load passengers on top of their goods (often over load) since for the passengers it is the only means of transportation service (Executive Director, NGO, male, early 60s, interviewed 6-6-2014 in Addis Ababa).

The other key safety issues focused on the risky behaviour of transport service drivers and the lack of education, training, regulation, and effective enforcement that contributes to these conditions.

There was consensus among the interviewees that driver behaviour (all vehicle types) and other risky behaviours (e.g., unsafe actions by vulnerable road users) significantly contributing to crashes can be positively impacted by education and training. Table 5 illustrates some of the key issues raised during the interviews.

Table 5. Selected comments from Safety Dialogue Interviews – Behaviour, Education and Training.

	Comments/Observations/Issues
Ethiopia	There is a need for a policy to enforce licensing and training to drives of any of the modes. In most cases either there is no policy or if there is, it is not fully enforced.
	More effort on driver skill development is needed. For example, setting up minimum driving age or minimum training level is necessary
	A research to create safety awareness is needed. For many people, car accident is accepted as destiny or something not preventable and not very important as well. No government agency, NGO, transport service providers, or even the users believe that something can be done to reduce the current state of traffic accidents in the country. It is extremely difficult t to convince official budget for safety works.
	Main threat is risky driving behaviors by all modes.
	Pedestrians: often walk in the wrong direction (supposed to walk against vehicular directions)
	Risky driving behavior – it is all about maximizing profit, drivers are not afraid of doing anything unlawful.
	Risky driving behavior is an issue in both rural and urban areas. Speeding, driving intoxicated and overloading passengers at night are all safety risks associated and result of the insufficient rural transport service
	Drivers do not follow speed limits, they over load and over speed to maximize profit. Almost all drivers drive under influence. Chat is the main drug they consume.
	They drive intoxicated, they over load and over speed. Ministry of Transport has started enforcement to put a brake on night driving. But users have complained considering this recommendation is reducing their transportation accessibility. Speeding problem need enforcement.
Ghana	Human capacity development as a road safety measure- About 80% of drivers are illiterates and majority of motor riders are unlicensed
	Education for pedestrians and motor-cyclists is key to safety
	Pedestrians are not too vulnerable but children walk along the road to school and that can be unsafe, but casualties are not common
Kenya	Safety is extremely affected by road user knowledge and skill. This particularly applies to motorcycles and to some extent mini buses and matatus. Motorcycles have been widely accepted for public transport in most rural communities in Kenya. The service is offered by private individuals who own the motorcycles. There are no schools to train drivers in the rural community. Drivers begin operating motor cycles and mini buses with insufficient knowledge and skills. As a result, the interaction between the road and the road users is extremely compromised.
	In addition, pedestrian in the rural community have limited knowledge and skill to cross the road. Highly affected primary school pupils who have to cross the road at least twice every day.
	Inadequate road user knowledge also limits the drivers' ability to read and interpret traffic signs and devices correctly. Moreover, failure to use seat belts can also be attributed to limited road user knowledge and appreciation of the safety benefits of seat belts.
	Drivers operating public transport vehicles are young, aggressive and reckless – specially, motorcycles and matatus.
	Driver behavior poses the biggest threat to rural transport safety. Most drivers do not obey traffic rules. As a result, there are cases of over-speeding, careless driving, drunken driving (driving under influence), lack of concern for pedestrians etc. This applies to all vehicle categories. Victim categories mostly at risk are passengers and not pedestrians.
	Inadequate deployment of professionals in the rural community comprising transportation engineers and medical personnel.
	There is a serious lack of sensitization and road user knowledge and skills. Noncompliance to traffic rules and regulations also contributes to accidents. Driver behave with impunity and the there is too much corruption on the enforcement end.
	Road condition hardly contributes to accidents in rural areas. This accounts for less than 15% of accidents in rural roads. Vehicle condition and poorly maintained vehicles pose greater threat to rural transport safety. This is further worsened by lack of driver knowledge on vehicle condition.

Police investigations have also shown that drivers are inadequately trained. Driving schools are owned and operated by the private sector whose main objective is to maximise profit without much concern about the quality of training offered. As a result, these drivers do not appreciate the need to obey traffic rules; they do not understand traffic signs their focus is to maximise the number of round-trips made per business day (civil engineering professor, University of Nairobi, male, mid-60's, interviewed 3-6-2014, Nairobi).

There is a need to develop a curriculum for training of public transport drivers. Currently, drivers are trained by private institutions that use different curriculum and are more profit oriented that with no focus on the quality of training being offered (Chief Inspector, Traffic Police, male, mid-40s, 13-6-2014, Nairobi).

There is a need to train police officers on crash management, for example: response, first aid, trauma management, accident scene management (Chief Inspector of Police, Traffic Police Department, male, mid-50s, 13-6-2014, Nairobi).

Additionally, poor mechanical and generally unsafe conditions of many rural transport services vehicles were regularly cited as contributing to crashes, injuries, and fatalities. And although there is some potential for education to positively impact vehicle operating conditions, it was widely agreed that improving this issue was a matter of regulation and enforcement. A range of selected input on vehicle-related issues are summarised Table 6.

Table 6. Selected comments from Safety Dialogue Interviews – Vehicle Issues.

	Comments/Observations/Issues
Ethiopia	Most mini-buses, mid-buses, and small trucks driven in the rural areas are very old (mostly ones that have been used in bigger towns and cities and their service life has come to an end). They are easy to breakdown on the road, and overturn and run off the road because of poor operating condition. So, risky driver behavior added with poorly operating vehicles is a huge safety issue in the under-served rural areas.
Ghana	Vehicles in the remote areas are nothing but junks that are not road worthy. Some are even without headlights and pose dangers at night.
	Vehicular injuries to both children and adults, because vehicles are old and lack maintenance, leading to breakdowns and injuries
Kenya	Most vehicles used for rural transport are un-road worthy and in poor condition. The vehicles are not regularly maintained and are mostly driven until total collapse. This applies to all vehicle categories. A number of crashes are attributed to vehicle-brake failures, gear failures etc. Some vehicles are operated without rear view mirrors hence inability to interact with other drivers on the road.
	Motorcycles and public service vehicles in rural communities are hardly in good condition. Enforcement officers are more reluctant in the rural communities and standards are assumed to be compromised. As a result, all vehicles and motorcycles that cannot be used in the urban centers end up in the rural communities.
	More than 50% of buses and minibuses operating in the rural community are un-roadworthy. Corruption of law enforcement officers applies to all vehicle categories and compromises enforcement of the safety requirements.

One of the risky driving behaviors noted was the lack of understanding and compliance of traffic control (and warning) devices. In addition to consensus that there is a lack of sufficient traffic control devices in rural areas, much of the discussion on control again turned to driver behaviour

and the need for education and training. The issue of effective enforcement was also raised consistently. Some selected interview excerpts related to enforcement are presented in Table 7.

Table 7. Selected comments from Safety Dialogue Interviews – Enforcement and Regulation.

	Comments/Observations/Issues
Ethiopia	Enforcement is vital and needs a lot of work.
	Another safety issue from the vehicle operating side is the lack of vehicle inspection.
	Lack of enforcement is most important issue affecting rural transport safety.
Ghana	Villagers build their own un-engineered speed ramps without warning signs and that also pose danger to vehicles.
Kenya	Corruption. Partly is a threat to rural transport safety. As a result, traffic rules are not sufficiently enforced due to compromise of the law enforcement officers.
	Enforcement. To some extent, safety is compromised by weak enforcement of the safety standards. This is attributed to lack of manpower (inadequate police in the rural communities), indiscipline of the law enforcement officers and corruption.
	Fines for breaking traffic rules are low; hence, those arrested can easily pay the fine and continue operating the same manner
	There is no limit as to how many times a driver can break traffic rule before his license is suspended

> Some *rural communities depend extensively on handcarts and donkey carts for transport of goods and various commodities. The conflict between NMT and the MT in the rural areas pose great threat to rural transport safety. A large proportion of these cases go unreported. Failure to report the accidents is due to fear of prosecution extortion by the police. Most of the time, both parties are always on the wrong (Civil engineering professor, University of Nairobi, male, early-60's, interviewed 3-6-2014, Nairobi).*

Although driving behaviours, especially those associated with motorcycles, were consistently cited as primary safety concerns, considerable appreciate of the importance of road conditions was indicated during the various interviews. Some key observations are provided in Table 8.

The discussion on road conditions extended to the presence of dust as a safety hazard to the extent that it reduces visibility and may, in fact, induce unsafe driving behaviours:

> *In case of overtaking particularly for motorcycles, the dust blinds the cyclists increasing the risk of running into oncoming vehicles (Engineer, National Department of Feeder Roads, male, mid-40s, interviewed 3-6-2014, Accra).*

Table 8. Selected comments from Safety Dialogue Interviews – Road Conditions.

	Comments/Observations/Issues
Ethiopia	Lack of proper maintenance is another potential threat
	The main threat is road maintenance. Most rural roads (gravel or earth roads) are susceptible to deteriorations and therefore needing frequent maintenance. It is a main concern because future maintenance is usually not thought of or planned upfront when the roads are opened.
	There is high fatality among the venerable users (mostly pedestrians). Current practice needs to consider the use of frequent speed bumps and pedestrian crossing in high speed roads. There is little less safety awareness from users.
Ghana	Bad roads are a potential threat. For instance non availability of culverts and bridges
	The unpaved roads are not engineered to high standards. When the surface is good there is speeding leading to high accident rates especially in the curves. And there are no road signs to warn drivers of impending hazard on the roads. Even when signs are installed, they will be easily covered with dust.
	When the surface is bad, drivers dodge potholes and that also leads to accidents.
	The roads are bad and with lots of potholes, and pedestrians share the road space with all modes. This poses safety problems to pedestrians (both adults and children), and bicycles as motorists try to dodge potholes.
Kenya	Most rural roads are not engineered to any standard. Over-speeding in roads, which are not designed for high-speed, results in serious crashes. Competition inherent in public service vehicles, due to the desire to make more round-trips and maximise income make the drivers to operate at very high speeds.
	Some roads have very high gradients, are narrow and have sharp bends. The rural accesses particularly very narrow. Cannot allow two vehicles to pass side by side.

Again, the discussions were often quite detailed and many points were not easily broken down into concise, definitive statements. For example, an interviewee in Ghana noted differences in road conditions within the country, but ultimately stressed the important role deficient vehicles and risky driving behaviours:

> *The rural areas can be divided into two groups with distinct characteristics. Those near trunk roads have better roads and see more vehicular traffic. The speeds are high, so pedestrian crashes are fatal. The other group is in the hinterlands and very remote areas, which are often served by feeder roads that are often seasonal and in deplorable states. Since the roads are bad, vehicular traffic is rare and sometimes serve only once or twice a week, and mostly on market days. The vehicles that ply such roads are often very old and dilapidated, and often operate with impunity because of the scarcity. There are no operational standards (Researcher, Building and Roads Research Institute, male, mid-30s, interviewed 27-5-2014, Kumasi).*

Several of the interviewees were sensitive to the need for improving the collection, management, and analysis of safety-related data and its importance as a foundation for evidenced-based safety studies and, ultimately, effective safety management systems. Selected comments related to the safety data and analyses are presented in Table 9.

Table 9. Selected comments from Safety Dialogue Interviews – Data and Analysis Techniques.

	Comments/Observations/Issues
Ethiopia	Research on safety outcomes after some safety solutions are implemented may help to create awareness and guarantee future funding.
	Quality of data is at the hands of the on-site police officer. Not all data transmitted from the regional offices is accepted by the federal office. At times they have to screen for errors and re-investigate some of the information. Therefore, data quality is an issue. It is also believed that some crashes go unreported, especially in further rural areas and in villages.
	Although all crash data is submitted to federal office, crash information on IMTs (Intermediate Means of Transport) or other transport services (motorcycle, three-wheelers such as Bajaj) are not usually maintained at the federal level. It is passed down to regional offices.
	Data availability/quality is an issue because no government body knows the correct number of vehicle or other modes.
	Data availability and information sharing are serious issues and need attention. There is almost no data.
Ghana	Data is an issue as secondary data is hardly available. Hospitals may report, but there is no coordination between hospitals and the police
	Traditional methods for black spot identification cannot work for rural areas, because of the exceptionally low volumes.
Kenya	There is no crash data in the rural communities. So many cases of accident go unreported to the police. In some cases, the police deliberately fail to take records of incidents. Insufficient data on rural transport is a threat to rural transport due to lack of sufficient information to inform decision.
	A number of factors that cause road accidents in rural communities have been identified; however, no study has been done to identify the most critical factor and the proportions that each factor contributes to the total number of crashes.

The overwhelming consensus among the interviewees was the lack of crash and related injury data in rural areas. Even the interviewees who are actively engaged in safety research and regularly access crash data intimated that the rural safety data was unreliable due to general underreporting or a lack of confidence in the accuracy of what is being reported from rural areas.

> *Data availability is very limited and it affects the validity of any recommended solutions. Besides, the common practice related to transportation issues is to identify the problem and then propose the solution. However, there needs to be a diagnosis effort in between to identify the cause of the problem before proposing and implementing any solution. This process itself needs more data (General Manager, private consultancy, male, early 60s, interviewed 9-6-2014, Addis Ababa).*

Finally, a number of other issues were raised in the interviews that did not fall neatly into any of the previous categories. Nonetheless, the insight into the issues provided by the interviewees rounded out the overall context of the complexity of rural transport safety. A listing of these miscellaneous issues is presented in Table 10.

Table 10. Selected comments from Safety Dialogue Interviews – Miscellaneous.

	Comments/Observations/Issues
Ethiopia	Small motorised three-wheelers (bajaj): unlicensed drivers, over speeding. Bajaj are very popular in all rural areas expect in some parts of the north where the terrain is hilly.
	Small trucks: same issues as above and carrying passengers on top of an over loaded goods in an open truck. They are not intended for people so they are risky.
	Animal drawn carts and animal backs: they are not seen by motorised drivers at night. The council has recommended the use of reflective materials on carts.
	The infrastructure providers which are regions and local districts (Weredas) are regulated by the Federal Ethiopian Roads Authority (ERA). All they do is provide the main infrastructure often times with no proper signs and markings. In this region, when signs and guideposts are damaged due to accident, ERA does not make effort to replace them.
	In places where IMTs are common, speed is not major cause of traffic accidents. Therefore, IMTs are viable transportation means in the very rural areas.
	In the absence of alternative transport means, the rural people are forced to accept any form of transportation, including being loaded on top of goods.
	It is believed that the lack of access and transportation service is more critical than the negative outcomes associated with the rural roads. And it is believed that traffic safety issues are relatively less in rural areas than urban areas.
	Bicycles are not common and not considered major safety issue.
	Traffic safety is something that has not received enough attention from officials yet. Rural safety is even more neglected. This office needs help from outsiders or insiders that have potential to be heard.
	Horse and donkey drawn carts are common inside the Kebeles (or the rural villages). Relatively, they are believed to be environmentally safe since they generate less dust. Also, they travel at low speed. They pose a major safety threat when they share the high-speed asphalt roads with vehicular traffic passing though cities.
Ghana	Roadside markets along highways are worrisome as some of the markets are located in curves and junctions with inadequate sight distances.
	Water transport is also a vital means for rural transport along the Volta River. This also has been very unsafe and boats have been capsizing every now and then.
	Bicycles, where they are in numbers they are safe. When numbers begin to reduce, i.e. outside the city. it becomes unsafe. The main safety concern for bicycles is the lack of infrastructure to accommodate them on the roads.
Kenya	Difficulties when crossing rivers.
	Insecurity for women and girls especially at night.
	Transport planning should focus more on most widely used modes in the rural namely; bicycles, walking, motor cycles, carts.
	Lack of involving the communities in provision of transport needs.
	Improved road materials for low volume, especially unpaved, roads in rural areas are needed.

As the interviews were semi-structured, the interviewers allowed (and encouraged) discussions to go beyond the points covered in the guides. Discussions often turned to policy level topics and provided interviewees the opportunity to describe "big picture" issues that from their professional perspective was related to the main health and safety topics of interest. A number of participants noted that transport provision in rural areas is typically a much lower priority than in urban areas. Reasons for this were noted as the simply limited available funding, rapid urbanisation garnering more attention and funding from the international community and, even, the fact that urban politicians often have more interests/influence in setting national policies and programmes.

At other times the discussion were more technical and addressed the need to more thoughtfully provide for adequate rural transport from a planning and engineering perspective. Examples of this line of discussion include calls to modify design policies and standards to explicitly address non-motorised modes in rural areas. Several statements indicated a need to re-orientate the design process to focus more on providing access (one interviewee particularly stressed residential access) rather than focusing on providing a set of standard roadway facilities and networks. The discussions even addressed the importance of water-based transport in parts of rural SSA.

> *Water transport is also a vital means for rural transport along the Volta River. This also has been very unsafe and boats have been capsizing every now and then. Even yesterday four lives were lost crossing the river (Director and transport planner, Private Consultancy, male, mid-40s, interviewed 11-6-2014 in Accra).*

Perhaps the complexity of the rural safety issue was best expressed as follows:

> *Although it is difficult to single out a root cause for most of the above, it is obvious that combination of lack of transport service, proper enforcement and regulation are major issues. Passengers will take any form of transport service because they don't have alternatives. Drivers will try to maximize their benefit by over loading and shortening travel time (speeding) knowing that the rural people don't have enough transport service. Drivers know they won't be caught by traffic police officers if they drive during night. So it is a complex issue. This issue may be solved (or at least reduced) with a working policy and proper enforcement of rules and regulations and provision of transport service (Executive Director, NGO, male, early 60s, interviewed 6-6-2014 in Addis Ababa).*

5.2 Pollution-oriented Interviews

The interviews and discussion on air pollution were quite interesting. Again, the interviews reflected the understanding and emphasis found in the literature with regard to rural air pollution as an issue. All of the interviewees that represented environmental or public health agencies were quick to concur that rural air pollution and its health impacts were poorly understood and research was needed. Nonetheless, the discussion were lively and the input thoughtful. For example, the following statements illustrate some of the issues associated with air pollution monitoring:

> *Rural vehicle emissions are quite minimal and so has not been a target. The focus has been in the urban centers. Even that the monitoring has only been done in Accra so far. Measurement of emissions in Accra uses an external probe that is inserted in the exhaust pipe. That suffers interference from other vehicles. Hence measurement along trunk roads can be more reliable, and the EPA has the capacity for such measurements. EPA now has 14 monitoring stations in Accra and plans are to expand this to Kumasi and Takoradi as*

these towns together account for about 70% of all vehicles in the country (Programme Officer, Ghana Environmental Protection Agency, female, mid-40s, interviewed 3-6-2014, Accra).

Setting national vehicle emission standard is under process but even that standard may not include anything specific for the rural setting, which has a different dynamics than urban (environmental expert, Ethiopian Ministry of Environment and Forestry, male, early 30s, 9-6-2014, Addis Ababa).

This office is not aware of any effort or practice that has tried to link respiratory patients in rural areas with dust exposure – where they live, how they travel, or what type of road they travel (director, Ethiopian Ministry of Health, male, early 40s, interviewed 11-6-2014, Addis Ababa).

The government is currently working to furnish road access and connect all rural areas under the Universal Rural Road Access Program (URRAP). Under this program, more emphasis is given to provide access without considering associated safety factors and environmental concerns. For instance dust pollution is an issue, which is the result of the type of road surface being selected. When new route is being selected, most of the effort is to do it at the minimum cost. This could result in more deforestation, unsafe vertical grades, sharp and unsafe horizontal curves, and insufficient or improper drainage system (General manager, private consultancy, male, early 60s, interviewed 9-6-2014, Addis Ababa).

Another quote from an interview in Kenya suggests a thorough understanding of the potential issues surrounding rural air pollution and precisely what is at stake by continuing to leave them unaddressed:

Most primary schools in the rural communities are located by the road sides. Since most rural roads are either earth road or gravel roads, school pupils are exposed to dust from the roads. These are indicated by reported cases of school children missing school days due to respiratory infections. Study can be done by comparing cases of pupil absenteeism in schools along the roadside to schools far from roadsides. This study has never been done (Civil engineering professor/public health expert, University of Nairobi, male, late-50's, interviewed 6-6-2014, Nairobi).

Other points raised in the pollution-related interviews include those listed in Table 11.

Table 11. Miscellaneous comments from Air Pollution and Health Dialogue Interviews.

	Comments/Observations/Issues
Ethiopia	Most vehicles are very old and release high levels of emission. There needs to be a strict standard and enforcement to monitor vehicles with poor operating standard.
	All transport modes driven on unpaved road generate dust, which is a major health threat to the drivers, passengers, pedestrians, as well as people living adjust to the roadside. It is also a threat to agricultural products near by the roads. Relatively, animal drawn carts and animal generate less dust.
	Another form of dust is one generated during road construction in rural areas. This form of dust could be minimised by sprinkling water on the construction site. However, this isn't practiced by contractors and not strictly regulated by the responsible officials. Dust and rock (stone) crushers are a serious issue affecting the rural air quality.
	Nearby water sources are polluted due to the dust. For most people, those water bodies are the source of drinking water, cleaning water, animal.
	All roads, including those in URRAP program (which all are rural unpaved roads), have an Engineering Impact Analyses (EIA) study done. However, once the roads are open to public, there is no form of standard or plan or any follow up to assess the extent of any impact the road has (economic, social, environmental…). Provision of the access is a priority but the associated negative impacts are the least priority.
	Although dust is a major issue in the rural areas, there is no known study done or no attention given to the overall effects of dust on the environment, health, nearby agriculture, water bodies…
	Dust is definitely a health risk in the rural areas.
	There is most likely no data or information on the extent of the impact or damage road dust is causing to individuals or the environment.
	There needs to be a standard to be able to monitor pollution level. But there is no national standard (and none for rural). Setting national vehicle emission standard is currently under process but even that standard may not include anything specific for the rural setting which has a different dynamics than urban.
	Health impacts to individuals living and working in the roadside environment exposed to pollutants should be highest priority followed by Health impacts to road users and the those traveling in vehicles (i.e., buses and minibus) exposed to pollutants
	Health impacts to road users (pedestrians, cyclists, motorcyclists, hawkers, etc.) exposed to pollutants. This is obvious and does not warrant research. Health impacts to individuals living and working in the roadside environment exposed to pollutants should be top priority. This can be an interesting research and the outcomes can support to develop new policy. Damage to nearby agriculture ranked second.
	There is a need for regulatory body to ascertain the regulation and enforcement of rules and policy requirements. For example, if Ministry of Environment is the policy maker, there needs to be another body of government agency or a third party to control, regulate, and enforce the policy. They policy maker and the regulatory body should not be the same agency.
Ghana	The vehicles in the rural areas are very dilapidated and dust even leaks into the vehicles. The vehicles themselves pose a health risk.
	Vegetation dampens emission in the villages.
	The level of attributions of respiratory conditions that can be linked to dust
	How much productivity is lost due to ill-health from poor roads and how much can be prevented by improving roads
	Identify and classify types of ill health suffered in rural areas
	So use household surveys to triangulate any secondary data available from the hospitals.
Kenya	There is a need to study the impact of dust pollution on vegetation and agricultural products. This will vary depending on region climate, soil type and traffic volume.
	Dust from rural roads is an issue of design and construction materials.
	The health impacts to road users are most important air pollution issue.
	Construction activities emitting dust/particulate matter without mitigation measures
	Data needs in order of decreasing priority – Measurement and chemical speciation of traffic dust generated; Health impacts to individuals living and working in the roadside environment exposed to pollutants; Health impacts to road users exposed to pollutants; Health impacts to individuals travelling in vehicles exposed to pollutants.
	Environmental awareness creation; public/multistakeholder participation models; addressing poverty and the related incentives to conserve environment; funding sustainability for related programmes.

Hospital records may be under reported because many illnesses do not end up in hospitals, as people often resort to unorthodox herbal treatments (Physician, Ghana Health Service, female, mid-50s, interviewed 11-6-2014 in Accra).

Because dust is not in the mainstream routine data collected by the health service. Hence information on dust pollution can only be obtained through new surveys and studies (Professor, University of Ghana, male, mid-50s, interviewed 11-6-2014 in Accra).

Still, as evidenced previously, there was a resignation conveyed by several interviewees that the benefits of the mobility and accessibility offered by rural roads and transport far outweighs the negative externalities of air pollution exposure. One interviewee observed:

Talking about dust and emissions is like a storm in a teakettle. There are bigger issues.

5.3 Healthcare Access Interviews

Public health and medical officials were interviewed in all three study countries. A summary of some of the key points raised during those discussions are set out in Table 12.

Table 12. Miscellaneous comments from Healthcare Dialogue Interviews.

	Comments/Observations/Issues
Ethiopia	Access to emergency medical service is still a serious issue. Most people don't have either a nearby health care station or they don't have safe transport means to get to one.
	Sick people and pregnant women are transported in the most risky travel condition which leads to secondary health problems. At times, the road condition is very bad and cause too much vibration when traveling by any mode. E.g. there are many Fistula patients that prefer to not travel and seek medical help because of the poor transport service or completely lack of service.
Ghana	Transport is key to healthcare, for the transport of the injured and the sick. Often times in the cause of accidents there is limited access to healthcare and this can increase the death tolls or complications.
	Maternal deaths are still high in rural areas for lack of fast access to health facilities.
	Motorcycles are very vital in rural transport. In many rural communities the sick and injured are carried on foot. Bicycles make it better and motorcycles become extremely beneficial in such cases.
	If communities can be equipped on how to give first aid, that could save lives due to the poor accessibility to health posts.
	The top 10 outpatient diseases has malaria as number 1, then acute respiratory diseases (common cold, bronchitis, etc., some may progress into Asthma.
	Data is an issue as secondary data is hardly available. Hospitals may report, but there is no coordination between hospitals and the police.
Kenya	Medical emergency cases do not get immediate medical attention due to inaccessible roads or lack of transport service. For example, women in labour might fail to reach a medical facility in time, which causes complications during birth and may negatively affect the health of both the mother and the baby. In some cases, either the baby or the mother or both die upon delivery. Another example is the case of snakebites. People living in the rural communities are exposed to snakes. Cases have been reported people dying from snakebites because they could not access a medical facility in time enough to save their lives.

The ministry is trying to increase health care accessibility by increasing the number of health care stations in rural areas. The ministry is also trying to assign ambulance in each

Woredas. Without ambulance, most rural patients are transported by stretcher (director, Ethiopian Ministry of Health, male, early 40s, interviewed 11-6-2014, Addis Ababa).

5.4 Stated Research Needs

During the discussion, interviewees were given the opportunity to explicitly identify what they see as pressing research (and to some extent policy) needs. A list of transcribed statements of research needs is presented below – they are organised into general areas but intentionally not presented in any particular order to better convey the complexity and range of input provided.

5.4.1 Road Safety Research Needs

- Develop transport planning methods for most widely used modes in the rural namely; bicycles, walking, motor cycles, carts.
- Study on models for predicting travel behavior on rural communities.
- Study on transport of goods and passengers in rural communities.
- Innovative ways to sensitise road users and drivers on safety regulations and rules.
- Develop a curriculum and standard for training rural drivers, which should be adopted by all driving schools and enforced. Currently, training of drivers is being done by the private sector and each driving school has their own curriculums which are inconsistent.
- Develop guideline and standards for use of MC for public transport. For example, minimum age, driving experience, minimum safety equipment, etc.
- Pros and cons of motorcycles in public transport and sustainability of motorcycle as an alternative mode for public transport.
- Focus on road geometry.
- There is a need to develop a curriculum for the training of public transport drivers. Currently, drivers are trained by private institutions that use different curriculum and are more profit oriented that have no focus on the quality of training being offered.
- Develop an integrated accident data management system. This can be used to analyze and compare accident data for the whole nation.
- Lack of government regulation of public transport services.
- Lack of policy on safety programs and implementation strategies.
- Develop a guideline for rural incident management and crash data collection and investigation.
- Study compliance to traffic rules with the objective to recommend innovative ways of reducing non-compliance. A study to clearly define and quantify rural road safety indicators to inform decision-making.
- Study to develop a guideline for rural transport safety management program and implementation strategy.

- Study incident/crash management, handling and investigation on rural roads to identify the missing links in crash management and recommend options for crash management strategies.
- A study to develop a guideline for public transport services in the rural communities.
- The advantages and disadvantages of by-passing towns as a speed management strategy.
- Addressing the issue of speed ramps as a speed management strategy on trunk roads that pass through settlements. Arguments for and against
- How to motivate enforcement by authorities and compliance among road users.
- Roadside maintenance and vegetation control
- Investigate appropriate speed calming methods applicable to rural roads.
- Prepare design guides for rural roads. Investigate how to keep road signs legible on dusty roads.
- Develop a rural transport safety program and implementation guidelines.
- Study safety needs of vulnerable rural road users: children, women,, and elderly.
- A number of factors that cause road accidents in rural communities have been identified; however, no study has been done to identify the most critical factor and the proportions that each factor contributes to the total number of crashes.
- The effect of road maintenance on safety.
- Lack of enforcement for motorised tricycles operating in without licenses.
- Long walks to school (children), farm and other services generally make pedestrians more exposed to the risk.
- Settlements along trunk roads have better roads, but experience high speeds as drivers disobey speed limits. The result of settlements along trunk roads is that there is high pedestrian activities along the roads, leading to high pedestrian casualties
- Most rural areas are served by feeder roads, which are often narrow, bad and seasonal
- Some of the rural areas are very remote and see a vehicle only once or twice in a week.

5.4.2 Air Pollution Research Needs

- There needs to be a standard to be able to monitor pollution level. But there is no national standard (and none for rural).
- Dust nuisance. Find how it can be curbed.
- Investigate alternative surfacing materials for rural road wearing course to mitigate dust nuisance.
- Study the impact of vehicle emission related pollution on school children by quantifying vehicle emissions and relating to the reported cases of sick children with respiratory infections in schools along the roadsides. This can be compared to schools far from roadsides.

5.4.3 Healthcare Access Research Needs

- Intervention needed to improve accessibility to health centers. Need for transport services together with infrastructure.
- How much productivity is lost due to ill-health from poor road and how much can be prevented by improving roads?

5.4.4 General Rural Transport Research Needs

- A study to develop a guideline for public transport services in the rural communities.
- Non-availability of transport services forces communities to walk.
- Accessibility in most cases improves only on market days when a vehicle comes over (once or twice in a week).
- Inadequate deployment of professionals in the rural community comprising transportation engineers and medical personnel.
- No policy on universal access to all inhabited areas. Some rural areas have no roads but only single wheel paths, which can only be accessed with motorcycles.
- Traffic is a function of economic activities. That is why vehicles go to some of these remote areas only on market days when there is ample demand.
- The roads are seasonal roads and impassable in the rainy season.
- Equity in provision of basic infrastructure is needed to enhance connectivity of transport networks resulting in reduced marginalisation of remote communities.

Interestingly, some of the interviewees provided detailed descriptions of crash reporting procedures, existing safety management practices and actually provided crash data (although data collection and analysis were not within the scope of the project or the interviews).

6. Internet Survey

An internet-based survey was developed to elicit expert input on the rural transport health and safety issues identified in the literature review. The survey questions were specifically aimed at capturing priorities and opinions with regard to potential research needs. A link to the survey was distributed to the AFCAP Community of Practice by email. It was also posted on the AFCAP LinkedIn Group and Twitter feed. The survey contained ten multiple-choice questions that allowed respondents to indicate (and rank) issues they deemed important. Comment fields were provided to allow for optional detailed input not explicitly addressed in the structured question format. A copy of the survey is provided in Appendix B and the results are summarised in the sections below.

Over the course of a two-week period, a total of 58 responses to the survey were received. The first three survey questions were intended to give context for the technical information provided in the survey.

6.1 Questions 1-3 – Respondent Information

In order to gauge the geographic range of expertise provided by the survey, the first question asked respondents to list the SSA countries in which they has professional experience. Figure 6 illustrates the level of geographic diversity of input captured in the survey. The second and third questions allowed respondents to report the type of organisation they represented and their area of specialty. The results of these two questions are summarised in Figure 7 and 8, respectively.

Q1: In what SSA countries do you have professional experience?

Figure 6. Countries in which Internet Survey Respondents Noted Professional Experience

There was a broad range of professionals represented among the Internet survey respondents. The majority indicated that they were affiliated with a governmental agency of some type with researchers/academics and private consultants tied for second. Among those that indicated "Other", four were with an international development agency one identified himself or herself as a "passenger transport service provider."

Q2: Which of the following best describes your professional affiliation?

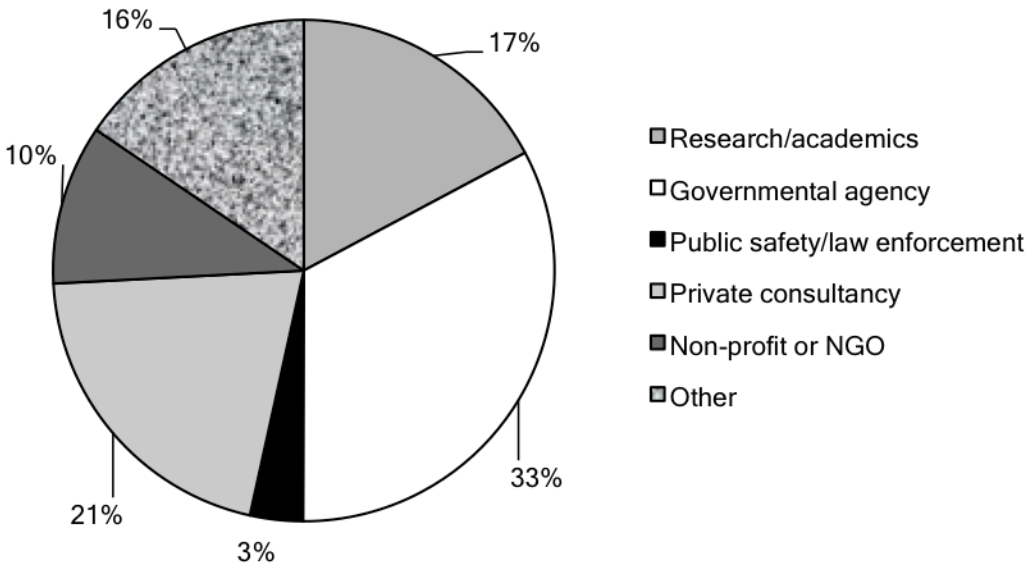

Figure 7. Summary of Professional Affiliation Responses

Most respondents indicated "Other" as their professional specialty and went on to provide detail listing: public transport service provider, policy analysts, public health professionals, transport planners, transport engineers, institutional reform and development specialist, IMT specialist, economists and social scientists.

Q3: Which of the following best describes your professional specialty?

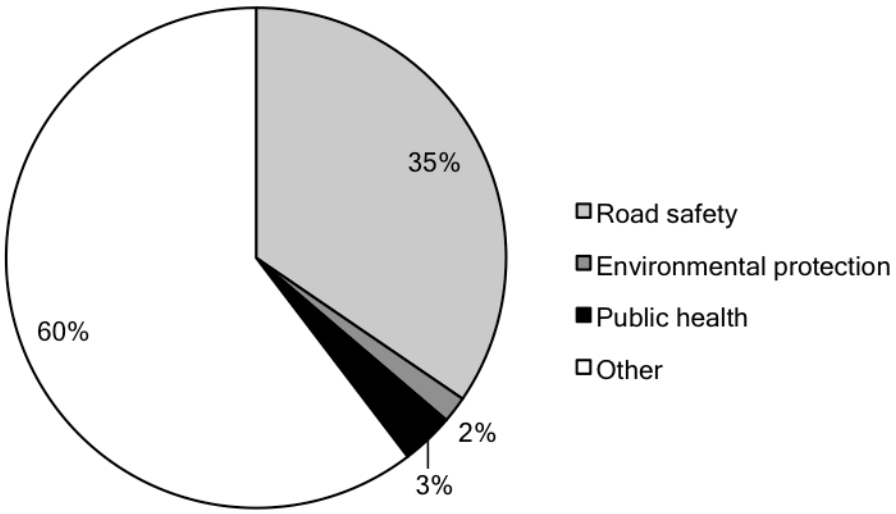

Figure 8. Summary of Professional Specialty Responses

The survey used a series of multiple-choice questions to allow respondents to indicate their opinion regarding the relative importance of various transport health and safety issues. The results of these questions are summarised in Figures 9 through 18.

6.2 Question 4 – Dangerous Transport Modes

The first technical opinion question, Question 4, was aimed at establishing a relative level of perceived dangerousness attributed to three classes of rural road users:

- Vulnerable road users (pedestrians, bicyclists, handcarts, animal carts, etc.)
- Transport services (buses and minibuses)
- Motorcycles (including motorcycle taxis).

Relative dangerousness was expressed as:

- Most dangerous (weight = 5)
- Dangerous (weight = 3)
- Least dangerous (weight = 1)

The raw results for Question 4 are summarised in Figure 9 and the average overall weightings are shown in Table 13. Both indicate that motorcycles are considered to be the biggest threat to rural road safety. The results for vulnerable road users and transport services were quite similar

for the first two categories but more respondents assigned "most dangerous" to vulnerable road users than for transport services.

Q4: In your opinion, which of the following transport modes is the most dangerous in rural Africa?

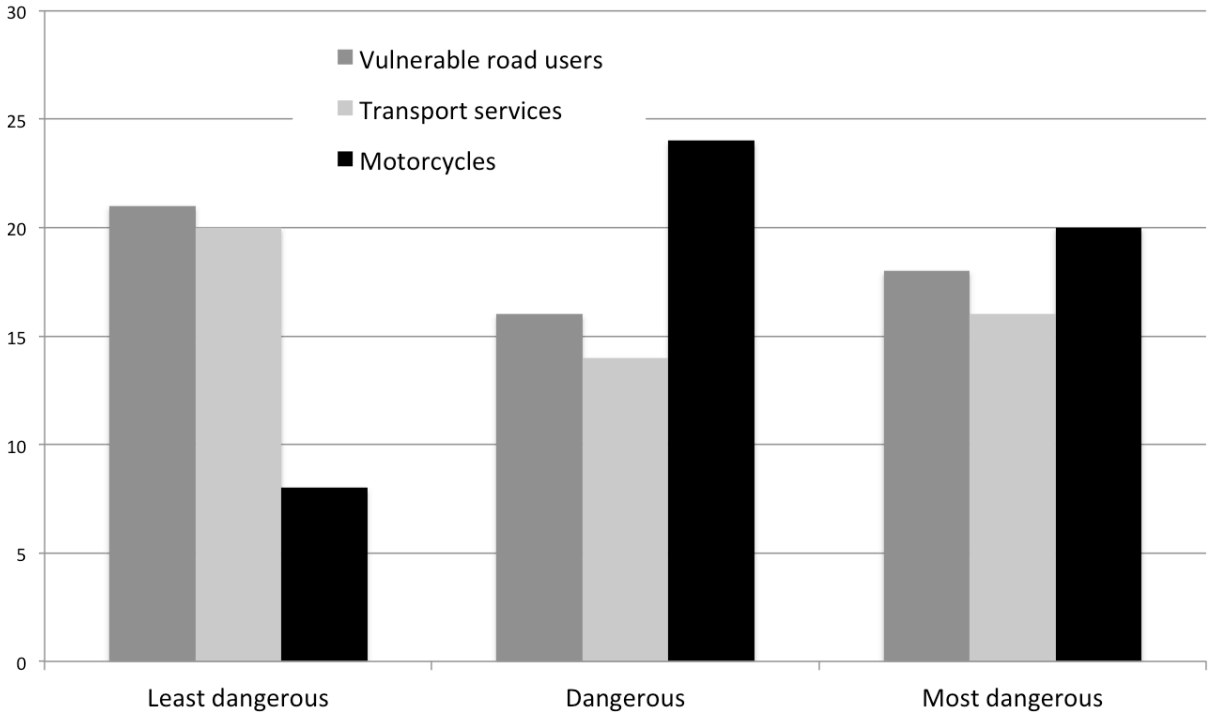

Figure 9. Summary of Results from Question 4

Table 13. Overall Average Weightings for Question 4.

	Transport Mode		
	Vulnerable road users	**Transport services**	**Motorcycles**
Avg. Weighting	2.89	2.84	3.46

The results in Figure 9 are not unexpected as they reflect conclusions drawn from the exploratory literature and the professional opinions documented from the field interviews. The comments submitted with this question reinforced the issue of the lack of training and regulation for motorcyclists.

> "Motorcycles are the most dangerous mode owing to poor skilled riders with little traffic rules and regulations understanding coupled with poor road infrastructure environment, adversely raises traffic crash chances."

Lack of safety education and awareness was also cited as a major problem with respect to vulnerable road users. Regardless of motorcycles being deemed the most dangerous mode, their utility in the rural environment was emphasised in the comments:

> "In rural areas where I have very much worked, community members mostly pointed out that they feel more unsafe when on a motorcycle than a four wheeled vehicle. Motorcycles are unregulated (in some areas they are banned by local authorities), drivers lack training, they are very young and majority do not have licenses. These are some of the concerns among local community members there but on the other hand they are full of praises for motorcycles on how they are affordable, quick and reliable especially during the rain season. Once safety is addressed, motorcycles will always be the best option."

Respondents rated vulnerable road users and transport services similar in term of their perceived dangerousness. Such a result was not unexpected but the detailed comments provide deeper insight into the thinking and, more importantly, the complexity underlying the quantitative ratings.

> "Vulnerable road users are usually victimised because of the levels of education by other road users."

> "Most of the accidents in rural area are related to the Non Motorised Transport because of the huge critical mass of these means of Transport. However the spectacular accidents include the motorcycles."

> "Most cyclists don't have training on road safety. Enforcement in buses and minibuses transport services is low."

> "Too many minibuses has created scramble for passengers resulting in total disregard of road rules and regulations. Most minibuses are imported as Cargo vehicles and fitted with crude makeshift seats which have not passed stringent safety checks."

> "Bus crashes make the headlines, because dozens of people die in one go. But the numbers that die in bus crashes are fewer than the numbers of VRUs and motorcyclists who die. The influx of motorcycles into Tanzania is a relatively recent thing, so the numbers of deaths and injuries in this category has not been as high as pedestrians and cyclists in recent years. But motorcyclists will soon become the leading category."

> "Transport Services are most dangerous for the following main reasons: unregulated and no enforcement (speed, overloading, poor driver training); insurance for vehicles but not for passengers (thus vehicles are replaced while passengers are not compensated for any injuries or fatalities)."

> "Public transport has the highest fatality rates. Motorcycles have high incidences of injuries. Seems to me that vulnerable road users are more of victims rather than culprits from other modes..."

Although it did not fit neatly into any of three categories in Question 4, one respondent pointed out an important road safety issues associated with rural areas:

> "Also stray animals/livestock in rural roads have recently increased accident fatality to an extent that in Zimbabwe we have formulated a law for stray animals in order to enforce the abduction and auctioning of stray animals by rural police. This have resulted in decrease of rural accidents caused by stray animals/livestock."

And another respondent suggested the promotion of handcarts to reduce the health burden of headloading throughout SSA stating:

> "…the vast majority of SSAfricans continue to rely on headloading for their daily transport needs, including collecting water and firewood, as well as all farm inputs and harvested crops."

6.3 Question 5 – Road Conditions

The relationship between transport infrastructure and safety is, in general, well established and it is known that poor infrastructure conditions in SSA contributes to traffic accidents. Question 5 allowed respondents to indicate the level importance they placed on three separate and distinct aspects of road conditions with respect to contribution to rural crashes. The three conditions were:

- Condition of travelway (e.g., potholes and ruts that can cause vehicles to lose control or encourage drivers to leave their travel lane to avoid hitting)
- Lack of adequate signage (e.g., warning signs for horizontal curves or other approaching hazards)
- Dust from unpaved roads obscuring visibility or resulting in risky driving behavior (e.g., overtaking vehicles to avoid following along in their dust).

Respondents were asked to rate each of the three conditions according to the following scale:

- Very unimportant - has already been adequately addressed or is not a major issue (weight = 5)
- Unimportant - warrants continued study as opportunities arise (weight = 4)
- Moderately important - should be included in future research plans (weight = 3)
- Important - should be addressed within the next 5 years (weight = 2)
- Very important - requires immediate attention (weight = 1).

The range of responses are summarised in Figure 10 and the weighted responses are shown in Table 14.

Q5: To the extent that road conditions contribute to rural road crashes in Africa, which of the following issues need research attention?

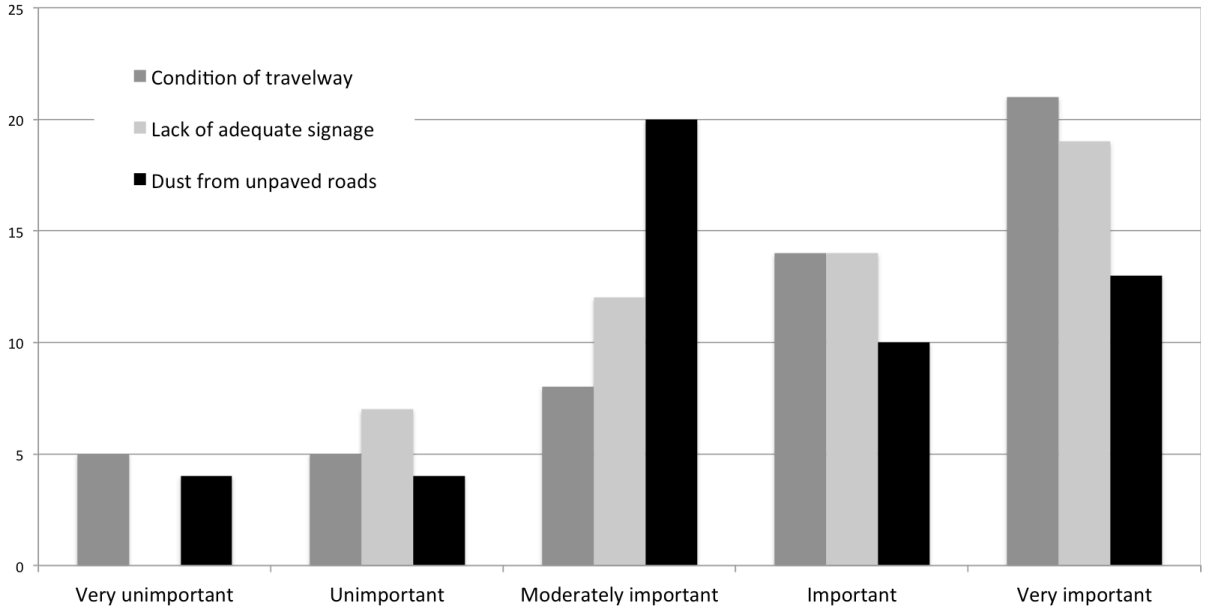

Figure 10. Summary of Results from Question 5

Table 14. Overall Average Weightings for Question 5.

Avg. Weighting	Road Condition		
	Condition of Travelway	Lack of Adequate Signage	Dust from Unpaved Roads
	3.77	3.87	3.47

Lack of adequate signage and road condition received similar numbers of "Very important" rankings and road condition had one more "important" response than did signage. Table 14 shows a higher level importance placed on the operation condition as dictated by traffic control and warning devices than on the physical condition of the road.

In addition to the relative importance expressed, comments submitted with the Question 5 consistently emphasised roadway design.

> "In my view the most contributor is the road condition, designs are poor (inadequate geometrics or do not conform to the surrounding topography resulting in limited sight distances and/or longer straight and steep sections on single 2-way carriageways leading to head-on collisions); others are inadequate signage (and/or vandalism of signage overtime) and poor riding surface (slippery surfaces when wet), etc."

> "What about the road design/layout in general, which does not cater for vulnerable road users (pedestrians forced to walk on the road)?"

> "Geometrical design, especially width, shoulders and drainage. How do different geometrical designs influence safety? - Surface type, including the range of surfacing options that fall in between (in terms of cost) unpaved and fully sealed (such as parallel strips, geocells and paving stones). How do different surface types influence safety?"

In particular, the need to consider vulnerable road users in design (e.g., overall width, provision of shoulders, footpaths) was emphasised. One commenter noted the importance of adequate drainage to preserving safe road surface conditions. The need to assess the role of different surface treatments (from unpaved to fully sealed) was addressed in the comments from both the perspective of different road user experiences (i.e., motorcycles) and dust control as it relates to visibility and safety.

> "While I was a researcher, I have participated in numerous studies regarding how method of construction, construction material, traffic, axle load, terrain, environment etc, will affect the performance of road, riding quality, gravel loss, dust pollution etc. In the course of this study, I coincidentally, able to notice and infer the negative impacts of dust and riding quality on road crash and accidents despite the rate of accidents and crashes was not substantiated with analytic methods as it was not part of the study. Thus, in my view, dust from unpaved roads and riding quality (paved & unpaved) plays a major role in road crashes and accidents in Ethiopia."

Two respondents explicitly addressed the need for a systematic approach to safety provision. One suggested the widespread adoption of safety-oriented low volume road design standards. The other proposed a more scientific approach aimed at evaluating the direct safety benefits associated with specific countermeasures (e.g., improved signage, pedestrian accommodations).

> "These issues are not key for me. More important would be understanding the relationship between different road characteristics and crash risk. Also the relative effectiveness of different remedial treatments on crash reduction (e.g. what is the impact of installing a pedestrian crossing facility/what is the impact of improved signing and lining/what is the impact of different intersection types?). If you move more towards a safe system approach you would focus on the aspects of road design/layout that contribute to high severity and fatal crashes in terms of the outcome of the injuries sustained."

> "The low volume road manual (inclusive of road safety) should be published to assist road agency of other African countries on reducing cost in construction of rural roads . References can be made from countries like Zimbabwe the pioneers of Africa low volume

roads(rural roads) research in 1986- 1995 funded by TRL, SWISSROADS and ILO. This is important -should be addressed within the next 5 years."

"Unintended consequences of road upgrading e.g., more speed, mix of fast / slow vehicles leading to more accidents and greater loss of life owing to speed. Would be good to test and compare preventive interventions that run in parallel to upgrading."

The issue of education and training was again raised. One commenter noted that road users do not understand the risks associated with different roadway environments. Other comments to Question 5 addressed specific issues such as the need for driver training/licensing programs to increase awareness of road-related issues and for vulnerable road users (animal carts were singled out) to appreciate and utilise reflective clothing and markings in unlit conditions. Another respondent stated that the need for education and training extends well beyond road users.

"Much as lack of adequate signage on these rural roads is a road safety concern, simply installing them doesn't necessarily reduce the extent of the problem. Again, due to lack of road safety knowledge among these drivers and other road users. It is very interesting to know how that these very frequent road users do not understand what most of these signs mean. Engineers put them on the ground but so far there is little that is done to sensitise people on what these signs warn against."

"Above all, professionalisation of the Transport industry must be a priority addressing the safety attitudes of all road users via education programmes. No amount of filling in potholes will stop the carnage without education programmes aimed at All stakeholders - Not just drivers. Without addressing Attitudes, no amount of improvement in road conditions with stop the road deaths and injuries - in fact better roads will lead to more deaths due to speeding."

6.4 Question 6 – Driving Behaviour

Question 6 was included to allow respondents to express which behavioural-related factors warrant research attention. Using the same importance scale described above for Question 5, experts were asked to convey the relative importance of:

- Aggressive driving (speeding, overtaking)
- Driving under the influence (alcohol, drugs)
- Distracted driving (texting, talking on mobile phones)
- Non-use of safety equipment (seatbelts, helmets, child restraints)
- Poor driving (education/experience, licensing/regulation).

Figure 11 and Table 15 show the raw and weighted average responses, respectively.

Q6: To the extent that risky driving behaviours contribute to rural road crashes, which of the following potential causal factors need immediate research attention?

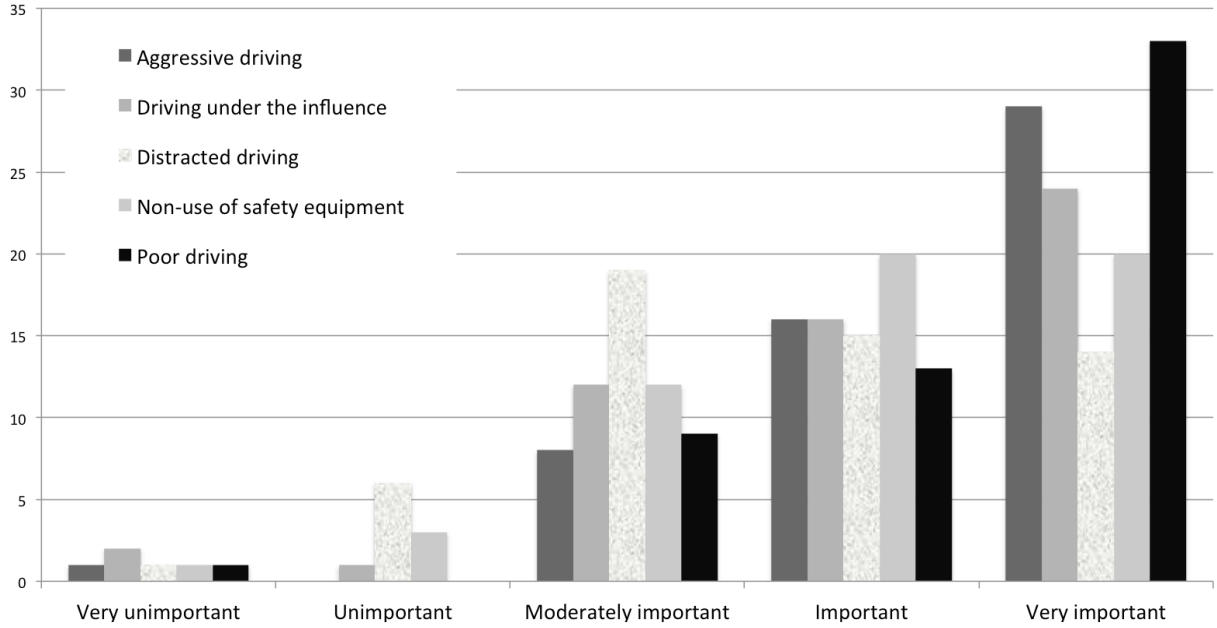

Figure 11. Summary of Results from Question 6

Table 15. Overall Average Weightings for Question 6.

	Driving Behaviours				
	Aggressive Driving	**Driving Under the Influence**	**Distracted Driving**	**Non-use of Safety Equipment**	**Poor Driving**
Avg. Weighting	4.33	4.07	3.64	3.98	4.39

Both Figure 11 and Table 15 illustrate the concern for all of the driving behaviours offered as choices in Question 6. Although similar (and related), issues of poor (i.e., untrained, inexperienced, and unregulated) driving and aggressing (i.e., taking risks such as speeding and overtaking) received the highest quantitative rankings. These two categories were frequently addressed in the respondent comments as was the recurring issue of a lack of adequate data to fully develop causal relationships to crashes and severities on which to base to formulate and implement specific, evidenced-based actions and, eventually develop safety management programs.

> "All are important. Fortunately we know what the impact of these things are (perhaps with the exception of the first and last) ... but what we don't have is good quality data on prevalence of these behaviours and what can be done to effectively fix these issues."

> "All need immediate attention. At the moment there's not enough data to know how to target behaviour change interventions. But our research has shown that, of the different

behaviours listed, poor driving and aggressive driving are the areas in greatest need of being addressed."

"The research has been done, we know what needs to be done, it's just effective implementation of recommendations that is lacking."

"With more roads being built for example in Uganda, with the absence to training and behaviour changing communications, road users in SSA are living the recipe for disaster. Urgent action is needed. The research has been done, we know what needs to be done, it's just effective implementation of recommendations that is lacking."

Other commenters explicitly called out motorcycles as a major source of the dangerous driving behaviours.

"Motorcycle riders are poorly trained and unregulated; motorists over speed carelessly on narrow roadways; there may be a need for speed calming measures in built up centers (townships) to manage speeds to assure safety of non-drivers."

While another noted that risky behaviour such as distracted driving will likely be an increasing concern in SSA:

"Rural Africa just like urban is seeing a huge increase in the use of mobile phones, apparently some of these drivers have mobile phones to easily communicate with their customers for picking them up etc, in the next five years though, the use of mobile phones in Africa (rural) will be very high increasing the safety risks among motorcycle drivers."

Clearly, Figure 12 reiterates the sense of urgency regarding education, outreach, training, and effective regulation of rural transport systems users. It also emphasises what has been communicated as increasingly prevalent risky behaviours (aggressing driving and impaired driving) – both of which are ultimately related to education and enforcement. While receiving the lowest "very important" designations, concern over distracted driving increasing in rural areas was expressed by multiple respondents in the comments. The other comments focused on the need to improve driver education and licensing. With regard to licensing, the issue of corruption was raised as it was in the field interviews. Echoing some of the discussion from the field interviews, another commenter noted that overloading of vehicles should be included among risky behaviours that need to be addressed. Another commenter mentioned the issue of corruption as negatively impacting effective licensing and regulation and, therefore, safety.

"Need work on governance around license tests - highly corrupt at present."

6.5 Question 7 – Impacts on Women and Children

The impact of road crashes is devastating to both individual families and communities as whole. As noted in the exploratory literature, many of the deaths and injuries remove working age young men from the workforce thus having dire economic consequences to their immediate livelihoods as well as the overall potential productivity of their communities. Many of these young men are killed or injured while providing transport for themselves and others (minibus drivers, motorcycle taxi drivers, etc.). As such, much of the safety research needs surrounding men are covered in the general safety themes of driving behavior, road condition, vehicle condition, etc.

Women, on the other hand are typically impacted in road crashes as passengers or as vulnerable road users (most often as pedestrians). The same can be said for children and there has been specific attention paid, both in the research as well as international campaigns, to the safety of children travelling to and from school. Question 7 was asked to gauge practitioner opinions on the extent to which women and children specifically warrant research attention. The results summarised in Figure 12 indicate the majority of respondents are sensitive to the issues specific to women and children as a subset of road users in SSA.

Q7: To what extent do you agree with the following statements?

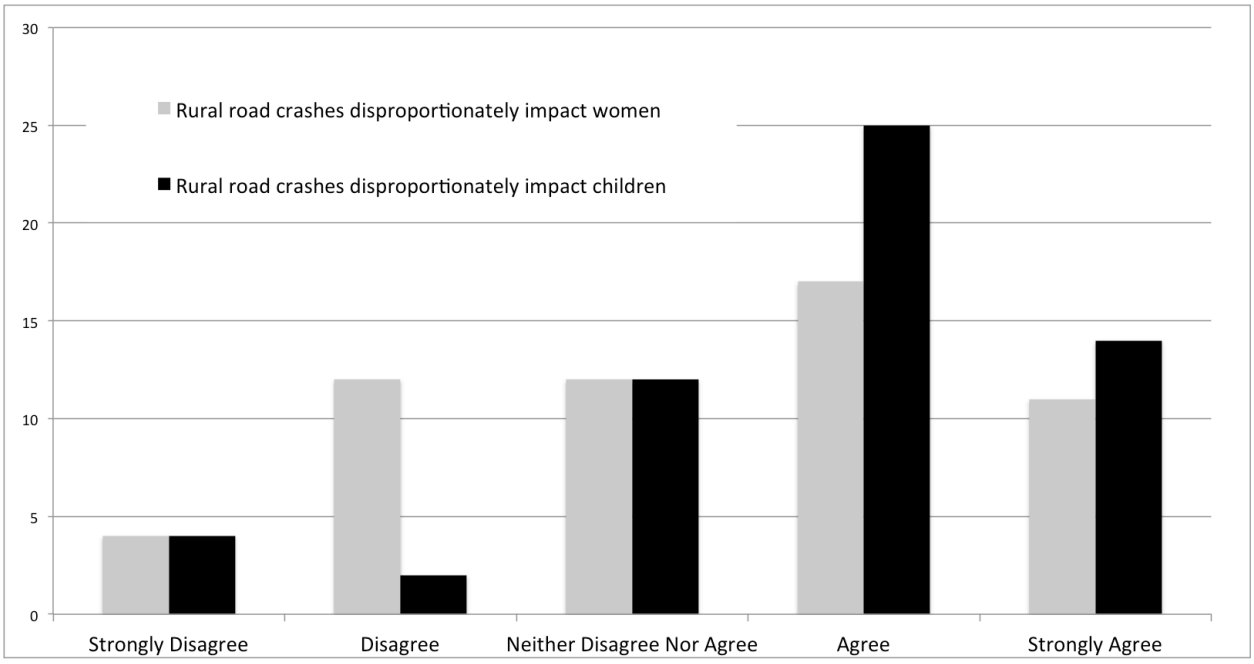

Figure 12. Summary of Results from Question 7

6.6 Question 8 – Rural Accessibility Research Needs

Question 8 assessed respondent opinion on the rural accessibility needs in order to provide a contextual backdrop for further consideration of rural transport health and safety. Evidence of the importance of healthcare accessibility was evident throughout the literature and there is an obvious connection to health and safety. The accessibility of education and economic opportunity was also discussed in the literature as indirectly contributing to improved rural health and safety. The results in Figure 13 show that the professional opinion offered in the survey reflected the results from the literature with more than two thirds of respondents indicating healthcare access as the most pressing accessibility issue in SSA.

Q8: Which of the following do you consider to be the most pressing accessibility issue in rural Africa?

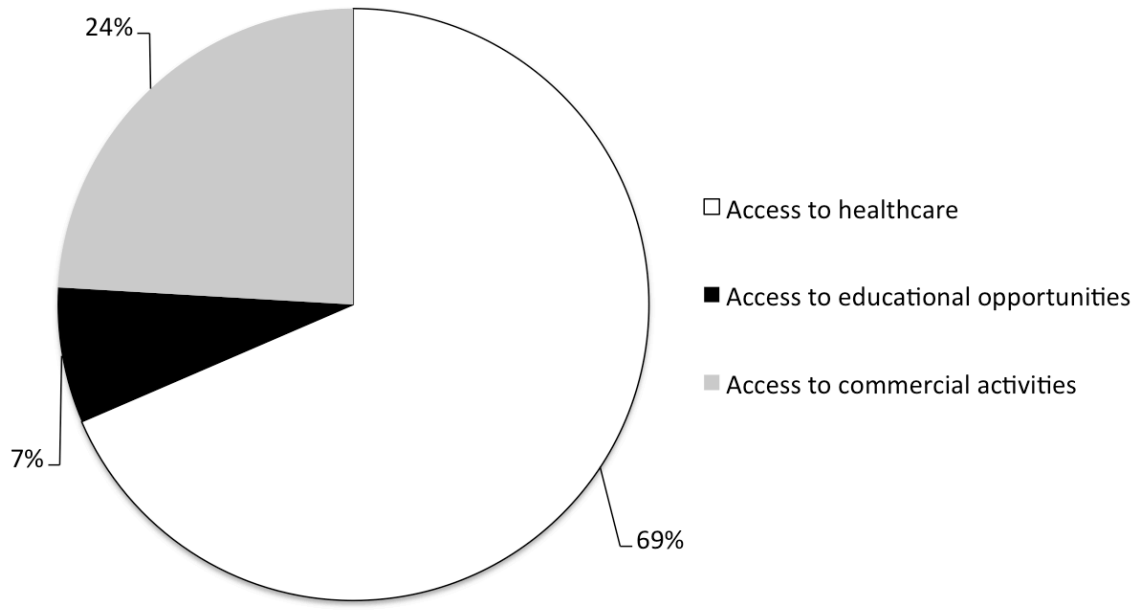

Figure 13. Summary of Results from Question 8

The Internet survey was structured such that a response to Question 8 would lead the participant to a relevant follow on question. For example, if a respondent indicated healthcare as the most pressing accessibility issue in Question 8, they were then given the opportunity to provide more detailed input on that issue (i.e., Question 9). If the respondent indicated education accessibility on Question 8, they were directed to its follow on - labeled as Question 19 below. And similarly, respondents indicating economic access as most important were then asked to provide more detail in Question 11. While it would have been interesting to elicit detailed input on all of three accessibility issues, the respondents were directed through the survey according to what they deemed most pressing in the interest of keeping the survey as brief as possible.

6.7 Question 9 – Healthcare Accessibility Research Needs

Question 9 asked respondents to numerically rank five areas of rural healthcare access with regard to their relative need for research attention. Question 9 was structured such that respondents had to assign a unique, relative ranking (5 = most in need of research attention, 1 = least in need of research attention) to each one of the access types. The range of responses to Question 9 is shown in Figure 14 and Table 16 shows that maternal and pre-natal access was definitively viewed as the rural healthcare-related accessibility issue in most need of attention from the research community.

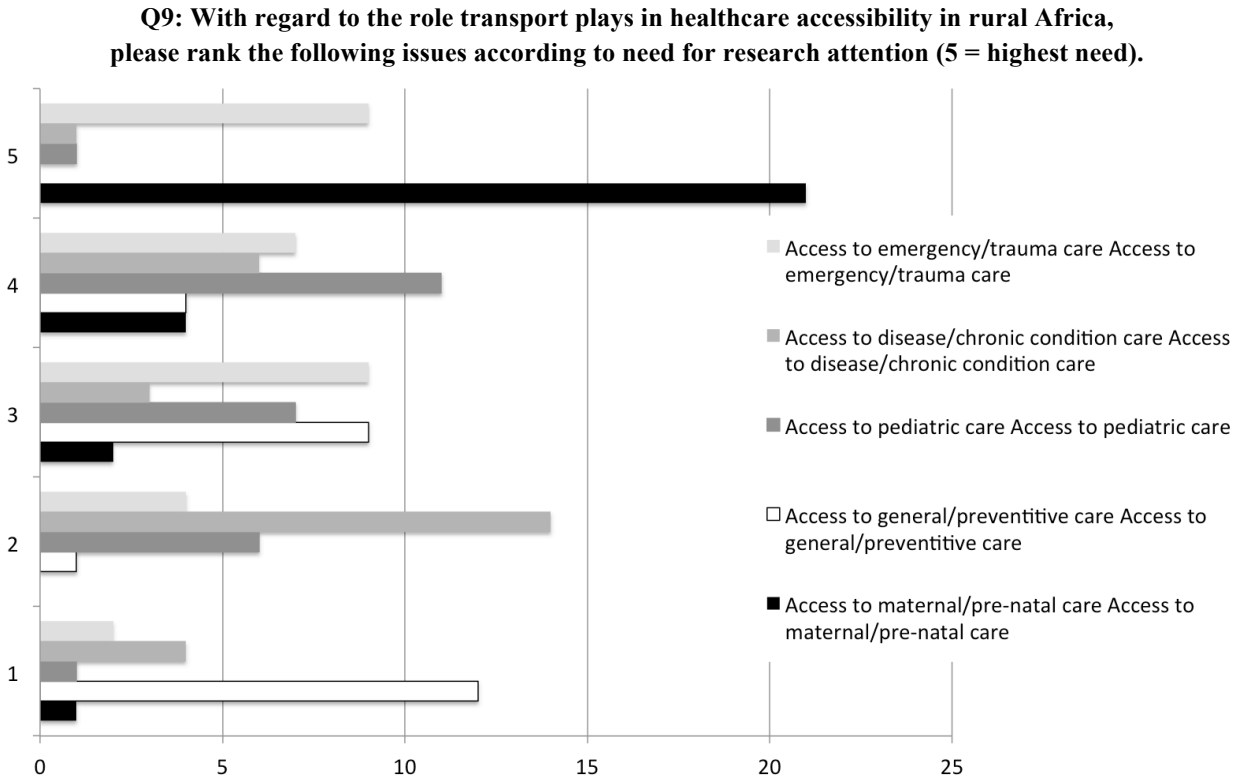

Figure 14. Summary of Results from Question 9

Table 16. Overall Average Weightings for Question 9.

	Access to …				
	Maternal/ pre-natal care	**General/ Preventative**	**Pediatric**	**Disease/ Chronic condition**	**Emergency/ trauma**
Avg. Weighting	4.57	2.19	3.19	2.50	3.55

Respondents were also given the opportunity to comment and the two comments presented below illustrate some of the complexities underlying this issue – mainly one of providing accessibility (and availability) of healthcare workers in addition to the patients.

"Generally, healthcare is a major problem in rural African countries regardless of the above mentioned issues because there is lack of professionals."

"1.Access to healthcare is part of a basket of services that transport MUST link/ make accessible. Should there be separate transport for day Patients and for commuter Workers? 2. How is planning in the developmental state ensure that access is equal to all social amenities and services?"

"maternal deaths during child births is still high in most of Sub-Saharan Africa mostly because pregnant women cannot access hospitals easily and even children are hardly immunized regularly due to distances from nearest health centers. Improved access will likely impact positively in this area."

Question 10 –Education Accessibility Research Needs

Similarly, those who indicated education as the most pressing rural access need, were asked to indicate which of three specific areas they deemed most in need of research:

- Safety education/awareness for children and parents.
- Provision of safer pedestrian facilities.
- Provision of transport services for schoolchildren.

The relative importance of each was indicated using the following scale (as seen previously):

- Very unimportant - has already been adequately addressed or is not a major issue (weight = 5)
- Unimportant - warrants continued study as opportunities arise (weight = 4)
- Moderately important - should be included in future research plans (weight = 3)
- Important - should be addressed within the next 5 years (weight = 2)
- Very important - requires immediate attention (weight = 1).

The raw responses for Question 10 are reported in Figure 15 and the weighted responses are summarised in Table 17.

Q10: With regard to the role transport plays in education accessibility in rural Africa, which of the following issues need immediate research attention?

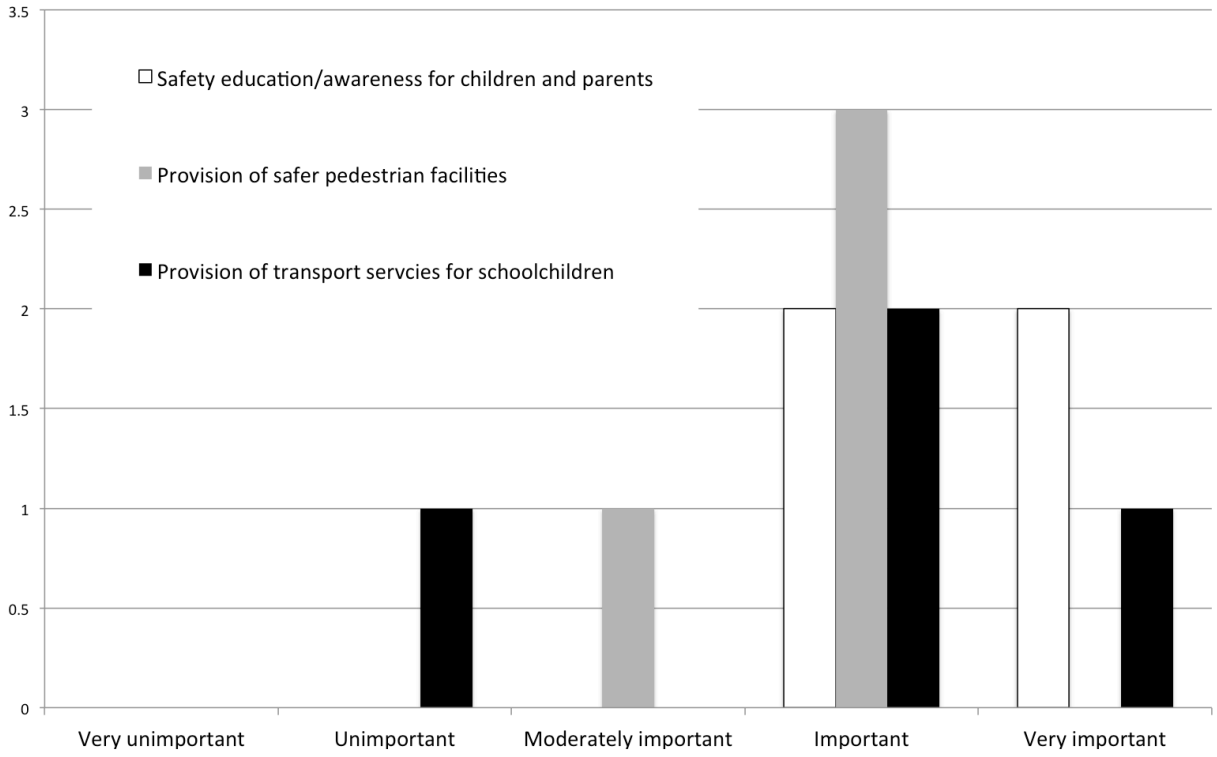

Figure 15. Summary of Results from Question 10

Table 17. Overall Average Weightings for Question 10.

	Enhancing Safe Education Accessibility		
	Road/travel safety Education & awareness for children and parents	**Provision of pedestrian facilities**	**Provision of transport services**
Avg. Weighting	4.50	3.75	3.75

Interestingly, Figure 15 shows that research into the "Provision of safer pedestrian facilities" was deemed as "important" by more respondents, the weighted rankings in Table 17 show that it ties with "Provision of transport services" while research into educational initiatives aimed empowering children to travel more safely was clearly seen as the most important of the three. The results in Table 17 echo the significant emphasis placed on education and training intended to affect positive changes in behaviour found in the field interviews.

6.8 Question 11 – Economic Accessibility Research Needs

Question 11, gave respondents who indicated economic access as the most pressing rural accessibility issue (in Question 8) the opportunity to provide more detail. Specifically, respondents directed to Question 11 were asked which of three economic related activities affected or were affected by road safety. The three activities included those that directly involve rural residents in the economic activity (i.e., transport of agricultural good to market and connectivity to service sector employment). Transport related to natural resource extraction was

included as initial conversations indicated goods haulage and particularly large trucks on inter-urban highways and some feeder roads. The choices allowed respondents to express one of the following that best described the perceived relationship between one of three economic activities and road safety. The results are summarised in Figure 16.

Q11: With regard to the role transport plays in economic accessibility in rural Africa, which of the following issues most affect (or are affected by) road safety?

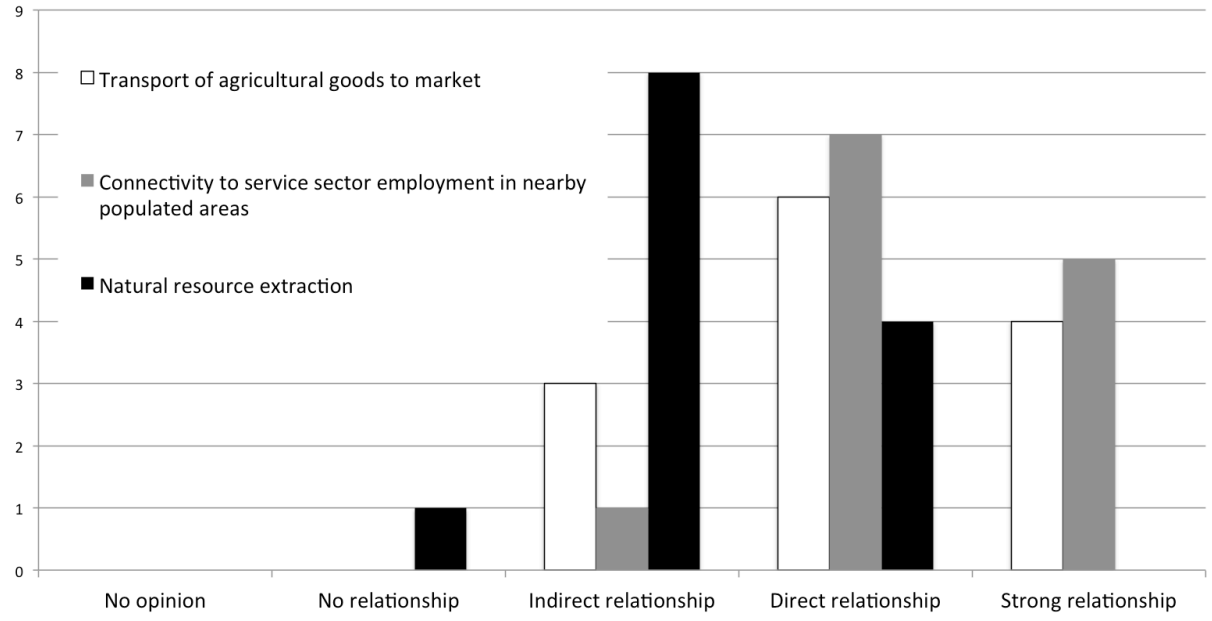

Figure 16. Summary of Results from Question 11

The results in Figure X, not unexpectedly, indicate that there is a direct relationship between perceived between the activities that directly involve rural residents. Whereas the safety impacts of vehicles moving bulk goods associated with areas of natural resources extraction were clearly seen as indirect – reflecting comments referring to risky driving (speeding, overtaking) and deficient vehicle operating conditions. One respondent provided input on the economic impact of road crashes stating:

> "Road safety definitely impacts upon economic growth since it is often quoted that 1-3% of GDP is lost because of road crashes. It has a very direct impact on health services. It is very much related to poverty since road traffic crashes disproportionately impact on young men (often breadwinners) and the loss of a bread winner can mean sustained poverty for generations within a family."

6.9 Question 12 – Rural Road Dust Research Needs

Question 12 asked respondents to indicate whether they believe that rural road dust (and other traffic induced air pollution) warrants more research attention that is has previously received.

The results shown in Figure 17 show that the majority (66%) indeed believe more research is needed. Of the remaining third or respondents, only 7% indicated there has been adequate research while 27% offered no opinion on the matter.

Q12: To what extent do you agree with the following statement? Dust and other air pollution from rural roads in Africa have not received adequate attention from the research and policy communities.

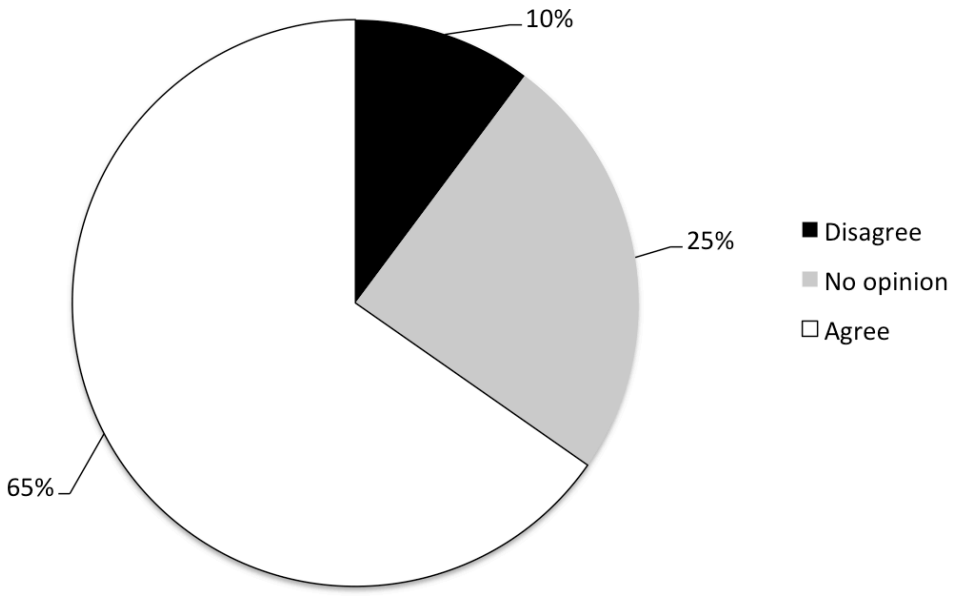

Figure 17. Summary of Results from Question 12

6.10 Question 13 – Rural Air Pollution Exposure

The impacts and pathways of exposure to air pollution from roads and vehicles is well documented in the literature. Question 13 allowed respondents to indicate which of three potential pathways resulted in the most vulnerable exposures:

- Most vulnerable (weight = 5)
- Vulnerable (weight = 3)
- Least vulnerable (weight = 1)

The range of responses is summarised in Figure 18 and the weighted responses are shown in Table 18.

Q13: In your opinion, which of the following groups are most at-risk due to air pollution in rural Africa?

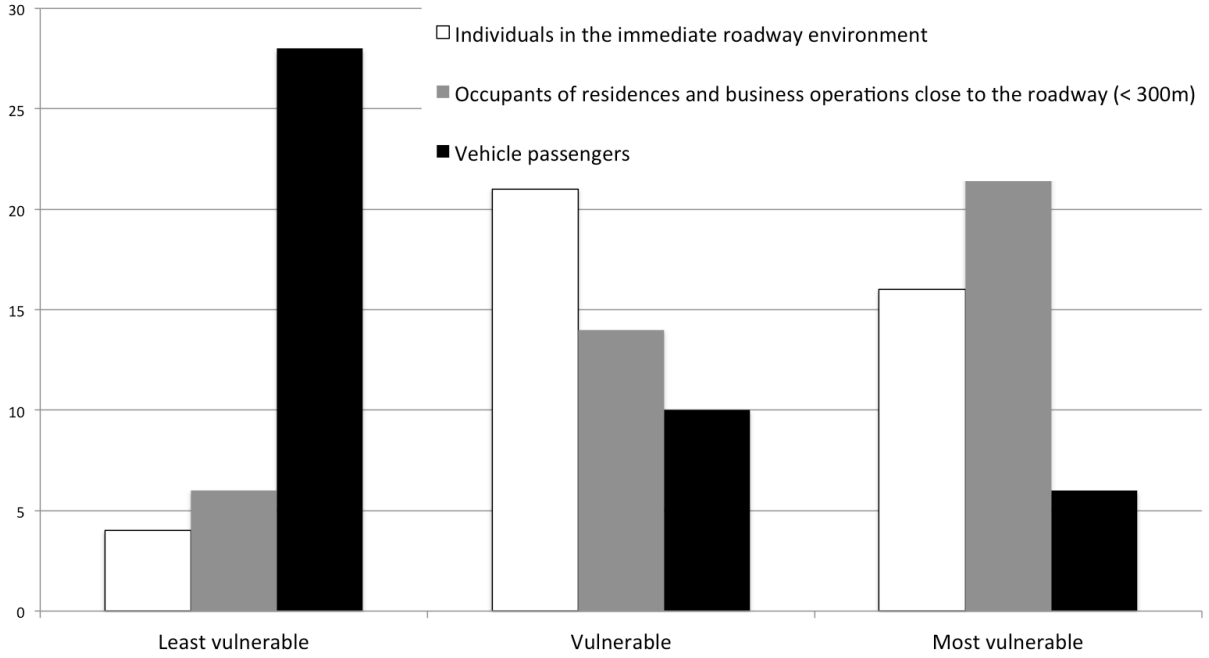

Figure 18. Summary of Results from Question 13

Table 18. Overall Average Weightings for Question 13.

	Groups at risk to air pollution exposure		
	Individuals in roadway environment	**Occupants of roadside residences and businesses**	**Vehicle passengers**
Avg. Weighting	3.60	3.88	1.96

Figure 18 and Table 15 definitively show that respondents perceive occupants of roadside residences and business as in the most danger of air pollution exposure. Interestingly, these results disagree with some of the pragmatic opinions expressed in the field interviews (and much of the literature) noting that open fires and other sources were the dominant air pollution sources in rural areas. The comments offered for Question 13 echoed those made during the field interviews suggesting that the need for increased mobility and accessibility in rural areas currently outweighs the relative risks of exposure to air pollution attributable to vehicles and roads.

6.11 Miscellaneous Points

A couple of the miscellaneous points of interest that were mentioned by interviews are presented below.

> "Animals loitering on roads, Rural road users not wearing reflective cloths at night, Oxcarts being driven at night without any lights (as in headlamp and taillights) or oxcart drivers not

carrying bright lamps to warn other motorists. No civic education for rural road users on road safety issue and proper road use. No road traffic safety enforcement on rural roads."

"There is a need to reduce speed or divert traffic away from villages, schools and other locations where people gather."

"Too many minibuses has created scramble for passengers resulting in total disregard of road rules and regulations. Most minibuses are imported as Cargo vehicles and fitted with crude makeshift seats which have not passed stringent safety checks."

7. Summary and Proposed Research Themes

As previously discussed, the purpose of the current project was to synthesise current knowledge regarding transport health and safety in rural SSA ands identify areas for new research. The literature revealed that there is strong evidence and consensus regarding the primary issues facing road safety as best expressed in such fact-based policies as the five pillars set out in the *Decade of Action for Road Safety*. The primary road safety issues and the problems associated with them were reaffirmed in both the field interviews conducted in the three study countries and the Internet survey. There was a lack of literature on rural air pollution attributable to transport. Interestingly, however, it was noted as an important issue in both the field interviews and the Internet survey. The concern over limited access to healthcare in SSA was a constant theme throughout the literature reviews, field interviews and Internet survey responses.

The following sections introduce and discuss several proposed research themes. The road safety-related research is proposed with the intention of building upon the wealth of previous research documented in the literature and existing strategies in Africa and throughout the global safety community. The proposed research related to rural health and air pollution from transport is intended to complement what has been well documented in urban areas throughout SSA. Specific projects (or project ideas) are offered under the themes. There is no attempt to fully develop scopes for the potential projects. Rather, the project concepts and needs are established for future consideration and potential development into new research efforts.

There are myriad other potential research themes, projects, initiatives, etc. that could be derived from the work proposed herein. As such, the following proposed ideas are in no way intended to be exhaustive. Rather, they represent what is considered to be a thoughtful distillation of the evidence gathered and analysed in this study on which future efforts to improve the understanding of rural transport health and safety can be based.

7.1 Theme 1 – Seeing the Big Picture

As set out in the introduction section of this report, there are myriad complex and contradictory relationships affecting the health and safety impacts associated with rural transport. What is needed is to begin a systematic set of research projects aimed at quantifying individual components:

- frequency of crashes
- crash severities (fatalities, debilitating injuries)
- causal factors
- effectiveness of countermeasures
- pollution exposure pathways
- pollution levels and health impacts (diseases, productivity losses, pupil absenteeism)
- healthcare costs spent on treating crashes and pollution-related diseases
- benefits of improved healthcare accessibility
- etc.

Perhaps a large-scale comparative study would be useful – one wherein two (or more) rural areas representing very different conditions (topography, existing transport system, socio-economic and cultural characteristics) would be targeted for detailed investigation. The project would be field intensive employing extensive local data collection. The data collection would attempt to assess the problems in the form of: basic travel patterns; dominant transport modes; spatial relationship to destinations, roadway and facility inventories; crash records; hospital records; ambient dust measurements; school attendance records; anecdotal evidence of lost productivity due to injuries and diseases; perceptions of enforcement and other evidence of external intervention; hospital and healthcare facility usage; etc.

There are numerous examples in the literature of comparative analyses being used to develop a greater understanding of general phenomena or trends. For example, Biran et al. (2004) examined the pros and cons associated with engaging children in firewood collection in two rural SSA communities. Adesina & Baidu-Forson (1995) collected and compared qualitative data on the perceptions and their effect on technology adoption among farmers in Burkina Faso and Guinea. There are excellent examples of comparative analyses of transport in developing countries ranging from the early comparison of transport and development trends in Ghana and Nigeria reported by Taaffe et al. (1963) to the relatively recent work by Paulozzi et al (2007) comparing economic development levels and road safety among different types of road users.

The data could be compared between the two locations to ascertain relationships among: police presence and crash rates, crash rates and dominant transport modes, transport modes and traffic levels, traffic levels and ambient dust levels, ambient dust levels and school attendance, etc.

Such relationships could form the basis for relative risk assessments, development of causal relationships and predictive tools, and decision support for future mitigation strategies and policies.

7.2 Theme 2 - Researching the Researchers

The results from the literature review and surveys of expert opinion indicated that motorcycles are a serious (and growing) road safety concern in rural SSA. Also, the lack of enforcement and safety awareness and knowledge among all road users was consistently called out as a major concern. Nonetheless, there have been numerous efforts to improve both of these issues in the past. Indeed, there have been research efforts to evaluate the effectiveness of the improvement efforts. The two project ideas presented in this section are aimed at performing wide-scale, systematic reviews of previous research (within SSA and beyond).

7.2.1 Meta-Analysis of Motorcycle Safety Research in Developing Countries

There have been many, many studies of motorcycle safety – driver behaviour, helmet use, alcohol influence, visibility enhancement, etc. – most of which have been conducted in industrialised countries (e.g., Clarke et al., 2004; Lardelli et al., 2005; Elliot et al., 2007; Dee, 2009; Law et al., 2009; Kim et al., 2010; Schneider et al., 2011; Haque et al., 2012; Jones et al., 2014). Likewise there have been numerous studies of motorcycle safety issues throughout the developing world (e.g., Yuan, 2000; Lin et al., 2003; Kasantikul et al., 2007; Tran et al., 2009) and many that have specifically focused on Africa (e.g., Naddumba, 2004; Solagberu et al., 2006; Oluwadiya et al, 2009; Ackaah & Afukaar, 2010; Chalya et al., 2010; Madubeze et al, 2011; Egbunike, 2012; Ogunmoded et al., 2012; Wole, 2012; Guerrero et al., 2013; Akaateba et al, 2014).

Reflected in all of the different studies, even the ones confined to Africa, are different socio-economic and cultural characteristics, topographies, levels of infrastructure development, regulation and enforcement capacities, training and licensing requirements, etc. In addition to the many factors affecting motorcycle safety, different studies may reach different, sometimes contradictory, conclusions regarding the effectives of countermeasures or they may offer very different recommendations. A meta-analysis (i.e., a statistical approach of combining the results of numerous individual research studies) is proposed to allow a systematic review of causal factors contributing to motorcycle crashes in rural Africa in addition to the identification of successful countermeasures. The literature is replete with examples of meta-analyses applied to transport safety issues including driver behaviour, (e.g., Elvik, 2001; Caird et al., 2008; Winter & Dodou, 2010; Phillips et al., 2010).

7.2.2 Meta-analysis of Community-based Transport Safety Campaigns and Enforcement Programs

As in the case of motorcycles, there is a wide array of research on the effectiveness of safety campaigns. Indeed, safety campaigns may comprise all sorts of education and outreach directed at changing the behaviour of the general public or targeted subgroups (e.g., school children). Such programs may be in the form of highly produced media campaigns (e.g., edutainment) or serious, fact-based social marketing campaigns (Kotler & Lee, 2008; Nathanail & Adamos, 2013). In some cases, safety campaigns may focus on specific training or capacity development while others may incorporate enforcement.

The range of possible activities and outcomes associated with transport safety campaigns requires a broad analysis approach to develop meaningful conclusions. Again a meta-analysis approach confined to the context of safety campaigns applicable in developing countries is proposed. Meta-analysis has been successfully applied to transport campaigns previously (e.g., Elliot, 1993; Phillips et al., 2011). Other studies have presented comparative analyses of multiple education and outreach campaigns and have focused on specific issues such as lessons learned on equity and participation (e.g., Lindqvist et al., 2003; Bradbury & Quimby, 2008; Nathanail & Adamos, 2013). Others have documented detailed outcomes from individual education-oriented campaigns (e.g., Lewis et al., 2007; Lewis et al., 2008; Hoekstra & Wegman, 2011; Groenewald, et al., 2012). There are examples from Africa such as a detailed literature review conducted to inform a public awareness campaign aimed at parents and children in South Africa (Soul City, n.d.) and two interesting examples of evaluations of enforcement programs in South Africa (Mohammed & Labuschagne, 2008). Nilsen (2006) documented a critical look at the structure of programmes with regard to representing community structure, encouraging participation, intersectoral challenges, mobilizing participants and maintaining engagement.

7.3 Theme 3 – Seeing Things for the First Time (again)

The idea behind this research theme is to take advantage of new technologies and methods for collecting transport-related data and information. There has been considerable progress in the use of novel data collection techniques in developed countries for purposes other than transport health and safety. Many of these can be employed in the SSA context to supplement existing data and provide new sources and depths of information already being collected. There is also potential to conduct targeted studies on specific issues (e.g., traffic-generated rural air pollution) that have not yet been the focus of intense study as evidenced by the literature review and interviews detailed in previous sections.

7.3.1 Feasibility Study of Using Unmanned Aerial Vehicles to Conduct Safety Research

It would be interesting to partner with international organisations (universities, suppliers, etc.) to examine the feasibility of using Unmanned Aerial Vehicles (UAVs) to conduct road safety auditing activities in rural areas. UAV technologies have evolved such that they are relatively inexpensive and easy to deploy. A recent study confirmed the utility of using UAVs to characterise the conditions of unpaved roads in the US (Brooks et al., 2013). The ability and flexibility of UAVs to assess infrastructure conditions in developing countries has also been documented in in the context humanitarian and disaster response (Tatham, 2009). Although controversial, there have been numerous studies into the feasibility of utilizing UAVs as part of traffic incident detection and crash investigation in both the UK and the US (e.g., Coifman et al., 2004).

7.3.2 Using Mobile Phone Data to Understand Travel Patterns and Behaviour

The proliferation of mobile phones throughout Africa is well documented (e.g., James & Versteeg, 2007; Aker & Mbiti, 2010). There are numerous examples in the literature of using location data from mobile phones to study transport and travel behaviour (e.g., González et al., 2008; Ahas et al., 2010; Yuan et al., 2012). Shoval & Isaacson (2006) have explicitly used mobile ohone data to track pedestrian movements. There is also considerable evidence of the success of using mobile phones to track mobility in rural areas, especially as it relates to public health (Tatem et al., 2009; Wesolowski et al., 2012; Wesolowski et al., 2013). And finally, Anokwa et al. (2009) and Tomlinson et al. (2009) reported on the use of mobile phones for data collection in the developing world.

A pilot study is proposed to ascertain the potential for using mobile phones for the collection of travel behavior and health-related information (e.g., road conditions, crashes) to create a richer understanding of how people experience road safety on a daily basis. AFCAP (2013) noted both "Improved data collection..." and "Community Involvement" in increasing safety as a technical priority in a presentation on Research Needs at the Low Volume Roads Symposium in 2013. The proposed effort would identify communities that are already aware of and/or active in local road safety issues and empower them to observe and report unsafe conditions (road conditions, behaviours, vehicles, etc.). It would be essential to provide the community participants with sufficient training and connect them to supportive researchers that affirm the value of their input. Equipped with cameras and mobile phones, local residents can document what they see as unsafe. It may even be possible to have them provide anecdotal evidence of observed crashes and injures sustained (and impacts) from within and around their communities. Although not scientific, such an approach could provide quantities of information that would not be feasible to collect by other means. Thoughtful selection and involvement of participants could enrich the day-to-day understanding of rural and remote safety issues on the part of external researchers.

Such a novel approach could uncover new means of safety knowledge discovery while potentially having added benefits such as heightened safety awareness among the participants and community members with whom they have some influence (e.g., Waterkeyn & Waterkeyn, 2014).

7.3.3 Examination of the Effects of Corruption on Effective Traffic Safety Enforcement in Rural Areas

Previous studies have either alluded to or explicitly documented (e.g., Anbarci et al., 2006) the effects of corruption on traffic safety. Further research is needed in SSA to document personal experience (or lack thereof) with regulatory (e.g., vehicle registration, licensing) and enforcement (i.e., police) officials among vehicle (minibus, motorcycle, etc.) operators. Additional work could be done to ascertain perceptions among different rural communities representing varying levels of accessibility, economic and social standing, cultural characteristics, etc. Finally, the potential for using Geographic Information Systems (GIS) for establishing relationships among spatial (e.g., distance to, regional density of) relationships between enforcement officials, types of vehicles (minibuses, motorcycles, goods vehicles, private trucks and 4X4s) providing passenger transport services, frequency of services, etc. should be considered.

7.3.4 Assessment of Exposure to Air Pollution from Rural Transport

The literature focused mainly on urban air pollution issues in Africa. Much of what was documented in rural areas was attributed to wood burning with regard to potential health effects. Discussions from the field interviews intimated that the issue of air pollution from rural transport was known but that it was largely overlooked in favour of the positive health (and other) benefits attributable to providing mobility to rural and remote locations. Responses to the Internet survey did, however, indicate concern over this issue and, specifically, that research was needed. And again, the AFCAP research needs presented in 2013 set out dust as one if its technical priorities (AFCAP, 2013). So targeted research is needed to fully ascertain the potential for harmful transport-induced air pollution to contribute to negative health outcomes in rural SSA. As such, three separate, but relatable, research efforts are proposed. One effort would comprise field measurement (e.g., source apportionment) of pollution in the roadway environment (roadside, along the road, in-vehicle). Another potential research effort would require cross-referencing rural hospital patients with respiratory ailments suggestive of dust and other traffic-related emissions and their potential exposure pathways (time spent in minibus or open vehicles; walking, cycling or motorcycling along rural roadways, proximity of houses to roadways). This could be done with hospital and/or home visits as appropriate. Finally, as suggested by some of the field interviewees, there is a notion that air pollution is adversely affecting school-aged children in rural areas. One way to examine this possibility would be to survey schoolteachers to identify pupil attendance problems related to perceived respiratory health problems (e.g., chronic

coughing) and conduct follow up interviews with families/communities and perform site visits to ascertain any potential exposure pathways (traffic, wood burning, etc.).

7.4 Theme 4 – Beginning with the end in mind

Finally, the end goal of any transport research, in SSA or elsewhere, should be progress towards improving the conditions, chiefly the health and safety, under which people travel. The most effective way to meet the goal is to understand how research results can be captured, exploited, utlilised, leveraged, … for better designs, practices, behaviours, strategies, policies, etc. The final research ideas focus on efforts to better understand how research can improve the health and safety of travel in rural SSA.

7.4.1 Enhanced Technology Transfer and Uptake of Transport Research

As the understanding of the relationship among the health and safety aspects of rural transport improves through various disaggregated research efforts, there is a need to begin targeted efforts to harness these findings and results and turn them into actionable policies. As such there needs to be new research aimed specifically at improving (and expanding) the research uptake and implementation among decision-makers at all levels (international, national, regional, etc.). The Transportation Research Board standing committee on Technology Transfer is currently sponsoring a research needs statement on how to incorporate technology transfer objectives into research projects during the scoping and proposal stages as opposed to planning the dissemination and implementation activities towards the end of the research process. Research exists on how to shape and conduct research so as to maximise the future policy impacts. For example, (Tran et al., 2009) document a process for engaging policy makers at five distinct stages of road safety research and illustrated the benefits through a research project to reduce motorcycle crashes though visibility enhancement. AFCAP (2013) noted in a presentation on Research Needs at the Low Volume Roads Symposium in 2013 that new knowledge was needed that was based on "appropriate or customised African research" and "Not inappropriate, inherited International Practice" and that local ownership of rural transport knowledge was critical to uptake and implementation. Therefore, a project is proposed to develop a set of guidelines for strengthening the policy connection of rural transport health and safety research. The project would be a stakeholder driven process aimed at setting best practices for producing actionable research results.

7.4.2 Taxonomy of Organisations Driving Rural Transport Safety in SSA

There are multiple levels of organisations working, sometimes with each other, on SSA development issues. Major international organisations such as the United Nations, the World Health Organization, The World Bank, etc. contain elements within them that promote transport safety through policies, research and direct financial support for projects. Similarly there are

various development agencies at the national level (DfID, USAID, Norad, etc.) running their own programs. There are numerous private grant-making foundations (e.g., Volvo Research Foundation) that support transport safety research in SSA. Only some of this work focuses explicitly on rural issues while most of it is aimed at the global issues of rapid urbainsation, climate change, etc. There is also a plethora of non-profits organisation, NGOs, public-private agencies, consultancies, university-based research centres, technology transfer programs, etc. that conduct much of the work sponsored at various levels in the hierarchy above and, very importantly, maintain much of the expertise in the area of rural transport health and safety. Indeed, AFCAP (2013) noted that the fragmentation of African-specific knowledge was an important issue facing rural transport research along with a need to consolidate international best-practices (AFCAP, 2013).

It would be useful to conduct a desk study (perhaps followed by an in-situ case study) to map out relationships among these change agents. Such a study itself may highlight important issues common among the many efforts past, present and planned. It would give an idea of where (i.e., which countries) work has been concentrated and, conversely, where new attention is needed. Ultimately, it could serve as an informational resource for new researchers entering the field as well as help experienced individuals and organisations identify and locate needed specialties and commons interests.

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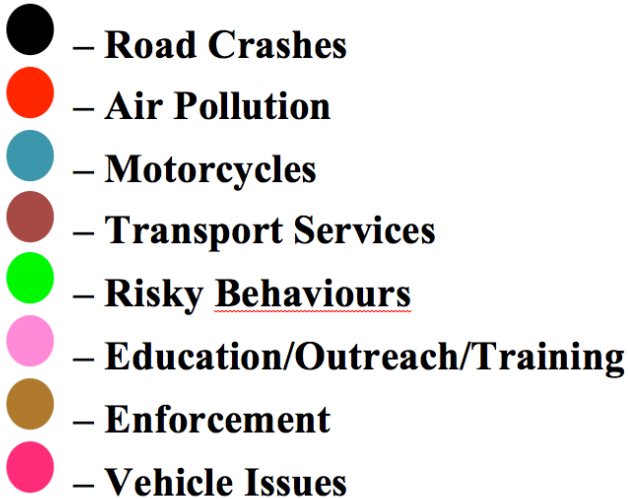
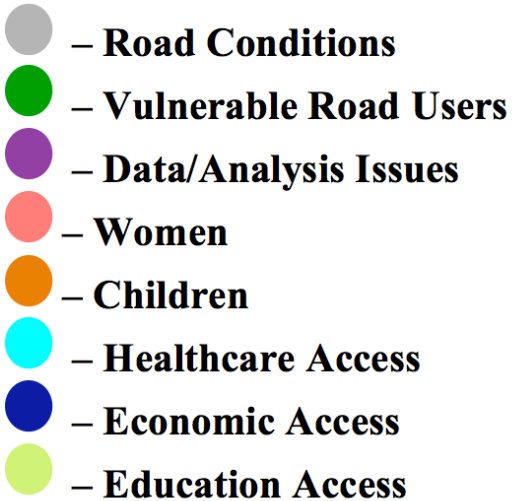

– Road Crashes
– Air Pollution
– Motorcycles
– Transport Services
– Risky Behaviours
– Education/Outreach/Training
– Enforcement
– Vehicle Issues


– Road Conditions
– Vulnerable Road Users
– Data/Analysis Issues
– Women
– Children
– Healthcare Access
– Economic Access
– Education Access

No.	Country	Topic	Citation	Summary
1	NE		Abam, F., Unachukwu, G. 2009. Vehicular Emissions and Air Quality Standards in Nigeria. *European Journal of Scientific Research*, 34(4), 50–60.	This paper reports the results of the investigation of vehicular emissions in selected areas in Calabar Nigeria. Three areas MP1, MP2 , and MP3 were considered with nine sampling points (SP1 – SP9) in each area placed 8.0m away from the edge of the road in downwind direction. Priority parameters: CO, NO2, SO2, PM10 and noise level were monitored. Other relevant parameters monitored includes ambient temperature, wind direction, wind velocity and traffic count. The results of CO, NO2, SO2, PM10 and noise level were in the range of 3.3-8.7ppm, 0.02 – 0.09ppm, 0.04 – 0.15ppm, 170 - 260 µ g/m3 and 58.5 - 72.4dB respectively. The highest level obtained for the air pollution indicators for CO was: 8.7ppm, 7.6ppm and 7.4ppm at SP1 for day 1, 2 and 3. The concentration of SO2 was highest at SP2 with values 0.10ppm and 0.12ppm. Emission concentration for NO2, PM10 and noise level was found to be highest at SP2 where traffic intersections and traffic count is high. All the five monitored air pollutants when compared with AQI level (Air quality index) were in the range of: CO – poor to moderate and moderate to poor in different locations. SO2 – was from very poor to poor, NO2- from very poor to poor, PM10 and noise level was poor at all locations. The overall comparison of data for different sections show that concentration of pollutants is highest at (SP1 – 3) and (SP8 – 9) in the three areas MP1, MP2 , and MP3 due to volume of traffic
2	KE		Abdulgafoor, M.Bachani, A., Koradia, P., Herbert, H., Mogere, S., Akungah, D., Nyamari, J., Osoro, E., Maina, W., Stevens, K. 2012. Road Traffic Injuries in Kenya: The Health Burden and Risk Factors in Two Districts. *Traffic Injury Prevention*, 13(1), 24-30.	Road traffic injuries (RTIs) contribute to a significant proportion of the burden of disease in Kenya. They also have a significant impact on the social and economic well-being of individuals, their families, and society. However, though estimates quantifying the burden of RTIs in Kenya do exist, most of these studies date back to the early 2000s—more than one decade ago. This article aims to present the current status of road safety in Kenya. Using data from the police and vital registration systems in Kenya, we present the current epidemiology of RTIs in the nation. We also sought to assess the status of 3 well-known risk factors for RTIs—speeding and the use of helmets and reflective clothing. Data for this study were collected in 2 steps. The first step involved the collection of secondary data from the Kenya traffic police as well as the National Vital Registration System to assess the current trends of RTIs in Kenya. Following this, observational studies were conducted in the Thika and Naivasha districts in Kenya to assess the current status of speeding among all vehicles and the use of helmets and reflective clothing among motorcyclists. The overall RTI rate in Kenya was 59.96 per 100,000 population in 2009, with vehicle passengers being the most affected. Notably, injuries to motorcyclists increased at an annual rate of approximately 29 percent (95% confidence interval [CI]: 27–32; P < .001). The mean age of death due to road traffic crashes was 35 years. Fatalities due to RTIs increased at an annual rate of 7 percent (95% CI: 6–8; P < .001) for the period 2004 to 2009. Observational studies revealed that 69.45 percent of vehicles in Thika and 34.32 percent of vehicles in Naivasha were speeding. Helmets were used by less than one third of motorcycle drivers in both study districts, with prevalence rates ranging between 3 and 4 percent among passengers. This study highlights the significant burden of RTIs in Kenya. A renewed focus on addressing this burden is necessary. Focusing on increasing helmet and reflective clothing use and enforcement of speed limits has the potential to prevent a large number of road traffic crashes, injuries, and fatalities. However, it is difficult to demonstrate the magnitude of the injury problem to policymakers with minimal or inaccurate data, and this study illustrates the need for national continuous, systematic, and sustainable data collection efforts, echoing similar calls for action throughout the injury literature. *doi: 10.1080/15389588.2011.633136.*

No.	Country	Topic	Citation	Summary
3	**GH**		Ackaah, W. 2010. Road traffic fatalities among children in Ghana. *Injury Prevention*, 16(S1), A70-A70.	The key objective of the study was to establish the characteristics of fatal road traffic crashes involving children (≤15 years) and to recommend measures to control them. Crash data for the period 2004–2008 in Ghana were analyzed using the micro-computer accident analysis package (MAAP) software. Recently published transport-related epidemiological and other studies provided additional data sources. Slightly over 9800 people were killed in road traffic crashes in Ghana during the 5-year period of which 19% were children. Majority (79%) of the children who died from these crashes were pedestrians. The child-pedestrian constituted 34% of all pedestrian fatalities. It was established that 76% of the children were hit by vehicles while crossing the road and were more likely to be boys (54%) than girls (46%). Compared to a child car-occupant, a child-pedestrian is about 20 times likely to die in a crash and majority (57%) of these crashes occurred on high speed roads passing through village settlements. A high number of children are at risk in traffic as pedestrians and are most likely to be killed on high speed roads in the non-urban setting. Education on road safety for children must be directed at those living in village communities along the major highways. Road engineers and planners should redesign the village road sections to calm traffic and make conscious efforts to integrate safer pedestrian facilities in new and existing roads in Ghana. *doi:10.1136/ip.2010.029215.254*
4	**GH**		Ackaah, W., Salifu, M. 2011. Crash prediction model for two-lane rural highways in the Ashanti region of Ghana. *IATSS Research*, 35, 34-40	Crash Prediction Models (CPMs) have been used elsehere as a useful tool by road Engineers and Planners. There is however no study on the prediction of road traffic crashes on rural highways in Ghana. The main objective of the study was to develop a prediction model for road traffic crashes occurring on the rural sections of the highways in the Ashanti Region of Ghana. The model was developed for all injury crashes occurring on selected rural highways in the Region over the three (3) year period 2005–2007. Data was collected from 76 rural highway sections and each section varied between 0.8 km and 6.7 km. Data collected for each section comprised injury crash data, traffic flow and speed data, and roadway characteristics and road geometry data. The Generalised Linear Model (GLM) with Negative Binomial (NB) error structure was used to estimate the model parameters. Two types of models, the 'core' model which included key exposure variables only and the 'full' model which included a wider range of variables were developed. The results show that traffic flow, highway segment length, junction density, terrain type and presence of a village settlement within road segments were found to be statistically significant explanatory variables (pb0.05) for crash involvement. Adding one junction to a 1 km section of road segment was found to increase injury crashes by 32.0% and sections which had a village settlement within them were found to increase injury crashes by 60.3% compared with segments with no settlements. The model explained 61.2% of the systematic variation in the data. Road and Traffic Engineers and Planners can apply the crash prediction model as a tool in safety improvement works and in the design of safer roads. It is recommended that to improve safety, highways should be designed to by-pass village settlements and that the number of junctions on a highway should be limited to carefully designed ones. *doi:10.1016/j.iatssr.2011.02.001*
5	**GH**		Ackaah, W., Afukaar, F. 2010. Prevalence of helmet use among motorcycle users in Tamale Metropolis, Ghana: an observational study. *Traffic Injury Prevention,* 2(5), 522–525.	Estimated helmet use among riders and pillion riders of motorcycles in the Tamale Metropolis of Ghana. Cross-sectional observations of helmet use were made at locations where traffic generally slowed down. Statistical analysis was carried out for variables by calculating chi-square ($\chi(2)$) tests to assess statistical significance. A total of 3115 riders and 1058 pillion riders (passengers) were observed at 10 different sites. The overall helmet use for riders was 34.2 percent and that for pillion riders was 1.9 percent. Riders' helmet use rate was highest among the elderly (49.6%), followed by adults (34.3%) and lowest for young people (21.9%) and the observed percentage differences were significant ($\chi(2)((2))= 67.1$; $p < .001$). A marked difference ($\chi(2)((1))= 6.7$; $p = .0096$) in helmet use was observed between riders riding within the central business district (CBD; 36.5%) and those outside the CBD (32.1%). Riders with at least one pillion rider (27.4%) were less likely to wear a helmet compared to riders riding alone without passengers (37.3%; $\chi(2)((1))= 29.347$; $p < .001$). Helmet use by motorcyclists in Ghana is generally low. There is a need for public awareness campaigns on the safety benefits of helmets to increase its prevalence in Ghana. The education on helmet use must be accompanied by sustained enforcement of the road traffic law by the traffic police to ensure compliance. *doi: 10.1080/15389588.2010.489198.*

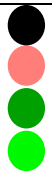
No.	Country	Topic	Citation	*Summary*
6	**NG**		Adeniyi, A., Owoade, O. 2010. Total petroleum hydrocarbons and trace heavy metals in roadside soils along the Lagos-Badagry expressway, Nigeria. *Environmental Monitoring and Assessment*, 167(1-4), 625-630.	Reports the level of total petroleum hydrocarbons (TPH) and trace heavy metals (lead, copper, and cadmium) in soil samples collected randomly from Iyana-Iba garage, Lagos State University bus stop, Adeniran Ogunsanya College of Education bus stop, and a control site off Lusada-Atan road, near Crawford University, Igbesa, Ogun state. TPH was estimated gravimetrically after Soxhlet extraction and column clean up, while soil metals were determined by atomic absorption spectrometry using mineral acid digestion.. Sites studied have higher levels of TPH and metals compared to the control soil samples. This is indicated by a statistically significant difference found between the concentration of analyzed elements in soils collected along Lagos-Badagry expressway and the control site. *doi: 10.1007/s10661-009-1078-3*
7			Adesunkanmi, A., Oginni, L., Oyelami, O., Badru, O. 2000. Road traffic accidents to African children: assessment of severity using the injury severity score (ISS). *Injury,* 31(4), 225-228.	Records of 324 children who were injured in road traffic accidents (RTA) between January 1992 and December 1995 were reviewed to determine the pattern, severity and outcome of their injuries. This represented 2% of all attendances at the emergency room. Pedestrians represented the largest group of patients. Head injuries were the most common injury, followed closely by limb trauma. Chest and abdominal trauma accounted for only 2.5 and 1.5% of patients, respectively. Eighty percent of abdominal injuries required a splenectomy, but most chest injuries were managed nonoperatively. In 306 children the ISS was 1-25 with no mortality but significant morbidity. Eighteen patients had an ISS of 26-54 with a 61% mortality rate (11 patients). The highest ISS were found in the group of patients who were passengers in a motor vehicle. *http://www.ncbi.nlm.nih.gov/pubmed/10719099*
8	**TZ**		Ae-Ngibise, K., Masanja, H., Kellerman, R., Owusu-Agyei, S. 2012. Risk factors for injury mortality in rural Tanzania: a secondary data analysis. *BMJ Open*, 2(6), e007121.	Injuries rank high among the leading causes of death and disability annually, injuring over 50 million and killing over 5 million people globally. Approximately 90% of these deaths occur in developing countries. Estimates the risk factors for injury mortality in the Rufiji Health and Demographic Surveillance System (RHDSS) in Tanzania. Secondary data from the RHDSS covering the period 2002 and 2007 was examined. Verbal autopsy data was used to determine the causes of death based on the 10th revision of the International Classification of Diseases (ICD-10). Trend and Poisson regression tests were used to investigate the associations between risk factors and injury mortality. The overall crude injury death rate was 33.4/100 000 population. Injuries accounted for 4% of total deaths. Men were three times more likely to die from injuries compared with women (adjusted IRR (incidence risk ratios)=3.04, p=0.001, 95% CI (2.22 to 4.17)). The elderly (defined as 65+) were 2.8 times more likely to die from injuries compared with children under 15 years of age (adjusted IRR=2.83, p=0.048, 95% CI (1.01 to 7.93)). The highest frequency of deaths resulted from road traffic crashes. Injury is becoming an important cause of mortality in the Rufiji district. Injury mortality varied by age and gender in this area. Most injuries are preventable, policy makers need to institute measures to address the issue. *doi: 10.1136/bmjopen-2012-001721*

No.	Country	Topic	Citation	*Summary*
9	**GH**	● ●	Afukaar, F. 2003. Speed control in developing countries: issues, challenges and opportunities in reducing road traffic injuries. *Injury Control and Safety Promotion*, 10(1-2), 77-81.	Speed has been determined to be one of the most common contributing factors in vehicle crashes. This study explores vehicle speed as a factor in the causation of road traffic crashes, using the example of Ghana. It examines the effectiveness of various speed control measures, based on police-reported traffic crashes in Ghana and published works on speed control measures in both industrialized and developing countries. In Ghana, pedestrians were the main victims of road traffic injuries. The dominant driver error assigned by traffic police was loss of control, with the underlying factor being excessive vehicle speeds. The 'speed factor' alone accounted for more than 50% of all Ghanaian road traffic crashes between 1998 and 2000. While the enforcement of speed limits by traffic police may not be affordable for most developing countries, rumble strips and speed humps were found to be effective on Ghanaian roads. Rumble strips installed on the main Accra-Kumasi highway reduced crashes by about 35% and fatalities by about 55%. Reducing vehicle speeds may be one of the most effective interventions to stem traffic crashes in low-income countries. However, setting lower speed limits is not an effective intervention without the traffic law enforcement resources to ensure that limits are followed. Developing countries must also look to other speed reduction measures such as speed bumps and rumble strips, roads that segregate high- and low-speed users, and technological solutions such as speed governors, as well as greater public awareness of the problem. *http://www.ncbi.nlm.nih.gov/pubmed/12772489*
10	**GH**	● ●	Afukaar, F., Antwi, P., Ofosu-Amaah, S., 2003. Pattern of road traffic injuries in Ghana: implications for control. *Injury Control and Safety Promotion,* 10(1-2), 69-76.	Road traffic injuries and fatalities are increasing in Ghana. Police-collected crash and injury data for the period 1994-1998 were aggregated and analyzed using the MAAP5 accident analysis package developed by the Transport Research Laboratory, U.K. Published results of recent transport-related epidemiological and other surveys provided an additional data source. According to the 1994-1998 police data, road traffic crashes were a leading cause of death and injuries in Ghana. The other leading causes of death and injuries are occupational injuries which involve non-mechanized farming and tribal conflicts. The majority of road traffic fatalities (61.2%) and injuries (52.3%) occurred on roads in rural areas. About 58% more people died on roads in the rural areas than in urban areas, and generally more severe crashes occurred on rural roads compared with urban areas. Pedestrians accounted for 46.2% of all road traffic fatalities. The majority of these (66.8%) occurred in urban areas. The second leading population of road users affected was riders in passenger-ferrying buses, minibuses and trucks. The majority of these (42.8%) were killed on roads that pass through rural areas. Pedestrian casualties were overrepresented (nearly 90%) in five regions located in the southern half of the country. Efforts to tackle pedestrian safety should focus on the five regions of the country where most pedestrian fatalities occur in urban areas. Policies are also needed to protect passengers in commercially operated passenger-ferrying buses, minibuses and trucks because these vehicles carry a higher risk of being involved in fatal crashes. *http://www.ncbi.nlm.nih.gov/pubmed/12772488*
11	**GH**	● ●	Afukaar, F., Damsere-Derry, J. 2010. Evaluation of speed humps on pedestrian injuries in Ghana. *Injury Prevention,* 16. A205-A206.	To evaluate the effectiveness of speed humps in reducing pedestrian crashes at selected settlements located along the Konongo-Kumasi highway. The study adopted before and after comparison of police reported casualty crashes at six treated sites. The crash data for the evaluation was obtained from the National Road Accident Database which is maintained through the use of the Micro-computer Accident Analysis Package (MAAP) software. Unobtrusive vehicles speeds were also measured with the aid of radar speed gun. The speed humps are effective in reducing casualty crash frequencies by 37.5%, fatal crashes by 46% and pedestrian crashes by 72%. Generally, road traffic crashes reduced both in number and severity at the treated sites. On average, there has been an annual pedestrian crash reduction of 3.25 fatal crashes, 2.75 serious injury crashes and 0.25 minor injury crashes; resulting in an annual reduction in pedestrian casualties of 63%. The average vehicle speeds established to be between 71 km/h and 87 km/h before installation of the speed humps reduced considerably to an average of between 32 km/h and 36 km/h after installation. Speed humps are effective in reducing pedestrian crashes in settlements located along the interurban highway. The speed humps are able to lower the average speeds of vehicles to levels below the 50 km/h posted speed limit desirable for settlements. The results are useful for black spots management in settlement areas and for strategic road safety investments. *doi:10.1136/ip.2010.029215.733*

No.	Country	Topic	Citation	*Summary*
12	**GH**		Aidoo, E., Amoh-Gyimah, R., Ackaah. 2013. The effect of road and environmental characteristics on pedestrian hit-and-run accidents in Ghana. *Accident Analysis and Prevention*, 53, 23-27.	The number of pedestrians who have died as a result of being hit by vehicles has increased in recent years, in addition to vehicle passenger deaths. Many pedestrians who were involved in road traffic accident died as a result of the driver leaving the pedestrian who was struck unattended at the scene of the accident. This paper seeks to determine the effect of road and environmental characteristics on pedestrian hit-and-run accidents in Ghana. Using pedestrian accident data extracted from the National Road Traffic Accident Database at the Building and Road Research Institute (BRRI) of the Council for Scientific and Industrial Research (CSIR), Ghana, a binary logit model was employed in the analysis. The results from the estimated model indicate that fatal accidents, unclear weather, nighttime conditions, and straight and flat road sections without medians and junctions significantly increase the likelihood that the vehicle driver will leave the scene after hitting a pedestrian. Thus, integrating median separation and speed humps into road design and construction and installing street lights will help to curb the problem of pedestrian hit-and-run accidents in Ghana. *doi.org/10.1016/j.aap.2012.12.021*
13	**KE**		Airey, T. 1991. The influence of road construction on the health care behaviour of rural households in the Meru district of Kenya. *Transport Reviews*, 11, 273-290.	This paper examines the effects of road improvements on the utilization of three hospitals in Kenya. Three hypotheses, which assume that road improvements will intensify the use of health facilities, expand the catchment areas of health facilities and widen individual choice and use of health facilities, are tested. The main impact of the new road has been confined to changes in the geographical accessibility, bringing more people within easy travelling distance of the three hospitals. However, only a small number of the sampled households show any sign of being strongly influenced by such change. In particular, it is the wealthy minority that show the greater sensitivity to the shrinkage of distance brought about by the new road. For the majority, hospital choice seems to be conditioned by a range of factors, notably cost of treatment, religious affiliation and attitudes to the efficacy of each health care system. These influences were in existence before the new road and operate independent of it. *doi:10.1080/01441649108716788*
14	**BF**		Allegri, M., Ridde, V., Louis, V., Sarker, M., Tiendrebéogo, J., Yé, M., Müller, O., Jahn, A. 2011. Determinants of utilization of maternal care services after the reduction of user fees: A case study from rural Burkina Faso. *Health Policy*. 99, 201-218.	To identify determinants of utilisation for antenatal care (ANC) and skilled attendance at birth after a substantial reduction in user fees. The study was conducted in the Nouna Health District in north-western Burkina Faso in early 2009. Data was collected by means of a representative survey on a sample of 435 women who reported a pregnancy in the prior 12 months. Two independent logit models were used to assess the determinants of (a) ANC utilisation (defined as having attended at least 3 visits) and (b) skilled assistance at birth (defined as having delivered in a health facility).76% of women had attended at least 3 ANC visits and 72% had delivered in a facility. Living within 5 km from a facility was positively associated, while animist religion, some ethnicities, and household wealth were negatively associated with ANC utilisation. Some ethnicities, living within 5 km from a health facility, and having attended at least 3 ANC visits were positively associated with delivering in a facility. User fee alleviation secured equitable access to care across socio-economic groups, but alone did not ensure that all women benefited from ANC and from skilled attendance at birth. Investments in policies to address barriers beyond financial ones are urgently needed. *doi: 10.1016/j.healthpol.2010.10.010.*

No.	Country	Topic	Citation	*Summary*
15			Alonge, O., Hyder, A. 2013. Reducing the global burden of childhood unintentional injuries. *Archives of Disease in Childhood*. 99, 62-69.	Among 1–19-year olds, unintentional injuries accounted for 12% of 5.1 million global deaths from injuries in 2010. Despite this high burden, childhood injuries have not received much attention in global health. This paper describes the major causes of deaths from childhood unintentional injuries and provides a review of interventions for reducing this burden. About 627 741 deaths were due to unintentional injuries in 2010 among 1–19-year olds. The proportionate mortality increased with age—from 12.6% among 1–4-year olds to 28.8% among 15–19-year olds. Deaths from Western sub-Saharan Africa and South Asia accounted for more than 50% of all deaths. Rates in these regions are 68.0 and 36.4 per 100 000 population, respectively, compared to 6.4 in Western Europe. Road traffic injuries (RTI) are the commonest cause of death, followed by deaths from drowning, burns and falls. Male children are more predisposed to unintentional injuries except for burns which occur more frequently among females in low and middle income countries (LMICs). Effective solutions exist—including barriers for preventing drowning; safer stoves for burns; child restraint systems for RTI—but the effectiveness of these measures need to be rigorously tested in LMICs. The general lack of a coordinated global response to the burden of childhood unintentional injuries is of concern. The global community must create stronger coalitions and national or local plans for action. Death rates for this paper may have been underestimated, and there is need for longitudinal studies to accurately measure the impact of injuries in LMICs. *doi:10.1136/archdischild-2013-304177*
16	**GH**		Akaateba, M., Amoh-Gyimah, R., Yakubu, I. 2014. A cross-sectional observational study of helmet use among motorcyclists in Wa, Ghana. *Accident Analysis and Prevention*, 64, 18-22.	Motorcyclists' injuries and fatalities are a major public health concern in many developing countries including Ghana. This study therefore aimed to investigate the prevalence of helmet use among motorcyclists in Wa, Ghana. The method used involved a cross-sectional roadside observation at 12 randomly selected sites within and outside the CBD of Wa. A total of 14,467 motorcyclists made up of 11,360 riders and 3107 pillion riders were observed during the study period. Most observed riders (86.5%) and pillion riders (61.7%) were males. The overall prevalence of helmet use among the observed motorcyclists was 36.9% (95% CI: 36.1-37.7). Helmet use for riders was 45.8% (95% CI: 44.8-46.7) whilst that for pillion riders was 3.7% (95 Cl: 3.0-4.4). Based on logistic regression analysis, higher helmet wearing rates were found to be significantly associated with female gender, weekdays, morning periods and at locations within the CBD. Riders at locations outside the CBD were about 7 times less likely to wear a helmet than riders within the CBD (48.9% compared to 42.3%; chi(2)((1)) = 49.526; p<0.001). The study concluded that despite the existence of a national helmet legislation that mandates the use of helmets by both riders and pillion riders on all roads in Ghana, helmet use is generally low in Wa. This suggests that all stakeholders in road safety should jointly intensify education on helmet use and pursue rigorous enforcement on all road types especially at locations outside the CBD to improve helmet use in Wa. doi*: 10.1016/j.aap.2013.11.008*
17	**ET**		Akloweg, Y., Hayshi, Y., Kato, H. 2011. The Effect of Used Cars on African Road Traffic Accidents: a Case Study of Addis Ababa, Ethiopia. *International Journal of Urban Sciences,* 15(1), 61-69.	This paper discusses the relationship between road traffic accidents and service of used cars. As a result of a poor traffic documentation system and a lack of attention given to road accidents in Africa, transport researchers have not addressed the problem in as much depth when compared to other causes of morbidity such as HIV, malaria, etc. Thus, this study provides an overview on used cars and their impact on road traffic accidents. It concludes by making policy recommendations that focus mainly on strict enforcement of vehicle pre-shipment inspection and a compulsory insurance requirement to minimize road morbidity and mortality caused by aged vehicles. Because it is a global issue, this paper also suggests big automakers cooperate in the refurbishment of used cars before deportation to developing countries by following proper inspection checklists. *doi: 10.1080/12265934.2011.580153*

No.	Country	Topic	Citation	Summary
18	**ZA**		Albers, P., Wright, C., Olwoch, J. 2010. Developing a South African Pedestrian Environment Assessment Tool: Tshwane Case Study. *South African Journal of Science*, 106(9-10), 23-30.	Pedestrians, comprising approximately 60% of the population, are among the most vulnerable road users in South Africa. The roadside environment may be an important factor influencing the nature and frequency of pedestrian fatalities. While there are audit tools for assessing the pedestrian environment in other countries, no such tool exists for South Africa. This study evaluated existing audit tools in relation to South African issues and conditions and developed a South African Pedestrian Environment Assessment Tool (PEAT). PEAT was tested at five sites in the Tshwane Metropolitan Area in Gauteng to assess its applicability. PEAT was simple to use and provided valuable information, however, appropriate measures need to be taken to address fieldworker security, especially for night-time assessments when several roadside factors, such as lighting, should be evaluated. Although it was not the focus of our study, based on our results, we suggest that the lack of pavements, pedestrian crossings and pedestrian lighting are factors that, potentially, could increase pedestrian vulnerability. *zdoi: 10.4102/sajs.v106i9/10.187*
19			Ameratunga, S., Hijar, M., Norton, R. 2006. Road-traffic injuries: confronting disparities to address a global-health problem. *The Lancet*, 367(9521), 1533-1540.	Evidence suggests that the present and projected global burden of road-traffic injuries is disproportionately borne by countries that can least afford to meet the health service, economic, and societal challenges posed. Although the evidence base on which these estimates are made remains somewhat precarious in view of the limited data systems in most low-income and middle-income countries (as per the classification on the World Bank website), these projections highlight the essential need to address road-traffic injuries as a public-health priority. Most well-evaluated effective interventions do not directly focus on efforts to protect vulnerable road users, such as motorcyclists and pedestrians. Yet, these groups comprise the majority of road-traffic victims in low-income and middle-income countries, and consequently, the majority of the road-traffic victims globally. Appropriately responding to these disparities in available evidence and prevention efforts is necessary if we are to comprehensively address this global-health dilemma. doi:10.1016/S0140-6736(06)68654-6
20			Anenberg, S., Horowitz, L., Tong, D., West, J. 2010. An Estimate of the Global Burden of Anthropogenic Ozone and Fine Particulate Matter on Premature Human Mortality Using Atmospheric Modeling. *Environmental Health Persepectives*, 118(9), 1189-1195.	Ground-level concentrations of ozone (O_3) and fine particulate matter [≤ 2.5 μm in aerodynamic diameter ($PM_{2.5}$)] have increased since preindustrial times in urban and rural regions and are associated with cardiovascular and respiratory mortality. We estimated the global burden of mortality due to O_3 and $PM_{2.5}$ from anthropogenic emissions using global atmospheric chemical transport model simulations of preindustrial and present-day (2000) concentrations to derive exposure estimates. Attributable mortalities were estimated using health impact functions based on long-term relative risk estimates for O_3 and $PM_{2.5}$ from the epidemiology literature. Using simulated concentrations rather than previous methods based on measurements allows the inclusion of rural areas where measurements are often unavailable and avoids making assumptions for background air pollution. Anthropogenic O_3 was associated with an estimated 0.7 ± 0.3 million respiratory mortalities (6.3 ± 3.0 million years of life lost) annually. Anthropogenic $PM_{2.5}$ was associated with 3.5 ± 0.9 million cardiopulmonary and 220,000 ± 80,000 lung cancer mortalities (30 ± 7.6 million years of life lost) annually. Mortality estimates were reduced approximately 30% when we assumed low-concentration thresholds of 33.3 ppb for O_3 and 5.8 $\mu g/m^3$ for $PM_{2.5}$. These estimates were sensitive to concentration thresholds and concentration–mortality relationships, often by > 50%. Anthropogenic O_3 and $PM_{2.5}$ contribute substantially to global premature mortality. $PM_{2.5}$ mortality estimates are about 50% higher than previous measurement-based estimates based on common assumptions, mainly because of methodologic differences. Specifically, we included rural populations, suggesting higher estimates; however, the coarse resolution of the global atmospheric model may underestimate urban $PM_{2.5}$ exposures. *doi: 10.1289/ehp.0901220*
21	**ZA**		Anesh, S., Jones, A., Love, B., Haynes, R. 2011. Temporal variations in road traffic fatalities in South Africa. *Accident Analysis and Prevention*, 43(1), 331-340.	The annual road traffic fatality (RTF) burden of 43 deaths per 100000 inhabitants in South Africa (SA) is disproportionately high in comparison to the world average of 22 per 100000 population. Recent research revealed strong geographical variations across district councils in the country, as well as a substantial peak in mortality occurring during December. In this study, the factors that explain temporal variations in RTFs in SA are examined. Using weekly data from the period 2002-2006 for the country's nine provinces, non-linear auto-regression exogenous (NARX) regression models were fitted to explain variations in RTFs and to assess the degree to which the variations between the provinces were associated with the temporal variations in risk factors. Results suggest that a proportion of the variations in weekly RTFs could be explained by factors other than the size of the province population, with both temporal and between-province residual variance remaining after accounting for the modelled risks. *doi:10.1016/j.aap.2010.09.012*

No.	Country	Topic	Citation	Summary
22	**NG**		Arosanyin, G., Olowosulu, A., Oyeyemi, G. 2013. An examination of some safety issues among commercial motorcyclists in Nigeria: a case study. *International Journal of Injury Control and Safety Promotion*, 20(2), 103-110.	The reduction of road crashes and injuries among motorcyclists in Nigeria requires a system inquiry into some safety issues at pre-crash, crash and post-crash stages to guide action plans. This paper examines safety issues such as age restriction, motorcycle engine capacity, highway code awareness, licence holding, helmet usage, crash involvement, rescue and payment for treatment among commercial motorcyclists. The primary data derived from a structured questionnaire administered to 334 commercial motorcyclists in Samaru, Zaria were analysed using descriptive statistics and logistic regression technique. There was total compliance with age restriction and motorcycle engine capacity. About 41.8% of the operators were not aware of the existence of the highway code. The odds of licence holding increased with highway code awareness, education with above senior secondary as the reference category and earnings. The odds of crash involvement decreased with highway code awareness, earnings and mode of operation. About 84% of the motorcyclists did not use crash helmet, in spite of being aware of the benefit, and 65.4% of motorcycle crashes was found to be with other road users. The promotion of safety among motorcyclists therefore requires strict traffic law enforcement and modification of road design to segregate traffic and protect pedestrians. *doi:10.1080/17457300.2012.686040*
23	**BF** **ML** **TD**		Assamoi, E., Liousse, C. 2010. A new inventory for two-wheel vehicle emissions in West Africa for 2002. *Atmospheric Environment*, 44(32), 3985-3996.	Rather surprisingly, urban atmospheric particulate levels in West Africa compare with measured concentrations in Europe and Asia megacities This pollution mainly derives from road traffic emissions with, in some capitals (e.g. Cotonou), the strong contribution of two-wheel vehicles. Two key questions arise: are presently available emission inventories. A global emission inventory of carbonaceous aerosol from historic records of fossil fuel and biofuel consumption for the period 1860-1997. A technology-based global inventory of black and organic carbon emissions from combustion. The aim of this paper is to develop a methodology to estimate emissions produced by two-wheel vehicles in West Africa for 2002 in a context where reliable information is hardly available. Fuel consumption ratios between two-wheel engines (in this work) and all vehicles issued from UN are as high as 169%, 264% and 628%, for Burkina Faso, Mali and Chad respectively, indicating that this global database does not properly account for regional specificities. Moreover, emission factors for black carbon (BC) and primary organic carbon (OCp) have been measured for two-stroke engines in Benin. New emission factor estimates for biofuels and mobile sources. Atmospheric Environment, in press.), giving significantly higher values than in Europe. This is particularly true for OCp, and consequently the calculated emissions for two-stroke engines are also significantly larger than total road traffic previously estimated in global inventories. The ensuing discussion illustrates the importance of two-stroke engines in the West Africa transport sector and the strong need for inventory updating. *doi:10.1016/j.atmosenv.2010.06.048*
24	**TZ**		Åstrøm, A., Moshiro, C., Hemed, Y., Heuch, I., Kvåle, G. 2006. Perceived susceptibility to and perceived causes of road traffic injuries in an urban and rural area of Tanzania. *Accident Analysis & Prevention*, 38(1), 54–62.	The aim of the study was to investigate social and behavioral correlates of perceived vulnerability to traffic injuries in an urban and rural setting in Tanzania. In 2002, a sample of 494 adults aged 15 years and above participated in household interviews in Dar es Salaam (urban) and Hai District (rural). The study was part of a population-based survey that collected self-report data on non-fatal injuries. In Dar es Salaam 75 and 82% of males and females, respectively, perceived it as likely that they would experience a traffic injury in general. The corresponding figures in Hai were 63 and 64%. Men rated their road traffic vulnerability similarly to women (OR = 0.8, 95% CI 0.5–1.3). Factors associated with high perceived vulnerability as a pedestrian or being injured by a bicycle were amount of road safety information received from health workers and friends, having caused a car to swerve and having crossed a road while talking. Respondents perceived driver recklessness and driver drunkenness as the leading causes of traffic injuries in both areas. Differences were found between the urban and rural setting with respect to perceived risk for traffic injury. The implications of these findings in the context of traffic injury prevention are discussed. *doi: 10.1016/j.aap.2005.06.022*

No.	Country	Topic	Citation	Summary
25	**KE**	● ●	Azetsop, J. 2010. Social Justice Approach to Road Safety in Kenya: Addressing the Uneven Distribution of Road Traffic Injuries and Deaths across Population Groups. *Public Health Ethics*, 3(2) 115-127.	Road traffic injury and deaths (RTID) are an important public health problem in Kenya, primarily affecting uneducated and disenfranchised people from lower socioeconomic groups. Studies conducted by Kenyan experts from police reports and surveys have shown that pedestrian and driver behaviors are the most important proximal causes of crashes, signifying that the occurrence of crashes results directly from human action. However, behaviors and risk factors do not fully explain the magnitude of RTID neither does it account for socioeconomic gradient in RTID. Instead, a social justice approach to RTID highlights the need for emphasizing distal causal factors. They allow us to understand how social inequities determine risk for RTID. Hence, designing policies that focus on behaviors will simply mask the underlying systemic causes of this growing phenomenon. To eradicate the RTID and address the gradient, a broader policy framework that includes the social dimension of injury, a strong political will to address the underlying causes of RTID and an effective partnership with stakeholders needs to be developed. *doi: 10.1093/phe/phq013*
26	**KE**	● ● ●	Bachani, A., Hung, Y., Mogere, S., Akungah, D., Nyamari, J., Stevens, K., Hyder, A. 2013. Prevalence, knowledge, attitude and practice of speeding in two districts in Kenya: Thika and Naivasha. *Injury-International Journal Of The Care Of The Injured*, 44(Supplement 4), S24-S30.	In Kenya, RTIs had the second highest increase in disability-adjusted life years between 1990 and 2010, compared to other conditions. This study aims to determine the prevalence, knowledge, attitudes and practices for speeding in Thika and Naivasha districts in Kenya. Direct observations of vehicle speed were conducted at various times during the day and different days of the week on six roads selected based on a multi-stage sampling method in two districts to determine the prevalence of speeding. Roadside KAP interviews were administered to drivers, at motorcycle bays, petrol stations, and rest areas. Eight rounds of speed observations and four rounds of KAP interviews were conducted between July 2010 and November 2012. Results from the speeding observational studies show an overall high proportion of vehicles speeding above posted limits in both districts, with an average of 46.8% in Thika and 40.2% in Naivasha. Trend analysis revealed a greater decline in this prevalence in Thika (OR: 0.804, 95% CI: 0.793-0.814) than in Naivasha (OR: 0.932, 95% CI: 0.919-0.945) over the study period. On average, 58.8% of speeding vehicles in Thika and 57.2% of speeding vehicles in Naivasha travelled at 10 km/h or higher above speed limit. While the majority of respondents agreed that speeding is a cause of road traffic crashes in both Thika (70.3%) and Naivasha (68.7%), knowledge of speed limits at the location of the interview was limited. Enforcement levels also remained low, but subsequent rounds of data collection showed improvement, especially in Thika. This study demonstrates an improvement in the prevalence of speeding in two districts of Kenya over 2010-2012. It also highlights the need for further action to be taken to address the problem, and represents new data on speeding in Kenya and Africa. *doi: 10.1016/S0020-1383(13)70209-2*
27	**ZA**	●	Bachoo, S., Bhagwanjee, A., Govender, K. 2013. The influence of anger, impulsivity, sensation seeking and driver attitudes on risky driving behaviour among post-graduate university students in Durban, South Africa. *Accident Analysis And Prevention*, 55, 67-76.	Road traffic accidents (RTAs) constitute a serious global health risk, and evidence suggests that young drivers are significantly overrepresented among those injured or killed in RTAs. This study explores the role of anger, impulsivity, sensation seeking and driver attitudes as correlates for risky driving practices among drivers, drawing comparisons between age and gender. The study used a cross-sectional survey design, with a sample of 306 post-graduate university students from two universities in Durban, South Africa, who completed the self-administered questionnaire. The results indicate that drivers with higher driver anger, sensation seeking, urgency, and with a lack of premeditation and perseverance in daily activities were statistically more likely to report riskier driving acts. Males reported significantly more acts of risky driving behaviour (RDB) than females. Driver attitudes significantly predicted self-reported acts of RDB on most indicators. Older drivers (25 years and older) had safer driver attitudes and a lower sense of sensation seeking and urgency in life. Interventions targeting young drivers, which focus on impeding the manifestation of anger, impulsivity and sensation seeking are recommended. Also, the empirical support for the attitude-behaviour hypothesis evidenced in this study vindicates the development or continuation of interventions that focus on this dynamic. *doi: 10.1016/j.aap.2013.02.021*

No.	Country	Topic	Citation	Summary
28	**ET**		Benegusenga, A. 2008. How The "Ingobyi" as a Means of Transporting Patients in Rural Areas Affects Maternal Health "The Case Of Gastsibo District - Rwanda". Rwandan Forum on Rural Transport and Development. Kigali, RW.	The availability of transport infrastructure in rural areas is a major constraint for the Rwandan poor. Average national distance from a main road is roughly 4.1km and general varies between 0 and 20 km. Despite huge investments in transport infrastructure, most motorized vehicle transport services are concentrated in and around the major urban centres notably along the tarred national highways. Although the health infrastructure is well developed, most health indicators in Rwanda are quite mediocre compared to the average in sub Saharan countries. Malaria, AIDS, tuberculosis, intestinal parasites, acute respiratory infections, diarrhoea-related illnesses, malnutrition, reproductory health illnesses are the major causes of morbity and mortality in the country. Generally, most of these illnesses, particularly malaria, affect pregnant women. The current maternal death rate is about 750 per 100 000 live births. Only one out of five women has adequate access to antenatal care and only three out of ten of them are delivered by a qualified staff. This situation results in pregnancy- and birth-related complications. In rural areas, the distance and means of transport to get to a health facility are some of the factors that limit women's access to health care. This study is aimed at examining the use of ingobyi as a means of transporting patients in rural areas and its positive or negative impacts on the health of pregnant women. The study is an analysis of the use of the ingobyi compared to other transport means, the management of this transport system, its negative impacts on the health of the passengers (pregnant women) and their causes. *http://www.mobilityandhealth.org/case/case_af.php*
29	**ET**		Berhanu G. 2004. Models relating traffic safety with road environment and traffic flows on arterial roads in Addis Ababa. Accident Analysis & Prevention, 36(5), 697–704.	This paper presents the study carried out to develop accident predictive models based on the data collected on arterial roads in Addis Ababa. Poisson and negative binomial regression methods were used to relate the discrete accident data with the road and traffic flow explanatory variables. Significant accident predictive models were found with a number of significant explanatory variables. The results show that the existing inadequate road infrastructure and poor road traffic operations are the potential contributors of this ever-growing challenge of the road transport in Addis Ababa. The results also indicate that improvements in roadway width, pedestrian facilities, and access management are effective in reducing road traffic accidents. *doi:10.1016/j.aap.2003.05.002*
30	**ET**		Berhanu, T., Liyew, T., Gobezie, A. 2008. *Research on Mobility and Health. Safe Transport of Critical Patients in Rural Ethiopia.* Ethiopia National Forum for Rural Transport and Development, Addis, Ababa, ET.	The study was undertaken in the Oromia region, in four small towns where the health establishments cater services to the rural community. The farthest research area is about 75 kms away from the capital city of the country, Addis Ababa. The research does not claim to have a thorough and an in-depth quantitative and qualitative study with adequate primary and secondary data commensurate to the size of the landmass and population of the country. Rather, the study is more of an exploratory nature based on observation and the use of the available scientific knowledge of the industrialized nations. Due to lack of data in the country's health establishments about the effects of unsafe transport on health, empirical evidences gathered from literature review, interviews of health professionals, transport operators, transport users and observations were instrumental in the analysis of the research. *http://www.mobilityandhealth.org/case/MobilityandHealth_finalreport_Ethiopia_SafeTransport.pdf*
31	**ET**		Beshah, T., Ejigu, D., Abraham, A., Kroemer, P., Snasel, V. 2012. Knowledge Discovery from Road Traffic Accident Data in Ethiopia: Data Quality, Ensembling and Trend Analysis for Improving Road Safety. *Neural Network World*, 22(3), 215-244.	Descriptive analysis of the magnitude and situation of road safety in general and road accidents in particular is important, but understanding of data quality, factors related with dangerous situations and various interesting patterns in data is of even greater importance. Under the umbrella of information architecture research for road safety in developing countries, the objective of this machine learning experimental research is to explore data quality issues, analyze trends and predict the role of road users on possible injury risks. The research employed Tree Net, Classification and Adaptive Regression Trees (CART), Random Forest (RF) and hybrid ensemble approach. To identify relevant patterns and illustrate the performance of the techniques for the road safety domain, road accident data collected from Addis Ababa Traffic Office is subject to several analyses. Empirical results illustrate that data quality is a major problem that needs architectural guideline and the prototype models could classify accidents with promising accuracy. In addition, an ensemble technique proves to be better in terms of predictive accuracy in the domain under study. *http://ias04.softcomputing.net/nnw2012_tibebe.pdf*

No.	Country	Topic	Citation	Summary
32	**ZA**		Beukes, E., Vanderschuren, M., Zuidgeest, M. 2011. Context sensitive multimodal road planning: a case study in Cape Town, South Africa. *Journal Of Transport Geography*, 19(3), 452-460.	Road planning practice relies almost exclusively on parameters related to traffic factors, such as private vehicle speeds and volumes. In many developing countries the requirements for public transport and non-motorised transport are not explicitly integrated into the planning process, despite the fact that these form the primary mode of transport for the majority of the population. This affects the mobility opportunities for these sectors of the population and contributes to poor road safety, especially with regards to pedestrians. The research outlined in the paper posits that, in order to assess the usage and needs of the road holistically, other factors related to the adjacent land uses, socio-economic characteristics of the population the road serves, and the environmental context within which the road is located, factors heavily in how the road is used and should, therefore, be considered within the planning process. The paper describes a methodology to include these factors in the planning of roads. The method attempts to prioritise amongst the five primary road based modes (public transport, car, freight, walking and cycling) based upon a combination of traffic and non-traffic factors. The method employed uses a geographic information system (GIS) based spatial multiple criteria evaluation (SMCE) model with inputs from widely available data sources such as census, household travel surveys, land use and environmental data to arrive at solutions for modal priorities. A case study is conducted along an arterial route in Cape Town, South Africa, providing infrastructure planning recommendations and audit possibilities for the future. Since weighting is an important driver in the SMCE process, a sensitivity analysis is conducted to investigate the effect of alternative weighting schemes on the outputs from the method. *doi: 10.1016/j.jtrangeo.2010.08.014*
33	**GH**		Bhalla, K., Adofo, K., Mock, C., Afukaar, F., Appiah, N., Ebel, B. 2012. Non-traditional data sources for injury control: an agenda for action in Ghana. *Injury Prevention*, 18(4).	The article discusses the benefits of using non-traditional information sources for enhancing the quality and availability of injury related statistics in low and middle income countries (LMICs) by taking Ghana as an example. Vital registration (VR) systems, mortuary surveillance, health and demographic surveillance sites (HDSS) and use of national household surveys are some approaches that are discussed. *doi: 10.1136/injuryprev-2012-040410.*
34	**SL**		Bhopal, S., Halpin, S., Gerein, N. 2013. Emergency Obstetric Referral in Rural Sierra Leone: What Can Motorbike Ambulances Contribute? A Mixed-Methods Study. *Maternal and Child Health Journal*, 17(6), 1038-1043.	Giving birth remains a dangerous endeavour for many of the world's women. Progress to improve this has been slow in SSA. The second delay, where transport infrastructure is key in allowing a woman to reach care, has been a relatively neglected field of study. Six motorbike ambulances, specifically engineered for use on poor roads in resource-poor situations were provided in 2006 in an emergency referral system in rural Sierra Leone. The aim of this study was to evaluate the implementation of this referral system in terms of its use, acceptability and accessibility. Data were collected from usage records, and a series of interviews and focus groups conducted to provide deeper understanding of the service. A total of 130 records of patients being transported to a health facility were found, 1/3 of which were for obstetric cases. The ambulance is being used regularly to transport patients to a facility. It is well known to the communities, is acceptable and accessible, and is valued by those it serves. District-wide birth attendant training and the sensitisation activities provided a foundation for the introduction of the ambulance service, creating awareness of the service and its importance, particularly for women in labour. Motorbike ambulances are suited to remote areas and can function on poor roads. *doi: 10.1007/s10995-012-1086-8*

No.	Country	Topic	Citation	Summary
35	**UG**		Bishai, D., Asiimwe, B., Abbas, S., Hyder, A., Bazeyo, W. 2008. Cost-effectiveness of traffic enforcement: case study from Uganda. *Injury Prevention*, 14(4), 223-227.	In October 2004, the Ugandan Police department deployed enhanced traffic safety patrols on the four major roads to the capital Kampala. To assess the costs and potential effectiveness of increasing traffic enforcement in Uganda. Record review and key informant interviews were conducted at 10 police stations along the highways that were patrolled. Monthly data on traffic citations and casualties were reviewed for January 2001 to December 2005; time series (ARIMA) regression was used to assess for a statistically significant change in traffic deaths. Costs were computed from the perspective of the police department in $US 2005. Cost offsets from savings to the health sector were not included. The annual cost of deploying the four squads of traffic patrols is estimated at $72,000. Since deployment, the number of citations has increased substantially with a value of $327 311 annually. Monthly crash data pre- and post-intervention show a statistically significant 17% drop in road deaths after the intervention. The average cost-effectiveness of better road safety enforcement in Uganda is $603 per death averted or $27 per life year saved discounted at 3). The costs of traffic safety enforcement are low in comparison to the potential number of lives saved and revenue generated. Increasing enforcement of existing traffic safety norms can be a cost-effective public health intervention in low-income countries. *doi: 10.1136/ip.2008.018341*
36	**NE**		Blanford, J., Kumar, S., Luo, W., MacEachren, A. 2012. It's a long, long walk: accessibility to hospitals, maternity and integrated health centers in Niger. *International Journal of Health Geographics*, 11(24).	Ease of access to health care is of great importance in any country but particularly in countries such as Niger where restricted access can put people at risk of mortality from diseases such as measles, meningitis, polio, pneumonia and malaria. This paper analyzes the physical access to health facilities within Niger with an emphasis on the effect of seasonal conditions and the implications of these conditions in terms of availability of adequate health services, provision of drugs and vaccinations. The majority of the transport within Niger is pedestrian, thus the paper emphasizes access by those walking to facilities for care. Further analysis compared the change in accessibility for vehicular travel since public health workers do travel by vehicle when carrying out vaccination campaigns and related proactive health care activities. The majority of the roads in Niger are non-paved (90%). Six districts, mainly in the region of Tahoua lack medical facilities. Patient to health facility ratios were best in Agadez with 7000 people served per health facility. During the dry season 39% of the population was within 1-hours walk to a health center, with the percentage decreasing to 24% during the wet season. Further analyses revealed that vaccination rates were strongly correlated with distance. Children living in clusters within 1-hour of a health center had 1.88 times higher odds of complete vaccination by age 1-year compared to children living in clusters further from a health center ($p < 0.05$). Three key geographic areas were highlighted where access to health centers took greater than 4 h walk during the wet and dry season. Access for more than 730,000 people can be improved in these areas with the addition of 17 health facilities to the current total of 504 during the dry season. This study highlights critical areas in Niger where health services/facilities are lacking. A second finding is that population served by health facilities will be severely overestimated if assessments are solely conducted during the dry season. Mapped outputs can be used for future decision making processes and analysis. *doi: 10.1186/1476-072X-11-24*
37			Both, A., Westerdahl, D., Fruin, S., Haryanto, B., Marshall, J. 2013. Exposure to carbon monoxide, fine particle mass, and ultrafine particle number in Jakarta, Indonesia: Effect of commute mode. *Science of the Total Environment*, 443, 965-972.	Rreal-time exposure to PM2.5, ultrafine PM (particle number) and carbon monoxide (CO) for commuting workers school children, and traffic police, in Jakarta, Indonesia. In total, we measured exposures for 36 individuals covering 93 days. Mean concentrations were higher in public transport than in private cars for PM2.5 and particle counts (54%), but not CO, likely reflecting in-vehicle particle losses in private cars owing to air-conditioning. However, average commute times were longer for private car commuters than public transport commuters Commute and traffic-related exposures experienced by Jakarta residents are among the highest in the world, owing to high on-road concentrations and multi-hour commutes. *doi: 10.1016/j.scitotenv.2012.10.082*

No.	Country	Topic	Citation	Summary
38			Bradbury, A., Quimby, A., 2008. Community road safety education: an international perspective. *Proceedings of The Institution of Civil Engineers-Municipal Engineer*, 161(2), 137-143.	The World Health Organisation forecasts that road crashes will be the third most frequent cause of death and disability worldwide by 2020. More than a million people are killed on the roads every year, with 85% of road traffic deaths and injuries occurring in low-income countries. Non-motorised road users are particularly at risk-500 children die every day inroadcrashes and in many developing countries 40-50% of those killed in road crashes are pedestrians. The UK Department for International Development (DFID) has a long history of commissioning research into improved road safety, including the development of road safety education (RSE) resource materials for use in the school curriculum. However, it is widely recognised that in developing countries not all children attend school, that parents and other members of the community have a significant influence on the behaviour of children and that adults themselves may not have benefited from any formal education. DFID's developing emphasis on poverty, livelihoods and sustainability issues suggested the need for a broader 'community' approach to road user education. This paper provides a review of such programmes, comparing developed with developing country practices, and a summary of empirical research undertaken in Africa and Asia using 'participatory' research techniques to test the effectiveness and durability of community RSE programmes, especially among high-risk vulnerable road users. *doi: 10.1680/muen.2008.161.2.137*
39	**RW**		Brown, H. 2007. Rwanda's road-safety transformation. *Bulletin of the World Health Organization*, 85(6), 425-426.	The article presents information about how road safety was improved in Rwanda. A World Bank situation report released in 1996 highlighted poor road safety in the country. Several people died in the accidents every year. Most of the accidents were caused by reckless drivers who refused to respect others' right of way. The World Bank found the number of road deaths in Rwanda to be among the world's highest in 1996. The Rawandan government started a road-safety programme after examining the World Bank situation report. http://www.who.int/bulletin/volumes/85/6/07-010607/en/
40			Bryceson, D. 1993. Rural household transport in Africa: Reducing the burden on women? *World Development*, 31 (11), 1715-1728.	Rural household travel patterns have been largely ignored in African transport studies. Over the past 10 years, however, village-level surveys have been undertaken which reveal the predominance of female porterage in rural transport. Donor agencies are now focusing efforts on "appropriate" technology interventions to directly enhance rural mobility and to indirectly improve agricultural productivity. Preliminary evidence, however, suggests that men rather than women are the main beneficiaries of appropriate transport technology. This paper asks why and suggests a number of methodological refinements to future rural transport studies to generate the information necessary for devising programs with a higher likelihood of effective assistance to rural women transporters. *doi: 10.1016/0305-750X(93)90079-O*
41	**UG ZW**		Bryceson, D., Mbara, T., Maunder, D. 2003. Livelihoods, daily mobility and poverty in sub-saharan Africa. *Transport Reviews*, 23(2),177-196.	Based on research funded by the UK Department for International Development, this paper investigates the utility of a livelihoods approach in identifying the mobility and accessibility needs of the poor. Mobility patterns and livelihoods of stratified samples of households in urban-to-rural corridors originating in the national capital cities of Zimbabwe and Uganda are compared, with emphasis on the poor's position relative to higher income groups. It is found that livelihood work was the most frequent purpose of short-distance travel for all income groups and localities, amounting to 38% of trip purposes in Uganda and 46% in Zimbabwe. On average, Zimbabweans were more mobile making more daily trips over longer distances reflective of greater reliance on motorized transport in the country. Nonetheless, walking dominates modal journeys in both countries. Ugandans display heavier dependence on bicycle and motorcycle transport primarily through taxi hire compared with Zimbabweans' private care and public kombi bus transport. Survey evidence suggests that Uganda's poor and middle-incomed urban and rural residents benefit from more widely available multimodal public transport. *doi: 10.1080/0144164032000068966*

No.	Country	Topic	Citation	Summary
42	**ET ZM**		Bryceson, D., Bradbury, A., Bradbury, T. 2008. Roads to poverty reduction? - Exploring rural roads' impact on mobility in Africa and Asia. *Development Policy Review*, 26(4), 459-482.	Within current poverty reduction programmes, focus on the social-welfare millennium development goals is widening to embrace a concern with infrastructural investment, particularly for remote areas. The previously popular assumption that rural disadvantage can be remedied by road-building is resurfacing. Using survey data from Ethiopia, Zambia and Vietnam, this article explores how effective such investment is in addressing mobility and social-service accessibility in rural areas. The findings indicate that, in extremely remote areas, road improvements may catalyse the expansion of social-service provision, as evidenced in Ethiopia. However, given the poor's relative lack of motor vehicles and ability to pay for public transport, they are, by no means, a sufficient condition for enhancing the mobility of the rural poor. *doi: 10.1111/j.1467-7679.2008.00418.x*
43			Buys, P., Deichmann, U., Wheeler, D. 2010. Road Network Upgrading and Overland Trade Expansion in Sub-Saharan Africa. *Journal Of African Economies*, 19(3), 399-432.	Recent research suggests that poor economic integration and isolation from regional and international markets have contributed significantly to poverty in Sub-Saharan Africa. Poor transport infrastructure and border restrictions are major deterrents to trade expansion which would stimulate economic growth and poverty reduction. Using spatial network analysis techniques and gravity trade model estimations, this paper quantifies the economics of upgrading a primary road network that connects the major urban areas in the region. The results indicate that continental network upgrading is worth serious consideration from an economic perspective. Our simulations suggest that overland trade among Sub-Saharan African countries might expand by about $250 billion over 15 years, with major direct and indirect benefits for the rural poor. Financing the programme would require about $20 billion for initial upgrading and $1 billion annually for maintenance. *doi: 10.1093/jae/ejq006*
44	**TZ**		Chalya, P. 2010. Motorcycle injuries as an emerging public health problem in Mwanza City, north-western, Tanzania. *Tanzanian Journal of Health Research*, 12(4), 214-221.	Road traffic crash is of growing public health importance worldwide contributing significantly to the global disease burden. There is paucity of published data on road traffic crashes in our local environment. This study was carried out to describe the injury characteristics and outcome of road traffic crash victims in our local setting and provide baseline data for establishment of prevention strategies as well as treatment protocols. This was a prospective hospital based study of road traffic crash victims carried out at Bugando Medical Centre in Northwestern Tanzania between March 2010 and February 2011. After informed consent to participate in the study, all patients were consecutively enrolled into the study. Data were collected using a pre-tested questionnaire and analyzed using SPSS computer software version 15.0. A total of 1678 road traffic crash victims were studied. Their male to female ratio was of 2.1:1. The patients ages ranged from 3 to 78 years with the mean and median of 29.45 (± 24.22) and 26.12 years respectively. The modal age group was 21-30 years, accounting for 52.1% patients. Students (58.8%) and businessmen (35.9%) were the majority of road traffic crash victims. Motorcycle (58.8%) was responsible for the majority of road traffic crashes. Musculoskeletal (60.5%) and the head (52.1%) were the most common body region injured. Open wounds (65.9%) and fractures (26.3%) were the most common type of injuries sustained. The majority of patients (80.3%) were treated surgically. Wound debridement was the most common procedure performed in 81.2% of the patients. The complication rate was 23.7%. The overall average length of hospital stay (LOS) was 23.5 ± 12.3 days. Mortality rate was 17.5%. According to multivariate logistic regression analysis, patients who had severe trauma (Kampala Trauma Score II ≤ 6) and those with long bone fractures stayed longer in the hospital and this was significant ($P < 0.001$) whereas the age of the patient, severe trauma (Kampala Trauma Score II ≤ 6), admission Systolic Blood Pressure < 90 mmHg and severe head injury (Glasgow Coma Score = 3-8) significantly influenced mortality ($P < 0.001$). Road traffic crashes constitute a major public health problem in our setting and contribute significantly to unacceptably high morbidity and mortality. Urgent preventive measures targeting at reducing the occurrence of road traffic crashes is necessary to reduce the morbidity and mortality resulting from these injuries. Early recognition and prompt treatment of road traffic injuries is essential for optimal patient outcome. doi:10.1186/1752-2897-6-1

No.	Country	Topic	Citation	Summary
45			Chen, G. 2010. Road traffic safety in African countries - status, trend, contributing factors, countermeasures and challenges. *International Journal of Injury Control and Safety Promotion*, 17(4), 247-255.	Road traffic crashes and injuries constitute a major health, economic and developmental challenge for many African countries. With only 4% of the world's motor vehicles, African roads witness more than 10% of the world total collision fatalities. With further motorisation, the number of road traffic crashes, injuries and fatalities are expected to grow. This study updates on the status, trends, causes, countermeasures and issues in traffic safety in African countries by reviewing studies published in the past 12 years. The study found that traffic fatalities continued its upward trend in recent years. Similar to those in motorised countries, the study identified that human behaviour and incapacitation account for more than 85% of the contributing factors reported by police in Africa. Unlike in developed countries, the victims of traffic casualties are primarily vulnerable road users. Pedestrians alone account for more than 40% of the total fatalities on African roads. Limited countermeasures were reported in the literature. The outcomes of these programmes are mixed and the research methods have inconsistent validity. Investigation in the feasibility of transferring proven programmes from motorised countries is suggested as an efficient measure for traffic safety improvement. DOI: 10.1080/17457300.2010.490920
46	**ZA**		Chimbindi, N., Baernighausen, T., Newell, M. 2013. An integrated approach to improving the availability and utilisation of tuberculosis healthcare in rural South Africa. *South Africam Journal of Medicine*, 103(4), 237-240.	Patients with tuberculosis (TB) face several challenges in accessing care, and an integrated service that includes HIV testing could be preferable for them ana ensure timely HIV treatment initiation and optimal TB care. To investigate factors, including uptake of HIV testing, associated with availability and utilisation of healthcare by TB patients in a rural programme devolved to primary care in Hlabisa sub-district, KwaZulu-Natal. Three hundred TB patients were randomly selected in a two-stage-sampling scheme with five primary healthcare clinic (PHC) sampling units selected with probability proportional to size. Data were collected using a structured questionnaire. We describe key availability and utilisation factors and analyse factors associated with being offered an HIV test in multiple regressions controlling for sex, age, education, employment and marital status. Most patients (75.2%) received care for a first episode of TB, mainly pulmonary. Nearly all (94.3%) were offered an HIV test during their current TB treatment episode, patients using their closest clinic being substantially more likely to have been offered HIV testing than those not using their closest clinic (adjusted odds ratio 12.79, p=0.05). About one-fifth (20.3%) of patients did not take medication under observation, and 3.4% reported missing taking their tablets at some stage. Average travelling time to the clinic and back was 2 hours, most patients (56.8%) using minibus taxis. We demonstrate high HIV testing rates among TB patients in a rural public programme, suggesting appropriate management of HIV-TB co-infected patients. We describe healthcare availability and utilisation factors that can inform the proposed district management teams for PHC re-engineering on areas needing improvement. *doi: 10.7196/SAMJ.6423*
47			Chisholm, D., Naci, H., Ali, A., Tran, N., Peden, M. 2012. Cost effectiveness of strategies to combat road traffic injuries in sub-Saharan Africa and South East Asia: mathematical modelling study. *British Medical Journal*, 344, e612.	To identify and estimate the population costs and effects of a selected set of enforcement strategies for reducing the burden of road traffic injuries in developing countries. Cost effectiveness analysis based on an epidemiological model. Two epidemiologically defined World Health Organization sub-regions of the world: countries in sub-Saharan Africa with very high adult and high child mortality (AfrE); and countries in South East Asia with high adult and high child mortality (SearD). Enforcement of speed limits via mobile speed cameras; drink-drive legislation and enforcement via breath testing campaigns; legislation and primary enforcement of seatbelt use in cars; legislation and enforcement of helmet use by motorcyclists; legislation and enforcement of helmet use by bicyclists. Patterns of injury were fitted to a state transition model to determine the expected population level effects of intervention over a 10 year period, which were expressed in disability adjusted life years (DALYs) averted. Costs were expressed in international dollars ($Int) for the year 2005. The single most cost effective strategy varies by sub-region, but a combined intervention strategy that simultaneously enforces multiple road safety laws produces the most health gain for a given amount of investment. For example, the combined enforcement of speed limits, drink-driving laws, and motorcycle helmet use saves one DALY for a cost of $Int1000-3000 in the two sub-regions considered. The potential impact of available road safety measures is inextricably bound by the underlying distribution of road traffic injuries across different road user groups and risk factors. Combined enforcement strategies are expected to represent the most efficient way to reduce the burden of road traffic injuries, because they benefit from considerable synergies on the cost side while generating greater overall health gains. *doi: 10.1136/bmj.e612*

No.	Country	Topic	Citation	Summary
48	**ZA**		Chokotho, L., Matzopoulos, R., Myers, J. 2012. Drivers' risk profile indicates the need for a graduated driving licence in South Africa. *South African Medical Journal*, 102(9), 749-751.	Current driver mortality estimates do not consider the great differences in exposure across the population, giving a false impression that driver deaths are lowest in the youngest age group. Interventions to reduce risk among the younger age group include graduated driver licensing (GDL) - a three-phase licensing system for novice drivers consisting of a learner's permit, a provisional license, and a full license. We calculated driver fatality rates per 10 000 registered drivers in each age group and assessed the need for stricter licensing conditions for novice and younger drivers. Age-specific driver mortality rates were calculated using Western Cape Province 2008 mortuary data. The total number of licensed drivers in each age group served as the denominator. Incidence rate ratios were calculated using the age group of 65 - 79 years as the reference. Chi-square test of trend on incidence rate ratios for the age groups was done. Statistical significance was set as $p<0.05$. There were 339 driver deaths; mean age was 39.4+/-13.8 years, and males accounted for 80% of the deaths. Age-specific driver mortality rates were highest in the youngest age group (15 - 19 years). There was a significant progressive decrease (except for the age group 45 - 49 years) in the risk of death from road traffic injuries with increasing age compared with the age group >= 65 years (chi(2) for trend $p<0.0001$). This study showed a relationship between driver's mortality risk and younger age, and underscores the need for introduction of a GDL programme in South Africa
49	**ZA**		Chokotho, L., Matzopoulos, R., Myers, J. 2013. Assessing Quality of Existing Data Sources on Road Traffic Injuries (RTIs) and Their Utility in Informing Injury Prevention in the Western Cape Province, South Africa. *Traffic Injury Prevention,* 14(3), 267-273.	Objectives: This study assessed whether the quality of the available road traffic injury (RTI) data was sufficient for determining the burden of RTIs in the Western Cape Province and for implementing and monitoring road safety interventions. Methodology: Underreporting was assessed by comparing data reported by the South African Police Services (SAPS) in 2008 with data from 18 provincial mortuaries. Completeness of the driver death subset of all RTIs was assessed using the capturerecapture method. Results: The mortuary and police data sets comprised 1696 and 860 fatalities respectively for the year 2008. The corresponding provincial road traffic mortality rates were as follows: 32.2 deaths/100,000 population per year (95% confidence interval [CI]: 30.733.8) and 16.3 deaths/100,000 population per year (95% CI: 15.317.5). The police data set contained 820,960 crashes, involving 196,889 persons, indicating substantial duplication of crash events. There were varying proportions of missing data for demographic and other identifying variables, with age missing in nearly half of the cases in the police data set. The estimated total number of driver deaths/year was 588.6 (95% CI: 544.4632.8), yielding estimated completeness of the mortuary and police data sets of 57.6 and 46.4 percent separately and 77.3 percent combined. Conclusion: This study found extensive data quality problems, including missing data, duplication, and significant underreporting of traffic injury deaths in the police data. Not all assumptions underlying the use of capturerecapture method were met in this study; hence, the estimates provided by this analysis should be interpreted with caution. There is a need to address the problems highlighted by this study in order to improve data utility for informing road safety policies. Supplemental materials are available for this article. Go to the publisher's online edition of Traffic Injury Prevention to view the supplemental file. *doi: 10.1080/15389588.2012.706760*

No.	Country	Topic	Citation	Summary
50			Covile, R., Hutchinson, E., Mindell, J., Warren, R. 2001. The transport sector as a source of air pollution. *Atmospheric Environment*, 35(9), 1537-1565.	Transport first became a significant source of air pollution after the problems of sooty smog from coal combustion had largely been solved in western European and North American cities. Since then, emissions from road, air, rail and water transport have been partly responsible for acid deposition, stratospheric ozone depletion and climate change. Most recently, road traffic exhaust emissions have been the cause of much concern about the effects of urban air quality on human health and tropospheric ozone production. This article considers the variety of transport impacts on the atmospheric environment by reviewing three examples: urban road traffic and human health, aircraft emissions and global atmospheric change, and the contribution of sulphur emissions from ships to acid deposition. Each example has associated with it a different level of uncertainty, such that a variety of policy responses to the problems are appropriate, from adaptation through precautionary emissions abatement to cost–benefit analysis and optimised abatement. There is some evidence that the current concern for road transport contribution to urban air pollution is justified, but aircraft emissions should also give cause for concern given that air traffic is projected to continue to increase. Emissions from road traffic are being reduced substantially by the introduction of technology especially three-way catalysts and also, most recently, by local traffic reduction measures especially in western European cities. In developing countries and Eastern Europe, however, there remains the possibility of great increase in car ownership and use, and it remains to be seen whether these countries will adopt measures now to prevent transport-related air pollution problems becoming severe later in the 21st Century. *http://dx.doi.org/10.1016/S1352-2310(00)00551-3*
51	**GH**		Damsere-Derry, J., Afukaar, F., Donkor, P., Mock, C. 2008. Assessment of vehicle speeds on different categories of roadways in Ghana. *International Journal of Injury Control and Safety Promotion*, 15(2), 83-91.	Empirical evidence from road safety literature suggests that vehicular speed is an important risk factor in the incidence and severity of road traffic crashes globally. Speed studies are at rudimentary stages in developing countries, thus making vehicular speed research imperative. The main aim of the study was to establish two major speed parameters, namely, the mean and dispersion, and their implications for more extensive and long-term speed monitoring in Ghana. Research workers stationed themselves in a parked car and used a radar gun to unobtrusively measure the travelling speeds of 28,489 vehicles at 15 different inter-urban locations on three highway categories. Excessive speeding is very pervasive on all highway categories in Ghana. Travelling speeds through settlements where a speed limit of 50 km/hour is mandatory were particularly excessive. Generally, 98%, 90% and 97% of vehicles exceeded the posted speed limit of 50 km/hour on national, inter-regional and regional roads respectively. Mean speeds and speed dispersions (as assessed by the standard deviations) through built-up areas were 81.3 +/- 17.3 km/hour on national roads, 64.7 +/- 12.3 km/hour on inter-regional roads and 72.6 +/- 13.4, km/hour on regional roads. On rural undivided highways with an 80 km/hour speed limit, mean and speed dispersions were 90 +/- 18.9 km/hour on national roads, 80.1 +/- 16 km/hour on inter-regional roads and 84.4 +/- 15.6 on regional roads; also translating into 66%, 47% and 60% of vehicles exceeding recommended speeds. In all cases, speed dispersions were notably higher than the value of 10 km/hour generally found in developed countries. Excessive speeding and wide speed dispersions are highly prevalent on Ghana's highways. These factors likely account for the high incidence of traffic crashes and fatalities in Ghana. An integrated speed monitoring and control programme and bypassing small and medium settlements would be required for the reduction of speed-related crashes, fatalities and injuries.

No.	Country	Topic	Citation	Summary
52	**GH**	● ●	Damsere-Derry, J., Ebel, B., Mock, C., Afukaar, F., Donkor, P. 2010. Pedestrians Injury Patterns in Ghana. *Accident Analysis Prevention*, 42(4), 1080-1088.	To establish the associations between pedestrian injury and explanatory variables such as vehicular characteristics, temporal trends, and road environment. A retrospective analysis of de-identified pedestrian crash data between 2002 and 2006 was conducted using the Building & Road Research Institute's crash data bank. We estimated the odds ratios associated with casualty fatalities using a multinomial logistic regression. There were 812 pedestrian casualties reported, out of which 33% were fatal, 45% sustained serious injuries requiring hospitalization, and 22% were slightly injured but were not hospitalized. Crossing the roadway accounted for over 70% of all pedestrians deaths. Whereas fatalities in 2002 and 2003 were statistically indistinguishable from those of 2004($p>0.05$), in comparison with 2004, there were significantly fewer fatalities in 2005 and 2006 (78% and 65% reduction respectively). According to police report, the probability that a pedestrian fatality occurring in Ghana is attributable to excessive speeding is 65%. The adjusted odds ratio of pedestrian fatality associated with speeding compared with driver inattentiveness was 3.6(95% CI: 2.5 to 5.2). It was also observed that generally, lighter vehicular masses were associated with lower pedestrian fatalities. Compared withå buses, pedestrians were less likely to die when struck by private cars (52%), pickup trucks (57%), and motorcycles (86%). Pedestrian death remains the leading cause of fatality among urban road users in Ghana. Risk factors associated with pedestrian fatality include being hit by heavy vehicles, speeding, and roadside activities such as street hawking, jaywalking and nighttime walking. Steps which may contribute to reducing pedestrian fatalities include measures to reduce vehicles speeds in settlements, providing traffic medians and lighting streets in settlements, and discouraging street and roadside activities such as hawking. *doi:10.1016/j.aap.2009.12.016.*
53	**GH**	● ●	Damsere-Derry, J., Ebel, B., Mock, C., Afukaar, F., Donkor, P., 2010. Risk factors of pedestrians' injury in Ghana. *Injury Prevention,* 16, A10	Dying on the road as a pedestrian is a serious health threat in developing countries. Pedestrian fatalities constitute over 60% of all urban road user deaths in Ghana. We estimated the OR associated with casualty fatalities using a multinomial logistic regression. Crossing roadways in Ghana is inimical to pedestrians. Generally, over 70% of all pedestrian fatalities occurred during crossing the roads. Whereas fatalities in 2002 and 2003 were statistically indistinguishable from those of 2004 ($p>0.05$), in comparison with 2004, there were significantly fewer fatalities in 2005 and 2006 (adjusted OR 0.22, $p=0.002$; and 0.35, $p=0.024$ respectively). The probability that a pedestrian death occurring between 2002 and 2006 in Ghana is attributable to excessive speeding is 65%. The adjusted OR of pedestrian death associated with speeding compared with driver inattentiveness was 3.6 (95% CI 2.5 to 5.2). Generally, lighter vehicular masses were associated with low pedestrian fatalities. Compared with buses, pedestrians were less likely to die when struck by private cars (52%), pick-up trucks (57%) and motorcycles (86%). Night-time fatalities were notably higher than daytime deaths (adjusted OR 1.7, $p=0.005$). Important risk factors associated with pedestrian death in Ghana include being hit by heavy or speeding vehicles, night-time walking and roadside activities. Steps which may contribute to reducing pedestrian fatalities include measures to reduce vehicle speeds in settled areas, providing traffic medians, lighting streets in settlements and discouraging roadside activities such as hawking. *doi:10.1136/ip.2010.029215.35*

No.	Country	Topic	Citation	Summary
54	**SN**		Dieme, D., Cabral-Ndior, M., Garcon, G., Verdin, A., Billet, S., Cazier, F., Courcot, D., Diouf, A., Shirali, P. 2012. Relationship between physicochemical characterization and toxicity of fine particulate matter (PM2.5) collected in Dakar city (Senegal). *Environmental Research*, 113, 1-13.	The massive increase in emissions of air pollutants due to economic and industrial growth in developing countries has made air quality a crucial health problem in this continent. Hence, it is somewhat critical to have a better knowledge on the air pollution in Sub-Saharan Africa countries. Three air pollution PM2.5 samples were also collected in two urban sites (i.e. Fann and Faidherbe) in Dakar (Senegal) and in a rural site near Dakar (i.e. Ngaparu). The two urban sites mainly differ in the type of used vehicles: in Fann, most of the traffic is made of buses, which are absent, in Faidherbe. The physicochemical characteristics of the three PM2.5 samples revealed their high heterogeneities and complexities, related to the multiple natural and anthropogenic emission sources. Results from 5-bromodeoxyuridine incorporation into DNA, mitochondrial dehydrogenase activity, and extracellular lactate dehydrogenase activity in PM2.5-exposed BEAS-2B cells suggested the exposure conditions (i.e. 3 and 12 mu g PM/cm(2) during 24, 48, and 72 h) to further consider. The organic fractions (i.e. mainly PAHs) of the PM2.5 samples were able to induce a time and/or concentration-dependent gene expression of CYP1A1 and CYP1B1, and, to a lesser extent, NQO1. There was a time and/or dose-dependent increase of both the gene expression and/or protein secretion of inflammatory mediators (i.e. TNF-alpha, IL-1 beta, IL-6, and/or 1L-8) in PM2.5-exposed BEAS-2B cells. In agreement with the physicochemical characterization, urban PM2.5 samples caused greater biological responses in BEAS-2B cells than the rural one. Variable concentrations of transition metals (i.e. Fe, Al, Pb, Mn, Zn) and organic compounds (i.e. PAHs) founded in the three PM2.5 samples might be firmly involved in a time- and/or dose-dependent toxicity, relying on inflammatory processes. *doi: 10.1016/j.envres.2011.11.009*
55	**NG**		Dongo, A., Kesieme, E., Eighemherio,A., Nwokike, O., Esezobor, E., Alufohai, E. 2013. Motorcycle Related Injuries among Rural Dwellers in Irrua, Nigeria: Characteristics and Correlates. *Emergency Medicine International*, 2013, Article ID 569103.	Background. The escalating use of motorcycle for commercial transportation of commuters and goods has resulted in an increase in morbidity and mortality from road traffic injuries. Objectives. To study the characteristics of motorcycle injuries seen in Irrua, Nigeria. Materials and Methods. This is a one-year prospective study of all patients seen from January 1, 2009, to December 31, 2009. A structured proforma was filled for all consecutive crash victims involving a motorcycle. Results. Motorcycle injuries accounted for 11.6% of attendance in surgical emergency room (142 out of 1,214); 76.8% were males. Amongst victims 47.1% were riders, 42.9%, passengers, and 7.8% pedestrians. Ex tremity injury accounted for 42.2% while head injury occurred in 21.8%. There were 9 deaths (6.3%). In this study no victim used crash helmet. Conclusion. Banning of motorcycle for commercial use and the introduction of tricycles into rural/suburban comminutes may be an important preventive strategy. *http://dx.doi.org/10.1155/2013/569103*
56			Downing, A., Sethi, D. *Health Issues in Transport and the Implications for Policy*. PR/INT/238/2001, UK DfID, London.	This paper produced by the UK Department for International Development (DFID) reviews current literature on the relationship between health and transport and poor communities. In particular, it focuses on the benefits of facilitating improved access to health and the negative side effects of the spread of disease through transport sector workers and the problem of road accidents. The authors argue that transport improvements have considerable potential to improve the health of the poor if combined with health care provision improvements that tackle the key issues of cost and quality. They point to a clear need for health and transport policies to be developed in an integrated way in relation to the development of rural areas rather than the traditional sectoral approach used in the past. The paper's overall conclusion is that development programmes need to adopt multi-dimensional approaches even at the project level. Community-based interventions using livelihoods methodologies can encourage this but it is important that transport and road improvement projects recognise and build in positive contributions to health. Similarly, health policies and projects need to consider transport impacts on health and both sectors should make use of each other's specialists. *http://siteresources.worldbank.org/INTWDR2004/Resources/22571_Transport_and_Health.pdf*

No.	Country	Topic	Citation	Summary
57			Edvardsson, K. 2009. Gravel Roads and Dust Suppression. *Road Materials And Pavement Design*, 10(3), 439-469.	This review paper deals with the field of dust generation on gravel roads, dust suppressant performance and evaluation techniques. By applying the proper dust suppressant, matching the gravel road condition specific to the site, dust emission can be reduced, thereby providing a healthier ambient air environment, increasing road safety and ride comfort while reducing the need and cost of vehicle repair, road maintenance activities, and aggregate replacement. By applying the proper application rate of the dust suppressant, the cost of annual dust control as well as the environmental impact can be significantly reduced. Suitable measuring techniques for evaluating dust suppressant efficiency will facilitate the choice of the most appropriate dust suppressant and its optimal application rate. *doi: 10.3166/RMPD.10.439-469*
58	**NG**		Ekpenyong, C., Ettebong, E., Akpan, E., Samson, T., Daniel, N. 2012. Urban city transportation mode and respiratory health effect of air pollution: a cross-sectional study among transit and non-transit workers in Nigeria. *BMJ Open*, 2(5), e001253.	To assess the respiratory health effect of city ambient air pollutants on transit and non-transit workers and compare such effects by transportation mode, occupational exposure and sociodemographic characteristics of participants. Cross-sectional, randomised survey. A two primary healthcare centre survey in 2009/2010 in Uyo metropolis, South-South Nigeria. Of the 245 male participants recruited, 168 (50 taxi drivers, 60 motorcyclists and 58 civil servants) met the inclusion criteria. These include age 18-35 years, a male transit worker or civil servant who had worked within Uyo metropolis for at least a year prior to the study, and had no history of respiratory disorders/impairment or any other debilitating illness. The adjusted ORs for respiratory function impairment (force vital capacity (FVC) and/or FEV(1)<80% predicted or FEV(1)/FVC<70% predicted) using Global Initiative for Chronic Obstructive Lung Diseases (GOLD) and National Institute for Health and Clinical Excellence (NICE) criteria were calculated. In order to investigate specific occupation-dependent respiratory function impairment, a comparison was made between the ORs for respiratory impairment in the three occupations. Adjustments were made for some demographic variables such as age, BMI, area of residence, etc. Exposure to ambient air pollution by occupation and transportation mode was independently associated with respiratory functions impairment and incident respiratory symptoms among participants. Motorcyclists had the highest effect, with adjusted OR 3.10, 95% CI 0.402 to 16.207 for FVC<80% predicted and OR 1.71, 95% CI 0.61 to 4.76 for FEV(1)/FVC<70% predicted using GOLD and NICE criteria. In addition, uneducated, currently smoking transit workers who had worked for more than 1 year, with three trips per day and more than 1 h transit time per trip were significantly associated with higher odds for respiratory function impairment at p<0.001, respectively. Findings of this study lend weights to the existing literature on the adverse respiratory health effect of ambient air pollution on city transit workers globally. The role of other confounders acting synergistically to cause a more deleterious effect is obvious. In all, the effect depends on the mode and duration of exposure. *doi: 10.1136/bmjopen-2012-001253*
59	**NG**		Eze, U., Kipsaina, C., Ozanne-Smith, J. 2013. Fatal road traffic injuries in Ibadan, using the mortuary as a data source. *Injury Prevention*. 19(6), 387-392.	Road Traffic Injury (RTI) in Africa represents 14% of global RTI deaths. Lack of timely, reliable data undermines road safety interventions. Available fatality data are aggregated, limited in detail or scarce in surveys. This is the first fatal RTI surveillance study in Nigeria. To pilot a systematic mortuary-based data collection in Ibadan, determine the nature and circumstances of fatal RTI and assess data quality against existing data sources.Methods Using a draft data collection system developed jointly by WHO and Monash University, the detailed information was prospectively collected on RTI University College Hospital mortuary admissions in Ibadan September 2010 to February 2011. Demographics, road user type, counterpart vehicle, intent, manner and medical cause of death were recorded. Mortuary admissions included 80 fatal RTI cases: 81.3% males. By road user category, 28 (35.0%) were pedestrians; 28 (35.0%) motorised 2-wheeler users; 18.8% car occupants; and 11.3% bus occupants. In 70% of cases, medical cause of death was head injury, including 25 of 28 motorised 2-wheeler users (89.3%). Estimates from this study indicate apparent increased mortuary capture of fatal RTI compared with police data. This study demonstrates the feasibility of collecting detailed, timely RTI fatality data through mortuary-based surveillance in Ibadan. While not all RTI deaths are reported to any authority in Ibadan, this large case series complements existing data sources and suggests that pedestrians and motorised 2-wheeler users die most often in road traffic crashes. Frequent head injuries among motorised 2-wheeler users strongly support the need for helmet wearing interventions. *doi: 10.1136/injuryprev-2012-040674*

No.	Country	Topic	Citation	Summary
60	**NG**		Falope, I. 1991. Motorcycle accidents in Nigeria. A new group at risk. *West Afr. J. Med,* 10(2), 187-189.	Multiple injuries often characterise motorcycle accidents. Head injury which is particularly common is a major cause of mortality, hence the enforcement of the law compelling all riders to wear helmets in most countries. The law collapsed in Nigeria about a decade ago. With the motorcycle becoming an important part of public transportation, infants, children and other age groups not usually associated with motorcycle accidents have become involved in the risk. A case of four month old baby with head trauma is presented to illustrate the point. The collapse of the law on helmets should be considered a temporary set back, and a new look taken at the challenges of motorcycle accidents. *http://www.ncbi.nlm.nih.gov/pubmed/1911489*
61	**SN ZA**		Garenne, M., Kahn, K., Tollman, S., Gear, J. 2000. Causes of death in a rural area of South Africa: An international perspective. *Journal of Tropical Pediatrics*, 46(3), 183-190.	The study compares the cause of death profile in a rural area of South Africa (Agincourt), with that in a rural area of West Africa (Niakhar), and in a developed country with the same life expectancy (France, 1951) in order to determine causes with high and low mortality and priorities for future health interventions. In the two African sites, causes of death were assessed by verbal autopsies, whereas they were derived from regular cause of death registration in France. Age-standardized death rates were used to compare cause-specific mortality in the three studies, Life expectancy in Agincourt was estimated at 66 years, similar to that of France in 1951, and much higher than that of Niakhar. Causes of death with outstandingly high mortality in Agincourt were violent deaths (homicide and suicide), accidents (road traffic accidents and household accidents), certain infectious diseases (HIV/AIDS, tuberculosis, diarrhea and dysentery), certain chronic diseases (cancer of genital organs, liver cirrhosis, gastrointestinal hemorrhage, maternal mortality, epilepsy, acute rheumatic fever, and pneumoconiosis) and malnutrition of young children (kwashiorkor). Causes of death with lower mortality than expected were primarily respiratory diseases (pneumonia, bronchitis, influenza, lung cancer), other cancers, vaccine preventable diseases (measles, whooping cough, tetanus), and marasmus. Verbal autopsies could be used in a rural area of a developing country without formal cause of death registration to identify the most salient health problems of the population. *http://tropej.oxfordjournals.org.libdata.lib.ua.edu/content/46/3/183.full.pdf+html*
62	**ZA**		Garrib, A., Herbst, A., Hosegood, V.,] Newell, M. 2011. Injury mortality in rural South Africa 2000-2007: rates and associated factors. *Tropical Medicine & International Health*, 16(4), 439-446	To estimate injury mortality rates in a rural population in KwaZulu-Natal, South Africa and to identify socio-demographic risk factors associated with adult injury-related deaths. The study used population-based mortality data collected by a demographic surveillance system on all resident and non-resident members of 11 000 households. Deaths and person-years of observation (pyo) were aggregated for individuals between 01 January 2000 and 31 December 2007. Cause of death was determined by verbal autopsy, coded using ICD-10 and further categorised using global burden of disease categories. Socio-demographic risk factors associated with injuries were examined using regression analyses. We analysed data on 133 483 individuals with 717 584.6 person-years of observation (pyo) and 11 467 deaths. Of deaths, 8.9% were because of injury-related causes; 11% occurred in children < 15 years old. Homicide, road traffic injuries and suicide were the major causes. The estimated crude injury mortality rate was 142.4 (134.0, 151.4)/100 000 pyo; 116.9 (108.1, 126.5)/100 000 pyo among residents and 216.8 (196.5, 239.2)/100 000 pyo among non-residents. In multivariable analyses, the differences between residents and non-residents remained but were no longer significant for women. In men and women, full-time employment was significantly associated with lower mortality [adjusted rate ratios 0.6 (0.4, 0.9); 0.4 (0.2, 0.9)]; in men, higher asset ownership was independently associated with increased. Reducing the high levels of injury-related mortality in South Africa requires intersectoral primary prevention efforts that redress the root causes of violent and accidental deaths: social inequality, poverty and alcohol abuse. *doi: 10.1111/j.1365-3156.2011.02730.x*
63			Greening, T., O/Neill. 2010. *Traffic-Generated Dust From Unpaved Roads: An Overview Of Impacts and Options for Control.* 1st AFCAP Practitioners Conference 23rd to 25th Nov. 2010	Over 70 per cent of the road network in sub-Saharan Africa remains unpaved. These roads will continue to form the greater part of road networks for the foreseeable future with the adverse impacts from traffic-generated dust being borne disproportionately by the rural and urban poor. The efficacy of dust control products is being studied in developed countries with large lengths of unpaved roads. However, quantitative data on the costs of dust impacts in developing countries and the benefits of longer-term solutions aimed at ameliorating them are scarce. Most trials on dust control in Africa involve the use of commercial products to stabilise gravel roads and control dust but these often fail to provide lasting benefit. This paper provides an overview of the available information on dust from unpaved roads, discusses the impacts of dust and options for its control and postulates the possible longterm consequences for people using and living near unpaved roads.

No.	Country	Topic	Citation	Summary
64	**TZ**	● ●	Guerrero, A., Bishop, T., Jinadasa, D., Witte, J. 2013. *Three Studies into Road Traffic Injury On Rural Roads in Tanzania*, V1.2. AFCAP/GEN/060/G, AFCAP, UK.	This research found high and increasing rates of RTI among rural communities, especially among drivers of motorcycle taxis. Analysis of the impact of a short community-based RTI prevention programme suggests that interventions were insufficient to reduce injury rates, though the severity of injuries sustained reportedly declined. Increasing rates of RTI may be due, at least in part, to an increase in traffic on the study roads. *http://r4d.dfid.gov.uk/pdf/outputs/AfCap/AFCAP-GEN-060-G-Final-Report.pdf*
65	**SN**	●	Guyavarch, E., Pison, G., Duthe, G., Marra, A., Chippaux, J. 2010. Mortality due to External Causes in Three Rural Areas of Senegal. *European Journal of Population*, 26(4), 483-505.	Mortality due to external causes was measured over the period 1985-2004 in three rural areas of Senegal-Bandafassi, Niakhar and Mlomp - whose populations have been under continuous demographic surveillance for many years. The standardized annual rate of deaths due to external causes is 31 deaths per 100,000 inhabitants in Niakhar, 56 in Bandafassi and 102 in Mlomp. The causes of injury-related deaths generally reflect the rural living environment, with relatively few deaths due to road accidents (1.9 deaths per 100,000 inhabitants in Niakhar, 3.0 in Bandafassi and 2.0 in Mlomp), but many deaths due to falls (8.6 deaths per 100,000 inhabitants in Niakhar, 15.1 in Bandafassi and 23.3 in Mlomp). For certain causes, mortality varies considerably. Snake bites, for example, cause 0.1 deaths per 100,000 inhabitants in Niakhar, 13.4 in Bandafassi and 3.0 in Mlomp. The differences between sites are linked in this case to the relative concentrations of wildlife, in turn linked to differences in the local environment and in population densities (144 inhabitants per sq.km in Niakhar versus 19 in Bandafassi and 114 in Mlomp). Although the study areas are still largely unaffected by causes of death associated with development, such as traffic accidents, mortality due to external causes is high. *doi: 10.1007/s10680-010-9213-y*
66	**KE**	● ● ●	Habyarimana, J., Jack, W. 2011. Heckle and Chide: Results of a randomized road safety intervention in Kenya. *Journal of Public Economics*, 95(11-12), 1438-1446.	We report the results of a randomized field experiment aimed at improving the safety of long-distance mini-busses or matatus in Kenya. Our intervention combines evocative messages aimed at motivating passengers to speak up against bad driving with a lottery that rewards matatu drivers for keeping the stickers in place. Independent insurance claims data were collected for more than 2000 long-distance matatus before and after the intervention. Our results indicate that insurance claims fell by a half to two-thirds, from a baseline annual rate of about 10%, and that claims involving injury or death fell by 60%. While we are unable to identify the mechanism(s) underlying this effect, the intervention is more cost effective in reducing mortality than other documented public health interventions. *doi: 10.1016/j.jpubeco.2011.06.008*
67		● ●	Han, X., Naeher, L. 2006. A review of traffic-related air pollution exposure assessment in the developing world. *Environment International,* 32, 6-120.	Exposure assessment studies in the developing world are important. Although recent years have seen an increasing number of traffic-related pollution exposure studies, exposure assessment data on this topic are still limited. Differences among measuring methods and a lack of strict quality control in carrying out exposure assessment make it difficult to generalize and compare findings between studies. In this article, exposure assessment studies carried out in the developing world on several traffic-related air pollutants are reviewed. These pollutants include particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO2), volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs). In addition, it discusses advantages and disadvantages of various monitoring methods (ambient fixed-site monitoring, microenvironment monitoring, and personal exposure assessment using portable samplers) for these pollutants in exposure assessment studies. Also included in this paper is a brief introduction of standards for these pollutants in ambient air or in occupational settings established by the United States Environmental Protection Agency (USEPA), the United States Occupational Safety and Health Administration (OSHA) and the World Health Organization (WHO). The review ends with a summary of the limitations and gaps in recent studies and suggestions for future research in the developing world *doi:10.1016/j.envint.2005.05.020*

No.	Country	Topic	Citation	Summary
68	**ZA**		Harris, G., Olukoga, I. 2005. A cost benefit analysis of an enhanced seat belt enforcement program in South Africa. *Injury Prevention*, 11(2), 102-105.	To examine whether a program to increase the wearing of seat belts in a South African urban area would be worthwhile in societal terms. A cost benefit analysis of a one year enhanced seat belt enforcement program in eThekwini (Durban) Municipality. Data were drawn from two main sources-a 1998 study of the cost of road crashes in South Africa and, given the absence of other data, a meta-analysis of the effectiveness of various types of interventions to reduce road crash casualties in the United States-and were analyzed using cost benefit analysis. A program designed to enforce greater wearing of seat belts, estimated to cost 2 million rand in one year, could be reasonably expected to increase seat belt usage rates by 16 percentage points and reduce fatalities and injuries by 9.5%. This would result in saved social costs of 13.6 million rand in the following year or a net present value of 11.6 million rand. There would also be favorable consequences for municipal finances. Investment in a program to increase seat belt wearing rates is highly profitable in societal terms. *doi: 10.1136/ip.2004.007179*
69	**RW**		Howe, J. Sustaining Africa's rural road networks- the asset management approach. *World Transport Policy & Research*, 5(1), 11-16.	Many rural roads in Africa are 'returning to the bush' because of inadequate maintenance. This is not helped by development loans which encourage construction of new roads and major rehabilitation of existing infrastructure rather than better value ongoing maintenance. Reported that more than 80% of roads in Rwanda were unpaved. *http://www.eco-logica.co.uk/pdf/wtpp05.1.pdf*
70			Hyder, A., Muzaffar, S., Bachani, A. 2008. Road traffic injuries in urban Africa and Asia: A policy gap in child and adolescent health. *Public Health*, 122(10), 1104-1110.	This study highlights the burden of urban road traffic injuries (RTIs) in children and young adults in South Asia and Sub-Saharan Africa to heighten awareness of current limitations in child health policies, and to direct future research and intervention development. Comparative analysis of recent Sub-Saharan Africa and South Asia reviews of RTIs, World Health Organization (WHO) Global Burden of Disease statistics, and the Bangladesh Health and Injury Survey. Children aged 0-18 years in South Asia and Sub-Saharan Africa reviews, aged 0-14 years in the WHO data, and aged 1-17 years in the Bangladeshi data. Child pedestrians comprise the Largest proportion of urban RTI victims. More healthy life years were Lost per 1000 children aged 0-18 years in South Asia than Sub-Saharan Africa. Disabitity-adjusted life years lost per 1000 children aged 0-14 years was greater in Africa than South-east Asia. South-east Asia has the greatest overall incidence of RTIs; however, Africa has poorer reported outcomes for children aged 0-14 years. These data sources point to the salience of intervening in RTIs in children to prevent a predicted boom in the RTI burden in children, particularly in the poorest regions of the world. However, child health policies in these regions have not yet embraced RTI, either in research or programmes. *doi: 10.1016/j.puhe.2007.12.014*
71	**UG**		Hulme, P. Mechanisms of trauma at a rural hospital in Uganda. *Pan African Medical Journal*, 7(5).	Trauma is an increasing cause of mortality worldwide with road traffic accidents (RTAs) causing 1.3 million deaths annually with 90% of this mortality occurring in low and middle income countries. The rise in trauma deaths has been neglected with infectious diseases taking precedence. More research needs to be conducted in resource poor countries to establish the main causes of trauma and find better solutions to the rising trend in mortality. Much of the trauma research in resource poor countries has focused on urban areas. This study aims to find the leading causes of trauma at a rural Ugandan hospital. A retrospective case note review was performed on all adult patients admitted to Kuluva Hospital with trauma related injuries in 2007. Kuluva Hospital is a rural 250 bed hospital in North-West Uganda. 490 trauma patients were admitted in 2007 accounting for 9.4% of admissions. 70.2% (n=344) were males and 29.8% (n=146) were females. The mean age of patients was 31.3 years and the mean length of stay was 7.4 days. In 2007 9 patients died following trauma, 6 from RTAs, 2 from burns and one after an assault. RTAs were the leading cause of trauma with 64.2% of admissions (n=315), followed by assaults with 16.5% (n=81) of admissions. Soft tissue injuries with 28.4% (n=149) and lacerations with 27.3% (n=143) were the most common diagnoses after trauma with fractures making up 18.7% of injuries (n=99). RTAs were an important cause of morbidity and mortality in a rural Ugandan hospital as they also are in urban areas. Low cost initiatives to reduce speed, prevent alcohol impaired driving, improve public education and wider access to high quality trauma care are vital to reducing the mortality and morbidity caused by RTAs in Africa. *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3172623/*

No.	Country	Topic	Citation	Summary
72	**NG**	●	Juillard, C., Labinjo, M., Kobusingye, O., Hyder, A. 2010. Socioeconomic impact of road traffic injuries in West Africa: exploratory data from Nigeria. *Injury Prevention*, 16(6), PAGES.	Road traffic injuries (RTIs) are increasingly contributing to the burden of disease in sub-Saharan Africa, yet little is known about the economic consequences and disability associated with them. To explore cost and disability consequences of RTIs in Nigeria. A population-based survey using two-stage stratified cluster sampling. Information on care-seeking choice, cost of treatment, ability to work, reduction in earnings, and disability were collected on 127 subjects who had suffered an RTI, of 3082 study subjects in seven Nigerian states. Univariate analysis was used to estimate frequency of disability, types of care sought, and trends for work lost, functional ability and cost of treatment. Unadjusted bivariate analysis was performed to explore care-seeking, cost of care, and work lost among disabled and non-disabled people. RTIs resulted in disability for 29.1% of subjects, while 13.5% were unable to return to work. Of the disabled people, 67.6% were unable to perform activities of daily living, 16.7% consequently lost their jobs, and 88.6% had a reduction in earnings. Private physician and hospital treatment were the most common forms of initial treatment sought, but traditional treatment was the most common second form of care sought. Average direct costs of informal and formal treatment were US $6.65 and US$35.64, respectively. Disabled people were more likely to seek formal care (p=0.003) and be unable to work (p=0.002). Economic and functional ramifications must be included in the spectrum of consequences of RTIs to fully appreciate the extent of the burden of disease, implying that health systems should not only address the clinical consequences of RTIs, but the financial ones as well. *doi: 10.1136/ip.2009.025825*
73	**KE**	● ●	Kinney, P., Gichuru, M., Volavka-Close, N., Ngo, N., Ndiba, P., Law, A., Gachanja, A., Gaita, S., Chillrud, S., Sclar, E. 2011. Traffic impacts on PM2.5 air quality in Nairobi, Kenya. *Environmental Science & Policy*, 14(4), 369-378.	Motor vehicle traffic is an important source of particulate pollution in cities of the developing world, where rapid growth, coupled with a lack of effective transport and land use planning, may result in harmful levels of fine particles (PM2.5) in the air. However, a lack of air monitoring data hinders health impact assessments and the development of transportation and land use policies that could reduce health burdens due to outdoor air pollution. To address this important need, a study of traffic-related PM2.5 was carried out in the city of Nairobi, Kenya, a model city for sub-Saharan Africa, in July 2009. Sampling was carried cut using portable filter-based air samplers carried in backpacks by technicians on weekdays over two weeks at several sites in and around Nairobi ranging from high-traffic roadways to rural background. mean daytime concentrations of PM2.5 ranged from 10.7 at the rural background site to 98.1 mu g/m(3) on a sidewalk in the central business district. Horizontal dispersion measurements demonstrated a decrease in PM2.5 concentration from 128.7 to 18.7 mu g/m(3) over 100 m downwind of a major intersection in Nairobi. A vertical dispersion experiment revealed a decrease from 119.5 mu g/m(3) at street level to 42.8 mu g/m(3) on a third-floor rooftop in the central business district. Though not directly comparable to air quality guidelines, which are based on 24-h or annual averages, the urban concentrations we observed raise concern with regard to public health and related policy. Taken together with survey data on commuting patterns within Nairobi, these results suggest that many Nairobi residents are exposed on a regular basis to elevated concentrations of fine particle air pollution, with potentially serious long-term implications for health. *doi: 10.1016/j.envsci.2011.02.005*

No.	Country	Topic	Citation	Summary
73	**TZ**		Kircher, K., Andersson, J. 2013. Truck Drivers' Opinion on Road Safety in Tanzania-A Questionnaire Study. *Traffic Injury Prevention*, 14(1), 103-111.	Even though the traffic fatality risk (fatalities per 100,000 inhabitants) in Tanzania is quite low, the fatality rate (fatalities per 10,000 vehicles) is one of the highest in the world. With increasing vehicle density this means that the number of people dying in traffic will increase dramatically in the near future. Therefore, it is important to implement measures to increase traffic safety as soon as possible, and in order to be able to do this in an efficient way, it is important to investigate where the main problems lie. Methods: Within the European Union (EU) project ASSET-Road a questionnaire study on road safety was conducted with 250 truck drivers in Tanzania. The study was done to increase the knowledge about the situation of the Tanzanian truckers, who are the most frequent road users in the country. The drivers were interviewed in 3 different towns in southern Tanzania, and participation was voluntary. The questionnaire treated demographics, the state of the drivers' vehicles, the frequency of breakdowns, and the maintenance of the vehicles. Further questions concerned driver behavior, crash involvement, crash risk, and crash mitigation. Results: The drivers who participated in the study were predominantly male and their average age was 36years. Truck drivers reported driving 10.6h without a break on average, with several drivers reporting that they had to drive 24h without rest. Around 40 percent of the trucks did not have any seat belts installed, with a larger share of older trucks lacking belts. Most of the drivers who had seat belts reported using them, however. Almost 40 percent of the drivers reported being involved in at least one crash, and 45 percent of those drivers had experienced fatal crashes. This underlines that the crash frequency per vehicle is very high, and the results are often severe, especially when heavy vehicles are involved. When asked what the 3 most common crash causations were, driver-related causes were named frequently. Drivers were said to be reckless, and further crash causations named were drunkenness, inattention, and sleepiness. One of the most frequently mentioned crash mitigation strategies was driver education, followed by improvement of roads and vehicles. The results indicate that countermeasures should be implemented in an integrated fashion, taking into account aspects such as driver, vehicle, infrastructure, and other road users. *doi: 10.1080/15389588.2012.671982*
75	**MW**		Kiser, M., Samuel, J., Mclean, S., Muyco, A., Cairns, B., Charles, A. 2012. Epidemiology of pediatric injury in Malawi: Burden of disease and implications for prevention. *International Journal Of Surgery*, 10(10), 611-617.	Pediatric injuries pose a significant health burden in sub-Saharan Africa, though historic data are too scarce to appreciate the extent of the problem. The purpose of this study is to utilize a comprehensive database to describe the epidemiology of pediatric injuries at a tertiary hospital in Malawi. Data were prospectively collected on patients presenting to the emergency department for treatment of injuries from 2008 to 2010 (n = 23,625). The subset of pediatric patients (n = 7233) underwent cross-sectional analysis to examine demographics, injury environment, timing and mechanisms. Pediatric patients, (0-16 years) comprised 30.6% of all trauma patients. Mean age was 7.2 years. Falls were the most common injury (43%), followed by burns (11.1%), pedestrian road traffic injuries (9.7%), foreign bodies (7.5%), and assaults (7.2%). Statistically significant differences in injury pattern were observed between gender, age groups and season. After logistic regression, predictors of fall included male gender, home setting, and rainy season, whereas predictors of burn included female gender, age 0-5 yrs, home setting, and cold season. Predictors of pedestrian injury included age 6-10 yrs, female, and roadside setting. Predictors of foreign body ingestion included age 0-5 yrs, female gender, home setting, and daytime, and predictors of assault include male gender, age 11-16 yrs, nighttime hours. All predictors were statistically significant ($p < 0.05$). This study revealed patterns of injury based upon age, gender, location, and season. Our results may prove useful to stakeholders in injury prevention for designing, evaluating, and implementing programs to improve public safety in children in Malawi and similar resource poor nations. *doi: 10.1016/j.ijsu.2012.10.004*
76	**UG**		Kobusingye, O., Guwatudde, D., Lett, R. 2001. Injury patterns in rural and urban Uganda. *Injury Prevention*, 7, 46-50.	To describe and contrast injury patterns in rural and urban Uganda. One rural and one urban community in Uganda. Community health workers interviewed adult respondents in households selected by multistage sampling, using a standardized questionnaire. In the rural setting, 1673 households, with 7427 persons, were surveyed. Injuries had an annual mortality rate of 92/100 000 persons, and disabilities a prevalence proportion of 0.7%. In the urban setting 2322 households, with 10 982 people, were surveyed. Injuries had an annual mortality rate of 217/100 000, and injury disabilities a prevalence proportion of 2.8%. The total incidence of fatal, disabling, and recovered injuries was 116/1000/year. Leading causes of death were drowning in the rural setting, and road traffic in the city. Injuries are a substantial burden in Uganda, with much higher rates than those in most Western countries. The urban population is at a higher risk than the rural population, and the patterns of injury differ. Interventions to control injuries should be a priority in Uganda. *doi:10.1136/ip.7.1.46*

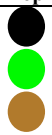
No.	Country	Topic	Citation	Summary
77			Koptis, E., Cropper, M. 2005. Traffic Fatalities and Economic Growth. *Accident Analysis and Prevention*, 37(1), 169-178.	This paper examines the relationship between traffic fatality risk and per capita income and uses it to forecast traffic fatalities by geographic region. Equations for the road death rate (fatalities/population) and its components—the rate of motorization (vehicles/population) and fatalities per vehicle (F/V)—are estimated using panel data from 1963 to 1999 for 88 countries. The natural logarithm of F/P, V/P, and F/V are expressed as spline (piecewise linear) functions of the logarithm of real per capita GDP (measured in 1985 international prices). Region-specific time trends during the period 1963–1999 are modeled in linear and log–linear form. These models are used to project traffic fatalities and the stock of motor vehicles to 2020. The per capita income at which traffic fatality risk (fatalities/population) begins to decline is $8600 (1985 international dollars) when separate time trends are used for each geographic region. This turning point is driven by the rate of decline in fatalities/vehicles as income rises since vehicles/population, while increasing with income at a decreasing rate, never declines with economic growth. Projections of future traffic fatalities suggest that the global road death toll will grow by approximately 66% over the next twenty years. This number, however, reflects divergent rates of change in different parts of the world: a decline in fatalities in high-income countries of approximately 28% versus an increase in fatalities of almost 92% in China and 147% in India. The road death rate is projected to rise to approximately 2 per 10,000 persons in developing countries by 2020, while it will fall to less than 1 per 10,000 in high-income countries. *http://dx.doi.org/10.1016/j.aap.2004.04.006*
78	**MW**		Kraemer, J., Honermann, B., Roffenbender, J. 2012. Cyclists' helmet usage and characteristics in central and southern Malawi: a cross-sectional study. *International Journal of Injury Control and Safety Promotion*, 19(4), 373-377.	The objective of this study was to determine the prevalence of, and factors associated with, bicycle helmet usage in southern and central Malawi. This study was across-sectional observation of public behaviour. The urban and rural roadways in southern and central Malawi were studied during the dry season. In total, 1900 bicyclists were observed along the roadways of southern and central Malawi over a four-day period. Observer ascertainment of cyclists' helmet status, approximate age, sex and bicycle operator or passenger status were measured. Of the 1900 cyclists observed, no cyclist was identified as wearing a helmet (exact 95% CI: 0.00.2%). There was no variation by age, sex or operator/passenger status. Nearly, 91.5% of observed cyclists were males and 87.7% were operating the bicycle. The sizeable majority of male cyclists were classified as young adults from adolescence to 25 years old (47.2%) or adults over age 25 (44.9%); 7.9% of male cyclists were pre-adolescent. Passengers were more likely to be female than operators (39.1% versus 4.2%), though, even for passengers, a higher proportion were males than females ($p < 0.001$). In Malawi, helmet usage is so rare as to be non-existent. This suggests an opportunity for significant improvement. Based on the observed cyclists' characteristics, interventions should be targeted to adult and young adult males. *doi: 10.1080/17457300.2012.663762*
79	**GH**		Kudebong, M., Wurapa, F., Nonvignon, J. Norman, I. Awoonor-Williams, J. Aikins, M. 2011. Economic burden of motorcycle accidents in Northern Ghana, *Ghana Medical Journal*, 45(4), 135–142.	This paper estimates the economic burden of motorcycle accidents in the Bolgatanga Municipality in Northern Ghana. Retrospective cross-sectional cost study. Data were collected from Drivers and Vehicle Licensing Authority, the Police, health facilities and motorcycle accident victims. Both quantitative and qualitative approaches were used for data collection. Cost analysis was based on the standard road accident cost conceptual framework. Ninety-eight percent of vehicles registered in the municipality in 2004 – 2008 were motorcycles. The motorcycles were significantly more than the cars registered. The economic burden of motorcycle accidents was estimated to be about US$1.2 million, of which, 52% were accident-related costs (i.e. property damage and administration) and 48% casualty-related costs (i.e. medical costs, lost labour outputs,). Most motorcycle accident victims were in their productive ages and were males. Only a third of the motorcycles were insured. Majority of the riders (71%) did not possess valid driving license. Main motorcycle injuries were head injuries, fractures, lacerations and contusions. Majority of the accidents were caused by lack of formal motorcycle riding training, abuse of alcohol and could be reduced through law enforcement, continuous mass education and helmet use. *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3283097/*

No.	Country	Topic	Citation	Summary
80	**CM NG UG**		Kumar, A. 2011. *Understanding the emerging role of motorcycles in African cities. Apolitical economy perspective. SSATP Discussion Paper NO. 13, Urban Transport Series.* The International Bank for Reconstruction and Development/ The World Bank, Washington, DC.	A decline in organized public transport systems has led to rapid growth in non-conventional means of public transport, initially provided by minibuses and shared taxi/vans, and more recently by commercial motorcycles. Unlike cities in South and East Asia, ownership and use of motorized two-wheelers as a personalized vehicle is very small in sub-Saharan cities. However, over the past decade there has been a significant growth in the use of motorcycles as a commercial public transport mode. While offering certain transport advantages in the form of easy maneuverability, ability to travel on poor roads, and demand responsiveness, commercial motorcycle service growth has also led to an increase in road accidents, traffic management problems, pervasive noise and increases in local air pollution and greenhouse gas emissions. Government efforts to regulate the market have had the contrary impact of compounding the problem by distorting market structures. The growth in the use of commercial motorcycles has also dispelled one of the commonly held illusions: fare controls in the public bus market are often justified to support affordability for a vast majority of low income population; however, commercial motorcycles are more expensive than the lowest bus fares, but are increasingly being patronized by the poor due to the inadequacy of bus services. This paper attempts to evaluate the commercial motorcycle mode used in the three cities of Douala, Lagos, and Kampala, based on their political economy context in order to draw general conclusions of value throughout Africa and the rest of the developing world. The evaluation underscores the linkages between governance failure and weak sector performance and highlights the need to adapt policy instruments to local political and economic context. Central to discussion is the necessity to develop a participation framework driven by open communications across a wide spectrum of stakeholders. *http://www.ssatp.org/sites/ssatp/files/publications/SSATP-DiscussionPapers/DP13-Role-Motorcycles.pdf*
81	**NG**		Labinjo, M., Juillard, C., Kobusingye, O., Hyder, A. 2009. The burden of road traffic injuries in Nigeria: results of a population-based survey. *Injury Prevention*, 15(3), 157-162.	Mortality from road traffic injuries in sub-Saharan Africa is among the highest in the world, yet data from the region are sparse. To date, no multi-site population-based survey on road traffic injuries has been reported from Nigeria, the most populated country in Africa. To explore the epidemiology of road traffic injury in Nigeria and provide data on the populations affected and risk factors for road traffic injury. Data from a population-based survey using two-stage stratified cluster sampling. Road traffic injury status and demographic information were collected on 3082 respondents living in 553 households in seven of Nigeria's 37 states. Incidence rates were estimated with confidence intervals based on a Poisson distribution; Poisson regression analysis was used to calculate relative risks for associated factors. The overall road traffic injury rate was 41 per 1000 population (95% CI 34 to 49), and mortality from road traffic injuries was 1.6 per 1000 population (95% CI 0.5 to 3.8). Motorcycle crashes accounted for 54% of all road traffic injuries. The road traffic injury rates found for rural and urban respondents were not significantly different. Increased risk of injury was associated with male gender among those aged 18-44 years, with a relative risk of 2.96 when compared with women in the same age range (95% CI 1.72 to 5.09, $p < 0.001$). The road traffic injury rates found in this survey highlight a neglected public health problem in Nigeria. Simple extrapolations from this survey suggest that over 4 million people may be injured and as many as 200 000 potentially killed as the result of road traffic crashes annually in Nigeria. Appropriate interventions in both the health and transport sectors are needed to address this significant cause of morbidity and mortality in Nigeria. *doi: 10.1136/ip.2008.020255*

No.	Country	Topic	Citation	Summary
82		●	Lagarde, E. 2007. Road Traffic Injury Is an Escalating Burden in Africa and Deserves Proportionate Research Efforts. *PLOS One*, 4(6), 170.	Road safety in Africa is "part of the broader development process". The situation is particularly worrying in this continent because of the combination of incompatible road users, poor vehicle condition, under-developed infrastructure, lack of risk awareness, and ineffective enforcement jeopardised by corruption or bribery. The severity of road traffic crashes is also likely to be much greater in Africa than anywhere else, because many vulnerable road users are involved, but also because of the poor transport conditions such as lack of seat belts, overcrowding, and hazardous vehicle environments. Death/injury ratios are, however, not easy to compare because of the differential reporting bias for fatal and non-fatal injuries. There are issues associated with emergency care. In Ghana, a study conducted in a rural area showed that most injured people are transported to hospitals staffed by general practitioners with no training in trauma care. The paucity of surveillance data from African countries leads to uncertainties, and probably to major under-estimates of the size of the problem. Implementing an effective and sustainable information system related to road traffic injuries should be among the first priorities, as this enables us to address three decisive objectives. Data can come from death statistics, hospital registries, and even from population surveys. Collection of police reports is, however, the most frequent system implemented in several African countries. These initiatives need to be generalised, standardised, and, most importantly, evaluated and optimised accordingly. In Africa, driving a car is still considered a privilege, an enviable option, not a risky task with inherent responsibilities. Unfortunately, Africa has other burning public health priorities. Documented success stories in road safety are needed to demonstrate that road traffic accidents need not be inevitable and unpredictable, but are avoidable. Changing the mindset of road users will be a challenge, but many lives are at stake. *doi: 10.1371/journal.pmed.0040170*
83	**BF**	● ●	Linden, J., Thorsson, S., Eliasson, I. 2008. Carbon Monoxide in Ouagadougou, Burkina Faso - A comparison between urban background, roadside and in-traffic measurements. *Water Air and Soil Pollution,* 188(1-4), 345-353.	Spatial variations of Carbon Monoxide (CO) are examined in the urban environment of Ouagadougou, Burkina Faso. Focus is given on the variations between urban background, roadside and in-traffic measurements. Results show significant differences between the three methods where average in-traffic values were 2-3 times higher than average roadside values and 10-12 times higher than average background values. During traffic congestions these differences extended up to 6 and 20 times respectively. Results are discussed in relation to human exposure assessments and WHO guidelines. *doi: 10.1007/s11270-007-9538-2*
84	**BF**	● ●	Linden, J., Boman, J., Holmer, B., Thorsson, S., Eliasson, I. 2012. Intra-urban air pollution in a rapidly growing Sahelian city. *Environment International*, 40, 51-62.	In this paper we analyze spatial and temporal variations of air pollution (PM1, PM2.5, PM10, CO, NOx, O-3, Toluene and Benzene) and climate in areas of different development typology in Ouagadougou, Burkina Faso. Analyses are based on measurements from fixed sites and car traverse measurements during field studies in 2007 and 2010. Large spatial and temporal variations were found, showing a generally poor air quality situation, with extreme levels of PM10, commonly exceeding air quality guidelines of WHO. Pollution levels increase considerably with increased atmospheric stability. Important sources were transported dust and re-suspension of dust from unpaved roads, but also traffic emissions and biomass burning. The spatial variations are examined with focus on effects for variations in potential exposure depending on for example area of residence and daily activity pattern, showing that great differences are likely to exist. Ouagadougou, like most developing countries worldwide, currently experiences an extremely rapid population growth in combination with limited financial means. This is likely to create increasingly harmful air pollution situations for the rapidly growing populations of these areas, and shows an urgent need for increased understanding of the pollution situation as well as development of mitigation strategies. *doi: 10.1016/j.envint.2011.11.005*

No.	Country	Topic	Citation	Summary
85	**BF**		Lord, D., Abdou, H., N'Zue, A., Dionne, G., Laberge-Nadeau, C. 2003. Traffic safety diagnostics and application of countermeasures for rural roads in Burkina Faso. *Transportation Research Record*, 1846, 39-43.	The government of Burkina Faso has recently been making important macroeconomic changes to encourage the economic growth of the country. To maintain this growth, the government has implemented a transportation program to improve road network efficiency and safety. A 2000 study to improve the safety of rural roads in Burkina Faso is described. The primary objectives were to assess traffic safety problems and propose countermeasures to reduce the number and severity of collisions on rural roads. Many rural roads were evaluated on site; all accident data and important socioeconomic variables were collected; and key staff members from various governmental and private agencies were interviewed. The study has shown that traffic safety problems in Burkina Faso are multidimensional, involving inefficient traffic safety management and policy, inadequate road networks, untrained drivers, and defective vehicles. Several traffic safety countermeasures have been proposed for immediate, short-, and long-term application. The most important countermeasures are to create a new institutional framework for improving traffic safety management and train the key personnel responsible for implementing these countermeasures. For the short term, the countermeasures mainly relate to roadway infrastructure improvements and better enforcement tools. For the long term, the countermeasures include a review of current highway traffic laws and their application, evaluation of existing countermeasures, and driver training improvement.
86	**GH**		Lund, I., Rundmo, T. 2008. Cross-cultural comparisons of traffic safety, risk perception, attitudes and behavior, *Safety Science*, 47(4), 547-553.	The core aim of the present study is to examine cultural differences in risk perception and attitudes towards traffic safety and risk, taking behaviour in the Norwegian and the Ghanaian public. An additional aim is to discuss the applicability of various traffic measures, suited for low and middle income countries in Africa. The results of the present study are based on two self-completion questionnaire surveys carried out in February and March 2006. The first was a representative sample of the Norwegian public above 18 years of age ($N = 247$). The second was a stratified sample of Ghanaian respondents ($N = 299$). In Ghana the data was collected in Accra and Cape Coast. The results showed that there is potential for further improvement of safety attitudes and risk behaviour among Ghanaians as well as Norwegians. There were also differences in the respondents' evaluation of attitudes, risk perception and behaviour. Perceived risk and attitudes also significantly predicted risk behaviour and accidents/collisions. The implications of these results for traffic safety will be discussed. *http://dx.doi.org/10.1016/j.ssci.2008.07.008*
87	**ZA**		Mabunda, M., Swart, L., Seedat, M. 2008. Magnitude and categories of pedestrian fatalities in South Africa. *Accident Analysis and Prevention*, 40(2), 586-593.	Road traffic injuries, a major global public health burden, are concentrated in low-income and middle-income countries.' In contrast to high-income countries, pedestrians make up the largest group of road traffic injuries and fatalities in low- and middle-income countries. This article presents an analysis of pedestrian fatalities (2001-2004) in four South African cities. The article describes the magnitude, demographic, and temporal factors associated with pedestrian fatalities and presents a typological analysis to identify particular groups of at risk pedestrians. The analysis can serve to inform the development of prevention programmes tailored to the needs of specific at risk pedestrian groups. Data were obtained from the National Injury Mortality Surveillance System (NIMSS). The results indicated that there were a total of 7433 pedestrian deaths (2001-2004) for the four cities and the majority occurred over weekends. Most (56.7%) were between ages 20 and 44 years. Overall, there were 3.3 male pedestrian deaths for every female pedestrian death, and over half (58%) of the 4004 cases tested were positive for alcohol. A typological analysis identified three categories of pedestrian fatalities: (1) male pedestrian fatalities that showed high levels of alcohol concentrations, (2) female and elderly pedestrian deaths that occurred between 6 AM and midday, and (3) children, adolescents, and young adult pedestrian fatalities that typically occurred during weekday afternoons and evenings. The findings call for multiple strategies for combating pedestrian fatalities.

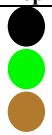
No.	Country	Topic	Citation	Summary
88	**KE**		Magnanya, J. Odero, K., Munguti. K. *Transport and Health. An Exploratory Study of Suba District in Kenya.*	This case study, undertaken in Suba District in Nyanza Province, Kenya, examined mobility and health linkages. The study areas were selected based on key health and transport indicators notably: areas near Ruma National Park which has long walking distances to goods and services and motorized transport services, Mufangano Island which is two hours away by boat from the main market and health facilities, and the fishing villages in Ringiti Island. The study assessed and analyzed issues related to maternal health, malaria, and gender disparities in relation to mobility using combination of qualitative and quantitative research methods was used to collect and analyze data. The approach included review of relevant literature and resources followed by a participatory appraisal of key respondents. The key tools used included Focus Group Discussions and assessment of needs and ranking of priorities. The study makes some interesting findings. Overall, the main barriers in transport to accessing health institutions in Suba are lack of transport services (including boat services), lack of money for transport services when the services are available, and lack of specialized affordable method of carrying patients who are not able to walk. People also face risk walking to health institutions especially in areas that are near the Ruma National Parks. Walking across mountainous terrain with a sick person was reported to be a burden. In Locations covered in the study (Gembe, Wakianga/Waware, Kamasengre, Kawanga, Kaksingri East, Ruma, Gwassi West and Mbita Township) the people have adapted self medication, including drinking water, massages and purchase of over the counter medication to deal with common interventions for mild illnesses and cope with transport difficulties. A number of intermediate forms of transport have been developed to improve access and provide means of transport in cases of severe medical conditions. These include use of bed stretchers, wheelbarrows, bicycle, handcarts, as well as use of boats for water transport. Localized conditions, for example, fear of wild animals in areas bordering Ruma National Park notwithstanding, no overall pattern in terms of transport challenges or preferred interventions is discerned from any of the study areas characterized as savannah, island or mountainous. The same is true when the data is disaggregated and analyzed by gender. As a result, this exploratory study marks the birth of further detailed research on the relationship between transport and health in and possible transport and mobility interventions that may be considered in attempted to improve access to health in Suba and indeed the whole country. *http://www.mobilityandhealth.org/case/case_af.php*
89	**KE**		Manyara, C. 2013. Combating Road Traffic Accidents in Kenya: A Challenge for an Emerging Economy. *Proceedings from the KESSA 2013 Conference,* 6-7.	Road Traffic Accidents are a major cause of death and disability around the world. Of the 23-34 million people injured in road accidents annually, an average of 1.24 million die. This makes road accidents the ninth ranked cause of death in the world and the ranking is projected to rise to third by 2020. An estimated 85% of the deaths occur in developing countries where 65% of the deaths are pedestrians, of which 35 % are children. In Kenya over 3000 people die through road accidents every year, most of them between the ages of 15 and 44 years. The cost to the economy from these accidents is in excess of US$ 50 million exclusive of the actual loss of life. Studies show that the causes, frequency and severity of road traffic injuries attributed to a poor driving culture, badly designed and neglected roads, and inadequate enforcement of existing traffic laws. The objectives of this study are to 1) analyze the nature and causes of traffic accidents, 2) examine the evolution of government policy regarding public transport, and 3) identify the role of stakeholders in combating the menace of road accidents in Kenya. Although a lot has been done on policy formulation, implementation and regulation on road design and use, and full and meaningful participation by stakeholders still need to be stepped up in order to address the menace effectively. *http://kessa.org/yahoo_site_admin/assets/docs/17_Manyara_KESSA_Proceedings_2013.25183342.pdf*

No.	Country	Topic	Citation	Summary
90	**SA**		Matzopoulos, R., Myers, J., Jobamputra, R. 2008. Road Traffic injury: Prioritising interventions. *South African Medical Journal*, 98(9)692-696.	Road traffic injuries are a leading cause of death and may be related to social inequality. To establish whether patterns of seatbelt use vary between different socioeconomic communities in the Cape Town Metropole, South Africa.Vehicles and their occupants at 7 high-volume crossings (3 in high-income areas) were placed under surveillance for 2 hours each during November 2010. All occupants were eligible for inclusion except occupants of non-motorised vehicles, two-wheel motorised vehicles, buses, taxis, heavy goods vehicles and emergency vehicles. Child seatbelt use was recorded only for children who appeared older than 3 years. A total of 4 651 vehicles with 6 848 occupants were surveyed. Rates of seatbelt use were 45.1% (n=3 090) for all occupants, 54.0% (n=2 513) for drivers, 33.1% (n=521) for front-seat passengers (adults 33.2%, n=452; children 32.7%, n=69) and 9.0% (n=56) for rear-seat passengers (adults 4.0%, n=13; children 14.4%, n=43). Occupants from high-income areas were more likely to wear seatbelts (odds ratio (OR) 4.35; 95% confidence interval (CI) 3.89 - 4.88). Use of child restraints was poor overall (22.3%, n=114), but also varied according to income areas (high income 40.9%, n=99; low income 0.03%, n=6; OR 26.77; 95% CI 11.44 - 62.63). The impact of road traffic injuries is significant, but can be decreased by using appropriate restraining devices. Seatbelt use in South Africa, although compulsory, is neither strictly adhered to nor enforced. Their use is proportionally lower in lower-income areas. Specific interventions are required to target these communities directly. *doi:10.7196/SAMJ.7126*
91			McMichael, A. 2000. The urban environment and health in a world of increasing globalization: issues for developing countries. Bulletin of World Health Organization, 78(9), 1117-1126.	Urban living is the keystone of modern human ecology. Cities have multiplied and expanded rapidly worldwide over the past two centuries. Cities are sources of creativity and technology, and they are the engines for economic growth. However, they are also sources of poverty, inequality, and health hazards from the environment. Urban populations have long been incubators and gateways for infectious diseases. The early industrializing period of unplanned growth and laissez-faire economic activity in cities in industrialized countries has been superseded by the rise of collective management of the urban environment. This occurred in response to environmental blight, increasing literacy, the development of democratic government, and the collective accrual of wealth. In many low-income countries, this process is being slowed by the pressures and priorities of economic globalization. Beyond the traditional risks of diarrhoeal disease and respiratory infections in the urban poor and the adaptation of various vector-borne infections to urbanization, the urban environment poses various physicochemical hazards. These include exposure to lead, air pollution, traffic hazards, and the ‘‘urban heat island’’ amplification of heatwaves. As the number of urban consumers and their material expectations rise and as the use of fossil fuels increases, cities contribute to the large-scale pressures on the biosphere including climate change. We must develop policies that ameliorate the existing, and usually unequally distributed, urban environmental health hazards and larger-scale environmental problems. *http://dx.doi.org/10.1590/S0042-96862000000900007*
92	**ZA**		Meel, B. 2008. Fatal road traffic accidents in the Mthatha area of South Africa, 1993-2004. *South African Medical Journal*, 98(9), 716-719.	Trauma is one of the leading causes of death in the Mthatha area, which is one of the least developed regions of South Africa. Road traffic accidents (RTAs) contribute substantially to the number of such deaths. To estimate the number of fatal RTAs in the Mthatha area, and analyse age and sex of the deceased. A review of autopsies performed in the Mthatha General Hospital mortuary was conducted. Data were analysed using the GENSTAT 9 package with a Poisson regression model. There were 2 736 deaths from RTAs over the 12-year period 1993 - 2004 in the Mthatha area. These casualties constituted an average annual rate of 57 deaths per 100 000 population. The highest (69.4/100 000) was in 1998, and the lowest (40.2/100 000) in 2001. Males outnumbered females by 2.6:1 (95% confidence interval (CI) 2.13 - 3.22), and the rate showed a decline of 0.97/100 000/year (95% CI 0.95 - 0.99) for the 1998 - 2001 period. The rate of decline was the same for males and females. The highest annual rate was 14.2 per 100 000 population in the age group 21 - 30 years, and the lowest, of 2.6 per 100 000 population, ill the group above 70 years of age. The death rates were related to sex ($p<0.001$) and calendar year ($p<0.049$). There was no significant connection between year and sex, implying that the effect of year (time) was the same for men and women. These results are statistically significant despite the very high variability in the data (S-2 =5.53). RTA-related deaths in the Mthatha area are 3 times higher than the global average. http://reference.sabinet.co.za.libdata.lib.ua.edu/sa_epublication_article/m_samj_v98_n9_a15

No.	Country	Topic	Citation	Summary
93	**CM**		Mefire, A., Mballa, G., Kenfack, M., Juillard, C., Stevens, K. 2013. Hospital-based injury data from level III institution in Cameroon: Retrospective analysis of the present registration system. *Injury-International Journal of the Care of the Injured*, 44(1), 139-143.	Data on the epidemiology of trauma in Cameroon are scarce. Presently, hospital records are still used as a primary source of injury data. It has been shown that trauma registries could play a key role in providing basic data on trauma. Our goal is to review the present emergency ward records for completeness of data and provide an overview of injuries in the city of Limbe and the surrounding area in the Southwest Region of Cameroon prior to the institution of a formal registration system. A retrospective review of Emergency Ward logs in Limbe Hospital was conducted over one year. Records for all patients over 15 years of age were reviewed for 14 data points considered to be essential to a basic trauma registry. Completeness of records was assessed and a descriptive analysis of patterns and trends of trauma was performed. Injury-related conditions represent 27% of all registered admissions in the casualty department. Information on age, sex and mechanism of injury was lacking in 22% of cases. Information on vital signs was present in 2% (respiratory rate) to 12% (blood pressure on admission) of records. Patient disposition (admission, transfer, discharge, or death) was available 42% of the time, whilst location of injury was found in 84% of records. Road traffic injury was the most frequently recorded mechanism (36%), with the type of vehicle specified in 54% and the type of collision in only 22% of cases. Intentional injuries were the second most frequent mechanism at 23%. The frequency of trauma found in this context argues for further prevention and treatment efforts. The institution of a formal registration system will improve the completeness of data and lead to increased ability to evaluate the severity and subsequent public health implications of injury in this region. *doi: 10.1016/j.injury.2011.10.026*
94	**TZ**		Mfinanga, D. 2014. Implication of pedestrians' stated preference of certain attributes of crosswalks. *Transport Policy*, 32, 156-164.	Pedestrians in Tanzania face many problems when crossing roads, including safety and convenience, which discourage the use of this important mode of transport. This study was aimed at determining pedestrians' preferences of environmental and infrastructural attributes of crosswalks in order to improve the utility of the facilities and mode by promoting elements preferred by the majority of pedestrians. The survey involved interviewing pedestrians and the results indicated that the majority prefer to cross on level ground and medians, with females and younger pedestrians more willing to use non-level crossings. The most preferred viable options for controlling vehicles' speed and the crosswalk were humps on either side of the crossing and the use of signals (especially on higher class roads), respectively. The majority considered safety to be the most desirable improvement with females and those on utilitarian trips most in support. Also, pedestrians' preference of attributes in relation to different road classes highly agrees with current design principles. It was found that gender, age of pedestrian, purpose of trip and road class affect pedestrian preference and if considered in the planning and design of crossing facilities, they can result in improved safety, convenience and use of this Non-Motorised Transport (NMT) mode. *doi: 10.1016/j.tranpol.2014.01.011*

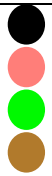
No.	Country	Topic	Citation	Summary
95	**ZA**		Micklesfield, L., Pedro, T., Kahn K., Kinsman, J., Pettifor, J., Tollma, S., Norris, S. 2014. Physical activity and sedentary behavior among adolescents in rural South Africa: levels, patterns and correlates. *BMC Public Health*, 14(40),	Physical inactivity is increasing among children and adolescents and may be contributing to the increasing prevalence of overweight and obesity. This study examines physical activity and sedentary behavior patterns, and explores associations with individual, maternal, household, and community factors amongst rural South African adolescents. In 2009, 381 subjects, stratified by ages 11-12-years and 14-15-years, were randomly selected from 3511 children and adolescents who had participated in a growth survey two years previously. Weight and height were measured and self-reported Tanner pubertal stage was collected. A questionnaire quantifying frequency and duration of physical activity (PA) domains and sedentary time for the previous 12 months was administered. Moderate-vigorous physical activity (MVPA mins/wk) was calculated for time spent in school and club sport. Socio-demographic and other related data were included from the Agincourt health and socio-demographic system (HDSS). The Agincourt HDSS was established in 1992 and collects prospective data on the community living in the Agincourt sub-district of Mpumalanga Province in rural north-east South Africa. Puberty, maternal education and socio-economic status (SES) contributed significantly to the mulitiple linear regression model for sedentary behavior (R-2=0.199; adjusted R-2=0.139; $p < 0.000$), and sex, SES and maternal education contributed to the tobit regression model for school and club sport MVPA ($p < 0.000$). MVPA, calculated from school and club sport, was higher in boys than girls ($p < 0.001$), and informal activity was lower (boys: $p < 0.05$ and girls: $p < 0.01$) while sedentary time was higher (girls: $p < 0.01$) in the older than the younger groups. Ninety-two percent (92%) of the sample reported walking for transport. In this study of rural South African adolescent boys and girls, SES at the maternal, household and community level independently predicted time spent in sedentary behaviors, and school and club MVPA. This study provides local data that can be used to dev elop health promotion strategies specific to this community, and other similar communities in developing countries. *doi:10.1186/1471-2458-14-40*
96	**TZ**		Mkoma, S., Maenhaut, W., Chi, X., Wang, W., Raes, N. 2009. Characterisation of PM10 atmospheric aerosols for the wet season 2005 at two sites in East Africa. *Atmospheric Environment*, 43(3), 631-639.	Ambient daily PM10 aerosol samples were collected at two sites in Tanzania in May and June 2005 (during the wet season), and their chemical characteristics were studied. The sites were a rural site in Morogoro and an urban kerbside site in Dar es Salaam. A Gent PM10 stacked filter unit sampler with sequential Nuclepore polycarbonate filters, providing fine and coarse size fractions, and a PM10 sampler with quartz fibre filters were deployed. Parallel collections of 24 h were made with the two samplers and the number of these collections was 13 in Morogoro and 16 in Dar es Salaam. The average mass concentration of PM10 was 27 +/- 11 mu g/m(3) in Morogoro, and 51 +/- 21 mu g/m(3) in Dar es Salaam. In Morogoro, the mean concentrations of organic carbon (OC), elemental carbon (EC), and water-soluble Organic carbon (WSOC) were 6.8, 0.51, and 2.8 mu g/m(3), respectively. In contrast, higher mean concentrations (11.9, 4.6, and 3.3 mu g/m(3), respectively) were obtained for Dar es Salaam. At both sites, species and elements, such as black carbon, NH4+, non-sea-salt SO42-, K, and Ni (and at Dar es Salaam also V, As, Br, and Pb) were mainly present in the fine size fraction. The common crustal and sea-salt elements, including Na, Mg, Al, Si, Cl, Ca, Ti, Mn, Fe, and Sr, and also NO3- and P (and to a lesser extent Cu and Zn) were concentrated in the coarse particles. Aerosol chemical mass closure indicated that the PM10 mass in Morogoro consisted, on average, of 48% organic matter (OM), 44% crustal matter, 4% sea salt, and 2% EC, while in Dar es Salaam OM, crustal matter, sea salt, and EC represented 37%, 32%, 9%, and 9% of the PM10 mass. The contributions of the secondary inorganic aerosol (non-sea-salt sulphate, nit rate, and ammonium) were small, i.e., only 5% in total at each site. Carbonaceous materials and crustal matter were thus the most important components of the PM10 mass. It is suggested that biomass burning is a major contributor to the OM; at Dar es Salaam there is also a very substantial contribution from traffic. A source apportionment calculation indicated that 68% of the OC at this site originated from traffic exhaust versus 32% from charcoal burning. The crustal matter at Morogoro is likely mainly attributable to soil dust resuspension. whereas in Dar es Salaam it is likely mostly resuspended road dust. *doi: 10.1016/j.atmosenv.2008.10.008*

No.	Country	Topic	Citation	Summary
97	**TZ**		Mmari, A., Potgieter-Vermaak, S., Bencs, L., McCrindle, R., Van Grieken, R. 2013. Elemental and ionic components of atmospheric aerosols and associated gaseous pollutants in and near Dar es Salaam, Tanzania. *Atmospheric Environment*, 77, 51-61.	Elemental and water-soluble ionic compounds (WSICs) of atmospheric aerosols (total suspended particulate - TSP) and some gaseous pollutants (SO2, NO2 and O-3) from a coastal, semi-urban and rural site in and near Dar es Salaam, Tanzania were investigated during dry and wet seasons of January 2005-November 2007. Na+, Ca2+, SO42-, NO3- and Cl- made up the dominant fraction of WSICs during the dry season with average concentrations ranging from non-detectable (n.d.)-5.4, 0.26-2.6, 0.74-14.7, 0.4-1.5 and 1.1-3.4 mu g m(-3), respectively, while in the wet season, from n.d. up to 1.7, 1.2, 4.4, 2.1 and 3.0 mu g m(-3), respectively. The total air concentrations of the detected elements (Al, Si, S, Cl, K, Ca, Fe and Zn) showed seasonal and site-specific variation in the range of 7.5-26.6 with an average of 14.5 mu g m(-3). Most of the air concentrations of pollutants were observed to decrease with increasing distance from the coastal site, which is under urban and industrial pollutant emissions. Sulphur and nitrogen oxidation ratios during the dry season ranged from 0.08 to 0.91 and 0.013 to 0.049, respectively, while they were between 0.09-0.65 and 0.002-0.095, respectively, in the wet season. These values indicate the photochemical oxidation of SO2 and a high extent of NO(3)(-)formation in the atmosphere. Neutralization ratios revealed the presence of acidic SO42- and NO3- aerosols. Principal component analysis identified sea spray, local combustion, vehicular traffic, biomass burning and resuspended road dust as dominant sources of aerosols at the studied coastal and semi-urban sites. However, at the rural site, besides sea spray, crustal sources, soil dust re-suspension and long-range transport are the possible origins of suspended particulates. (C) 2013 Elsevier Ltd. All rights reserved. *http://dx.doi.org/10.1016/j.atmosenv.2013.04.061*
98	**GH**		Mock, C., Forjuoh, S., Rivara, F. 1999. Epidemiology of transport-related injuries in Ghana. *Accident Analysis and Prevention*, 31(4), 359-370.	To better elucidate the incidence, characteristics, and consequences of transport-related injuries in a less developed country in Africa, we undertook an epidemiologic survey in Ghana. A total of 21 105 persons were surveyed, in both an urban area (Kumasi, n = 11 663) and a rural area (Brong-Ahafo, it = 9442). In the preceding year, a total of 656 injuries were reported in the urban area and 928 injuries reported in the rural area. Transport-related mechanisms accounted for 16% of all injuries in the urban and 10% of all injuries in the rural area. The annual incidence of transport-related injuries was almost identical in the two settings, 997/100 000 persons in the urban area and 941/100 000 in the rural area. In both settings, transport-related injuries were more severe than other types of injuries in terms of mortality, length of disability, and economic consequences. In the urban area, the most common transport-related mechanisms were either to passengers involved in crashes of mini-buses or taxis (29%) or to pedestrians struck by these vehicles (21%). In the rural area, the most common transport-related mechanisms were bicycle crashes. The second most common rural mechanisms were motor vehicle crashes, which were the most severe and which involved commercial (83%) rather than private vehicles. Prevention strategies need to be different from those in developed countries and should target commercial drivers more than private road users. *doi: 10.1016/S0001-4575(98)00064-5*
99			Mock, C., Kobusingye, O., Vu Anh, L., Afukaar, F., Arreola-Risa, C. 2005. Human resources for the control of road traffic injury. Bulletin of the World Health Organization, 83, 294-300.	The definition of the ideal numbers and distribution of human resources required for control of road traffic injury (RTI) is not as advanced as for other health problems. We can nonetheless identify functions that need to be addressed across the spectrum of injury control: surveillance; road safety; and trauma care. Many low-cost strategies to improve these functions in low- or middle-income countries can be identified. For all these strategies, there is need for adequate institutional capacity, including funding, legal authority, and human resources. Several categories of human resources need to be developed: epidemiologists who can handle injury data, design surveillance systems, and undertake research; engineers and planners versed in safety aspects of road design, traffic flow, urban planning, and vehicle design; police and lawyers who understand the health impact of traffic law; clinicians who can develop cost-effective improvements in the entire system of trauma treatment; media experts to undertake effective behaviour change and social marketing; and economists to assist with cost-effectiveness evaluations. RTI control can be strengthened by enhancing such training in these disciplines, as well as encouraging retention of those who have the needed skills. Mechanisms to enhance collaboration between these different fields need to be promoted. Finally, the burden of RTI is borne disproportionately by the poor; in addition to technical issues, more profound equity issues must be addressed. This mandates that people from all professional backgrounds who work for RTI control should develop skills in advocacy and politics. *http://www.who.int/bulletin/volumes/83/4/294.pdf*

No.	Country	Topic	Citation	Summary
100	**SA**		Mohammed, S., Labuschagne, F. 2008. Can Draconian law Enforcement solve the South African Road Safety Crisis? *Proceedings of e the 27th Southern African Transport Conference (SATC) 2008,* Pretoria, South Africa, 7 – 11 July, 2008.	Traffic law enforcement has been defined as the area of activity aimed at controlling road user behaviour by preventative, persuasive and punitive measures in order to effect the safe and efficient movement of traffic. The Department of Transport launched the Road to Safety Strategy in 2001 aimed at addressing serious policy and implementation issues linked to bad road safety conditions. A major part of the Road to Safety Strategy involves dealing with attitudes such as those that entail behaviour personified in risky / dangerous / bad behaviour. The perceived acceptable behaviour of traffic violation by society (rather than a punishable act) magnifies the road safety problem in South Africa. Severe punishment and draconian legislations have been pinpointed in some studies as a crucial factor in behavioural change towards safer roads. The focus of this paper is to present a literature review on effects of draconian traffic policies and legal sanctions on road traffic safety and analyse those measures that are easy, affordable and outcome driven to overcome the South African road safety crisis. The current road safety situation in South Africa will be reviewed in terms of the traffic legislations, traffic policing and the legal sanctions. The role of different road safety agencies and offices within the national, provincial and local governments will also be outlined. The study will point to some lessons learned from some countries in their ongoing road safety programmes. The effect of licence loss and imprisonment of convicted drunk drivers on the Australian road safety situation and the effect of a demerit point system in countries where it is implemented are some of the cases that the study will present. Some technical details such as the human and technological resources needed for such traffic safety measures will also be part of the paper.
101			Mohan, D. 2008. Road traffic injuries: a stocktaking. *Best Practice & Research Clinical Rheumatology*, 22(4), 725-739.	Once we accept that road traffic injury control is a public health problem, and that we have an ethical responsibility to arrange for the safety of individuals, then it follows that health and medical professionals have to assume responsibility for participating in efforts to control this pandemic. Over 1.2 million people die of road traffic crashes annually. Road traffic injuries are among the second to the sixth leading causes of death in the age groups 15–60 years in all countries around the world. Control of road traffic injuries is going to require very special efforts as patterns are different in high- and lower-income countries, and while some countermeasures are applicable internationally, others will need further research and innovation. We will need to focus on the safety of pedestrians, bicyclists and motorcyclists, speed control, and prevention of driving under the influence of alcohol. *http://dx.doi.org/10.1016/j.berh.2008.05.004*
102	**KE**		Moisi, J., Gatakaa, H., Noor, A., Williams, T., Bauni, E., Tsofa, B., Levine, O., Scott, J. 2010. Geographic access to care is not a determinant of child mortality in a rural Kenyan setting with high health facility density. *BMC Public Health*, 10(142).	Policy-makers evaluating country progress towards the Millennium Development Goals also examine trends in health inequities. Distance to health facilities is a known determinant of health care utilization and may drive inequalities in health outcomes; we aimed to investigate its effects on childhood mortality. The Epidemiological and Demographic Surveillance System in Kilifi District, Kenya, collects data on vital events and migrations in a population of 220,000 people. We used Geographic Information Systems to estimate pedestrian and vehicular travel times to hospitals and vaccine clinics and developed proportional-hazards models to evaluate the effects of travel time on mortality hazard in children less than 5 years of age, accounting for sex, ethnic group, maternal education, migrant status, rainfall and calendar time. In 2004-6, under-5 and under-1 mortality ratios were 65 and 46 per 1,000 live-births, respectively. Median pedestrian and vehicular travel times to hospital were 193 min (inter-quartile range: 125-267) and 49 min (32-72); analogous values for vaccine clinics were 47 (25-73) and 26 min (13-40). Infant and under-5 mortality varied twofold across geographic locations, ranging from 34.5 to 61.9 per 1000 child-years and 8.8 to 18.1 per 1000, respectively. However, distance to health facilities was not associated with mortality. Hazard Ratios (HR) were 0.99 (95% CI 0.95-1.04) per hour and 1.01 (95% CI 0.95-1.08) per half-hour of pedestrian and vehicular travel to hospital, respectively, and 1.00 (95% CI 0.99-1.04) and 0.97 (95% CI 0.92-1.05) per quarter-hour of pedestrian and vehicular travel to vaccine clinics in children < 5 years of age. Significant spatial variations in mortality were observed across the area, but were not correlated with distance to health facilities. We conclude that given the present density of health facilities in Kenya, geographic access to curative services does not influence population-level mortality. *doi: 10.1186/1471-2458-10-142*

No.	Country	Topic	Citation	Summary
103	**BW**		Moloi, K., Chimidza, S., Lindgren, E., Viksna, A., Standzenieks, O. 2002. Black carbon, mass and elemental measurements of airborne particles in the village of Serowe, Botswana. *Atmospheric Environment*, 36(14), 2447-2457.	Absorption of sunlight by sub-micron particles is an important factor in calculations of the radiation balance of the earth and thus in climate modelling. Carbon-containing particles are generally considered as the most important in this respect. Major sources of these particles are generally considered to be bio-mass burning and vehicle exhaust. In order to characterise size fractionated particulate matter in a rural village in Botswana with respect to light absorption and elemental content experiments were performed, in which simultaneous sampling was made with a dichotomous impactor and a laboratory-made sampler, made compatible with black carbon analysis by reflectometry. The dichotomous impactor was equipped with Teflon filters and the other sampler with glass fibre filters. Energy dispersive X-ray fluorescence was used for elemental analysis of both kinds of filters. It appeared that Teflon filters were the most suitable for the combination of mass-, elemental- and black carbon measurements. The black carbon content in coarse (2.5-10μm) and fine (<2.5μm) particles was determined separately and related to elemental content and emission source. The results show that the fine particle fraction in the aerosol has a much higher contribution of black particles than the coarse particle fraction. This observation is valid for the village in Botswana as well as for a typical industrialised city in Sweden, used as a reference location.*doi:10.1016/S1352-2310(02)00085-7*
104	**TZ**		Moshiro, C., Mswia, R., Alberti, K., Whiting, D., Unwin, N., Setel, P. The importance of injury as a cause of death in sub-Saharan Africa: results of a community-based study in Tanzania. *Public Health*, 115(2), 96-102.	This paper describes rates and causes of injury deaths among community members in three districts of the United Republic of Tanzania. A population-based study was carried out in two rural districts and one urban area in Tanzania. Deaths occurring in the study areas were monitored prospectively during a period of six years. Censuses were conducted annually in the rural areas and biannually in the urban area to determine the denominator populations. Cause-specific death rates and Years of Life Lost (YLL) due to injury were calculated for the three study areas. During a 6 year period (1992–1998), 5047 deaths were recorded in Dar es Salaam, 9339 in Hai District and 11 155 in Morogoro Rural District. Among all ages, deaths due to injuries accounted for 5% of all deaths in Dar es Salaam, 8% in Hai and 5% in Morogoro. The age-standardised injury death rates among men were approximately three times higher than among women in all study areas. Transport accidents were the commonest cause of mortality in all injury-related deaths in the three project areas, except for females in Hai District, where it ranked second after intentional self-harm. We conclude that injury deaths impose a considerable burden in Tanzania. Strategies should be strengthened in the prevention and control of avoidable premature deaths due to injuries. http://dx.doi.org/10.1038/sj.ph.1900725
105	**BW**		Mupimpila, C. 2008. Aspects of road safety in Botswana. *Development of Southern Africa*, 25(4), 425-435.	The present paper analyses aspects of road safety in Botswana. In this country, the number of deaths,from road accidents is relatively high compared with other African countries. The main causes of accidents are speeding and drunken driving and the increasing traffic congestion during rush hours in the urban areas. The paper describes the current situation and the rood safety policy, and discusses the need to improve road safety in the country. It recommends emphasising road injury prevention, encouraging the use of public transport because it is safer, setting quantitative targets for reducing road traffic fatalities, and establishing a Road Traffic Council. DOI: 10.1080/03768350802318506

No.	Country	Topic	Citation	Summary
106	**NG**		Mustapha, B., Blangiardo, M., Briggs, D., Hansell, A. 2011. Traffic Air Pollution and Other Risk Factors for Respiratory Illness in Schoolchildren in the Niger-Delta Region of Nigeria. *Environmental Health Perspectives*, 119(10), 1478-1482.	Association of childhood respiratory illness with traffic air pollution has been investigated largely in developed but not in developing countries, where pollution levels are often very high. In this study we investigated associations between respiratory health and outdoor and indoor air pollution in schoolchildren 7-14 years of age in low socioeconomic status areas in the Niger Delta. A cross-sectional survey was carried out among 1,397 schoolchildren. Exposure to home outdoor and indoor air pollution was assessed by self-report questionnaire. School air pollution exposures were assessed using traffic counts, distance of schools to major streets, and particulate matter and carbon monoxide measurements, combined using principal components analysis. Hierarchical logistic regression was used to examine associations with reported respiratory health, adjusting for potential confounders. Traffic disturbance at home (i.e., traffic noise and/or fumes evident inside the home vs. none) was associated with wheeze [odds ratio (OR) = 2.16; 95% confidence interval (CI), 1.28-3.64], night cough (OR = 1.37; 95% CI, 1.03-1.82), phlegm (OR = 1.49; 95% CI, 1.09-2.04), and nose symptoms (OR = 1.40; 95% CI, 1.03-1.90), whereas school exposure to a component variable indicating exposure to fine particles was associated with increased phlegm (OR = 1.38; 95% CI, 1.09-1.75). Nonsignificant positive associations were found between cooking with wood/coal (OR = 2.99; 95% CI, 0.88-10.18) or kerosene (OR = 2.83; 95% CI, 0.85-9.44) and phlegm compared with cooking with gas. Traffic pollution is associated with respiratory symptoms in schoolchildren in a deprived area of western Africa. Associations may have been underestimated because of nondifferential misclassification resulting from limitations in exposure measurement. *doi: 10.1289/ehp.1003099*
107	**UG**		Naddumba, E. 2004. A cross-sectional retrospective study of boda-boda injuries at Mulango Hospital in Kampala, Uganda. *East and Central African Journal of Surgery*, 9, 44-47.	During the last 5 years, many Ugandans have resorted to use of small Motorbikes popularly known as "Boda-boda", as quick means of Transport. The Boda Bodas that have been mainly operated by the youths as a means of public transport have been responsible for many "accidents". The purpose of this paper is to highlight the Musculo -Skeletal Injuries that directly or indirectly result from Boda Boda Traffic "accidents", with a view of assisting the policy makers in their efforts of reducing Road Traffic Accidents in Uganda. This was a cross-sectional retrospective study conducted at Mulago Hospital on the Surgical and Orthopaedics Wards. Records of patients admitted through the emergency admitting ward for the period July - September 2001 were studied. During the period under study, a total of 182 road traffic injuries were admitted. 46 (25%) of these were as a result of Boda Bodas. The commonest injury was Open Tibia1 Fractures (21%). The majority of the victims (20%) had poly trauma. The motorcyclists were mainly youths with an average age of 24 years. Stria legislature should urgently be put in place to curb the reckless motorcyclists as an effort to control these emerging traffic injuries. *http://www.bioline.org.br/abstract?id=js04011*
108	**KE**		Ng'ang'a, L., Odhiambho, J., Mungai, M., Gicheha, C., Nderitu, P., Maingi, B., Mackiem, P., Becklake, M. 1998. Prevalence of exercise induced bronchospasm in Kenyan school children: an urban-rural comparison. *Thorax*, 53, 919-926	Higher rates of exercise induced bronchospasm (EIB) have been reported for urban than for rural African schoolchildren. The change from a traditional to a westernised lifestyle has been implicated. This study was undertaken to examine the impact of various features of urban living on the prevalence of EIB in Kenyan school children. A total of 1226 children aged 8–17 years attending grade 4 at five randomly selected schools in Nairobi (urban) and five in Muranga district (rural) underwent an exercise challenge test. A respiratory health and home environment questionnaire was also administered to parents/guardians. This report is limited to 1071 children aged ⩽12 years. Prevalence rates of EIB for the two areas were compared and the differences analysed to model the respective contributions of personal characteristics, host and environmental factors implicated in childhood asthma. A fall in forced expiratory volume in one second (FEV_1) after exercise of ⩾10% occurred in 22.9% of urban children and 13.2% of rural children (OR 1.96, 95% CI 1.41 to 2.71). The OR decreased to 1.65 (95% CI 1.10 to 2.47) after accounting for age, sex, and host factors (a family history of asthma and breast feeding for less than six months), and to 1.21 (95% CI 0.69 to 2.11) after further adjustment for environmental factors (parental education, use of biomass fuel and kerosene for cooking, and exposure to motor vehicle fumes). The EIB rates in this study are higher than any other reported for African children, even using more rigorous criteria for EIB. The study findings support a view which is gaining increasing credence that the increase in prevalence of childhood asthma associated with urbanisation is the consequence of various harmful environmental exposures acting on increasingly susceptible populations. *doi:10.1136/thx.53.11.919*

No.	Country	Topic	Citation	Summary
109	**UG**		Nakitto, M., Mutto, M., Howard, A., Lett, R. 2008. Pedestrian traffic injuries among school children in Kawempe, Uganda. *African Health Sciences*, 8(3), 156-159.	Traffic injuries are an important problem in low income countries. In Uganda road traffic is the largest single cause of injury in Kampala; pedestrians, and children are most affected. Pedestrian injury affects school children in Uganda. To determine the overall risk of pedestrian traffic injury among school children in Kawempe, Uganda. A cohort was assembled at 35 primary schools and followed for 3 terms. Ten of the schools had participated in previous injury programs, others were systematically selected. Injuries were recorded by teachers using a questionnaire. Data collected included ID, school, age, grade, gender, incident date, vehicle type, and injury outcome. Demographic characteristics are described and cumulative incidences calculated. The cohort included 8,165 children (49% male) from 35 primary schools. The mean age was 9 years (Sd=2.78). Of the 35 schools, 92% were day; the others mixed day and boarding. 53 children (27girls) were involved in a traffic incident. 25% of the injuries reported were serious and warranted care in a health facility. No deaths occurred. Forty % of incidents involved commercial motorcycles, 41% bicycles, 9% cars, 8% taxis, and 2% trucks. The cumulative incidence was 0.168% each term. Over the 3 terms of the year the cumulative incidence was 0.5 +/- 0.02. There were no gender differences in the cumulative incidence. Each school year about 1/2% of Kawempe school children are involved in a traffic incident. Interventions are necessary to reduce the unacceptably high incidents of pedestrian traffic. Interventions to alleviate this situation including safer routes, teaching skills of road crossing to children as well as better regulation and road safety education to two wheelers could reduce the unacceptably high incidents of pedestrian traffic injury. *http://www.ajol.info/index.php/ahs/article/view/7066*
110			Nantulya, V., Reich, M. 2002. The neglected epidemic: road traffic injuries in developing countries. *Education and Debate,* 324, 1139-1141.	Road traffic injuries are a major cause of death and disability globally, with a disproportionate number occurring in developing countries. 1 2 Road traffic injuries are currently ranked ninth globally among the leading causes of disability adjusted life years lost, and the ranking is projected to rise to third by 2020.1 In 1998, developing countries accounted for more than 85% of all deaths due to road traffic crashes globally and for 96% of all children killed.2 Moreover, about 90% of the disability adjusted life years lost worldwide due to road traffic injuries occur in developing countries.1 The problem is increasing at a fast rate in developing countries due to rapid motorisation and other factors (fig 1).3 However, public policy responses to this epidemic have been muted at national and international levels. Policy makers need to recognise this growing problem as a public health crisis and design appropriate policy responses. Injury and deaths due to road traffic crashes are a major public health problem in developing countries. More than 85% of all deaths and 90% of disability adjusted life years lost from road traffic injuries occur in developing countries. Among children aged 0-4 and 5-14 years, the number of fatalities per 100 000 population in low income countries was about six times greater than in high income countries in 1998. The highest burden of injuries and fatalities is borne disproportionately by poor people in developing countries, as pedestrians, passengers of buses and minibuses, and cyclists. *http://dx.doi.org/10.1136/bmj.324.7346.1139*
111	**ZA**		Naysmith, S., Rubincam, C. 2012. Women in the Driver's Seat: An Exploratory Study of Perceptions and Experiences of Female Truck Drivers and Their Employers in South Africa. *Journal of Southern African Studies*. 38(3), 579-599.	The road freight industry is essential to Southern African economies, and South Africa, the largest economy and port of entry and exit for the majority of goods coming and going to the region, has a shortage of trained, quality truck drivers. This study investigates the extent to which employers are hiring female drivers in response to this skilled-labour shortage and brings to light the experiences of both employers and female truck drivers in South Africa's road freight industry. Theresults of this study are discussed in relation to these expectations. Findings suggest that women are increasingly targeted for employment, beyond the requirements of affirmative action legislation, due to the perception that female drivers are safer, more conscientious, less likely to endanger public safety and company property. This has led some employers to conclude that the female drivers they employ are not only equal but superior to their male colleagues. While female drivers note challenges in gaining entry and acceptance in the industry, they also report a positive experience with colleagues and supervisors. *doi: 10.1080/03057070.2012.708997*

No.	Country	Topic	Citation	Summary
112	**GH**	● ●	Nordfjærn, T., Rundmo, T. 2008. Perceptions of traffic risk in an industrialised and a developing country. *Transportation Research Part F: Traffic Psychology and Behaviour*, 12(1), 91-98.	This study aimed to investigate differences in traffic risk perception among a Norwegian and Ghanaian public. This was carried out while controlling for relevant background variables such as gender, age, and levels of educational achievement. In order to obtain the core aim of the study, a self-completion questionnaire was devised and distributed to a representative sample of the Norwegian population (n = 247) and to a stratified sample in Accra and Cape-Coast in Ghana (n = 299). The results showed that the Ghanaian sample perceived higher traffic risk than the Norwegian sample. Gender, age, and levels of educational achievement exerted minimal influences on risk perception. The results were discussed in context of industrialisation, cultural differences, and health beliefs. *http://dx.doi.org/10.1016/j.trf.2008.08.003*
113	**GH** **TZ**	● ●	Nordfjaern, T., Jorgensen, S., Rundmo, T. 2012. Cultural and socio-demographic predictors of car accident involvement in Norway, Ghana, Tanzania and Uganda. *Safety Science*, 50(9), 1862-1872.	The prevalence of road traffic accidents is increasing towards endemic proportions in developing countries. The present study investigated cultural and demographic predictors of car accident involvement in a developed country in Europe and three developing countries in Sub-Saharan Africa. The comparison was carried out with questionnaires among a randomly obtained representative sample of the Norwegian population (n = 247) as well as stratified samples in Accra and Cape-Coast in Ghana (n = 299), Dar-es-Salaam and Arusha areas in Tanzania (n = 599), and the central Kampala and the Mbarara district in Uganda (n = 415). Measurement instruments of culture as symbol exchange and destiny orientation were used to predict self-reported road traffic accident involvement by car among the respondents. Demographic characteristics, such as gender, age and education, were also included as predictors of car accidents. The results showed that male gender was the only significant predictor of accident involvement in Norway. Introverted and extroverted culture, destiny orientation and written culture were associated with accident involvement in the African countries. Male gender also predicted accidents in these countries. Non-technical injury preventive countermeasures in developing countries could focus on cultural practice and fatalistic beliefs. Countermeasures in both developed and developing countries should target male drivers. *doi: 10.1016/j.ssci.2012.05.003*
114	**GH** **TZ** **UG**	● ●	Nordfjaern, T., Simsekoglu, O., Rundmo, T. 2014. Culture related to road traffic safety: A comparison of eight countries using two conceptualizations of culture. *Accident Analysis and Prevention*, 62, 319-328.	The majority of previous cross-country studies of human factors relevant to traffic safety have not operationalized and measured culture. Also studies in this vein have mostly been carried out in Europe and the United States. The aim of the study was to examine country cluster differences, based on the Culture's Consequences framework, in road traffic risk perception, attitudes towards traffic safety and driver behaviour in samples from Norway, Russia, India, Ghana, Tanzania, Uganda, Turkey and Iran. An additional aim was to examine cluster differences in road traffic culture as symbol use and to investigate whether this theoretical cultural framework predicts risk perception, attitudes towards traffic safety and driver behaviour in the country clusters. The sample consisted of a total of 2418 individuals who were obtained by convenience sampling in the different countries. The countries segmented into four Culture's Consequences clusters; Norway, Russia and India, Sub-Saharan Africa, and Near East countries. The findings showed that Norwegians reported overall safer attitudes towards traffic safety and driver behaviour than the remaining country clusters. Individuals in Africa reported the highest risk perception. The countries also differed substantially in road traffic culture as symbol use. Contrary to established cultural theory, prediction models revealed that cultural factors were stronger predictors of driver behaviour than of risk perception. Also, the social cognitive risk constructs (i.e. risk perception and attitudes) solely explained variance in driver behaviour in the Norwegian and Russia/India clusters. Previous empirical efforts, which aimed to demonstrate that culture is important for the risk perception criterion, may have focused on a criterion variable that is not strongly related to driver behaviour. Furthermore, countermeasures aimed to influence social cognition may have stronger applicability in countries with a more individualistic western cultural orientation. *http://dx.doi.org/10.1016/j.aap.2013.10.018*

No.	Country	Topic	Citation	Summary
115	**NG**		Nwadiaro H., Ekwe K., Akpayak I., Shitta H. 2011. Motorcycle injuries in North-Central Nigeria. *Nigerian Journal of Clinical Practice,* 14(2), 186-9.	The increasing use of commercial motorcycle as mode of transportation in urban cities in Nigeria has become important source of morbidity and mortality. This is coupled with poor helmet use, narrow roads, increasing traffic, and poor licensing of the motorcycle riders. The objectives of this study are to determine the pattern of injuries following accident involving motorcycles, the mortality rate, and the immediate causes of mortality. This is a combined retrospective and prospective study spanning over 2 years (1 year each). Patient's records were retrieved to collate data for the retrospective study while all the patients presenting to the casualty unit of Jos University Teaching Hospital following involvement in motorcycle accidents between April 2006 and March 2007 were selected for the study. Out of 485 motorcycle injured patients, 295 and 190 were recruited from the retrospective and prospective study respectively. The male: female (M: F) ratio was 4.8:1. The ages ranged from 2.5 to 84 years with a peak at 21-30 years. The total number of injuries was 559 with 443 patients singly injured and 42 patients multiply traumatized. Head injury (40.1%) was the most frequently occurring injury followed closely by extremity injuries (38.1%). None of the patients wore protective helmet. Thirty-six (36) mortalities (7.4%) were recorded and all dead patients had head injuries. All deaths occurred within 24 h. Head injury represents a common cause of morbidity and mortality following motorcycle injuries in our environment. Therefore, strict enforcement of helmet laws from May 10, 2010 may reduce morbidity and mortality. doi: 10.4103/1119-3077.84012.
116	**NG**		Odelowo, E. 1994. Pattern of trauma resulting from motorcycle accidents in Nigerians: a two-year prospective study. *Afr. J. Med. Sci,* 23, 109-112.	A two-year prospective study of injuries sustained from motor-cycle accidents (MCA) was conducted at the University of Ilorin Teaching Hospital, Ilorin, Nigeria, in 1983 and 1984 after repeal of the national mandatory helmet law. MCA patients constituted 10.3% of 715 road traffic accident (RTA) patients and also presented a 5.7:1 male preponderance. Peak age was 18 to 30 years. Nearly 75% sustained lower extremity, chest and cranioencephalic injuries. This analysis of MCA injuries provides objective basis for current comparison with what obtains in jurisdictions with/without mandatory helmet law and future comparison when the law is re-enacted in our state. http://www.ncbi.nlm.nih.gov/pubmed/7625297
117	**KE**		Odero, W., Kibosia, J.C. 1995. Incidence and characteristics of injuries in Eldoret, Kenya. *East Afr. Med. J,* 72, 706-710.	Injuries are a major cause of mortality, morbidity and disability. They have been recognized worldwide as a serious public health problem. The epidemiology of injuries in Kenya is however poorly documented and specific programmes for their surveillance and prevention have not been established. This study aimed at examining the incidence and causes of trauma, their relationships with demographic characteristics as well as hospital utilization. It was a prospective hospital based survey over a three month period in which trauma victims presenting to hospitals located within Eldoret town were enrolled. A total of 1304 casualties were registered of whom 71% were males and 29% females. The most vulnerable groups were males and young adults aged between 20 and 30 years. Exposure during night-time and weekends in addition to alcohol intoxication all had a significant influence on the incidence. Assaults were the leading cause of injuries being responsible for 40%. Road traffic accidents (RTAs) accounted for 18%, falls 17%, burns 3% and dog bites 3%. 16.5% of the victims aged above 15 years, who were examined within 12 hours of injury had taken alcohol. 25% of the assault victims were alcohol related while this was 10% amongst road traffic casualties. Passengers in public transport vehicles were most involved in RTAs. They comprised 56% whereas bicyclists, pedestrians and drivers accounted for 15%, 14%, 8% respectively. 80% of the casualties were treated as outpatients while 20% were admitted. The mean length of stay was seven days. Twelve patients died. The use of operating theatres was required in only eleven cases, while X-rays were indicated in nearly one third of the victims. The implications of these findings, with regard to the formulation of injury prevention strategies are discussed. http://www.ncbi.nlm.nih.gov/pubmed/8904060

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118			Odero, W., Garner, P., Zwi, A. 1997. Road Traffic Injuries in Developing Countries: a Comprehensive Review of Epidemiological Studies. *Tropical Medicine and International Health*, 2(5), 445-460.	Motor vehicle accidents are the leading cause of death in adolescents and young adults worldwide. Nearly three-quarters of road deaths occur in developing countries and men comprise a mean 80% of casualties. This review summarizes studies on the epidemiology of motor vehicle accidents in developing countries and examines the evidence for association with alcohol. *doi: 10.1111/j.1365-3156.1997.tb00167.x*
119	**KE**		Odero, W. 1998. Alcohol-related road traffic injuries in Eldoret, Kenya. *East African Medical Journal*, 75(12), 708-711.	To establish the extent of alcohol involvement in motor vehicle crashes occurring in Eldoret in western Kenya. A descriptive hospital-based study. Crash-involved patients aged 16 years and above presenting for treatment in all hospitals located in Eldoret town over a period of six months. Casualties were enrolled consecutively. A questionnaire eliciting demographics and crash circumstances was administered. Blood alcohol concentration (BAC) was evaluated either by breath tests or venous blood sample analysis in consenting casualties presenting within 10 hours of the crash. BAC levels of 5 mg% and greater were taken as a positive test; patients registering BAC levels equal to or greater than 50 mg% were considered as being intoxicated. Of the 188 patients evaluated, 23.4% were BAC positive and 12.2% were intoxicated. Males were twice as likely as females to have been drinking prior to the crash (26.4% versus 13.6%; p = 0.08). Significantly greater proportions of night-time and weekend crashes involved intoxicated subjects (p = 0.02 and p = 0.03, respectively). Motor vehicle drives were the most affected by alcohol (60%), whereas pedestrians (33.3%), passengers (16%) and pedal cyclists (8.3%) were involved to a lesser extent. In comparison to passengers, drivers were eight times more likely to have been drinking (OR = 7.9, p = 0.04). Alcohol is a contributing factor in a substantial proportion of traffic crashes occurring in western Kenya. Policy response and specific interventions for discouraging driving under the influence of alcohol, including the establishment and enforcement of a legal BAC limit are needed. *http://www.ncbi.nlm.nih.gov/pubmed/10065211*
120	**KE**		Odero, W., Khayesi, M. Heda, P. 2003. Road traffic injuries in Kenya: magnitude, causes and status of intervention. *Injury Control and Safety Promotion,* 10, 53-61.	Road traffic crashes exert a huge burden on Kenya's economy and health care services. Current interventions are sporadic, uncoordinated and ineffective. This report offers a descriptive analysis of secondary data obtained from a variety of published literature and unpublished reports. Over three thousand people are killed annually on Kenyan roads. A four-fold increase in road fatalities has been experienced over the last 30 years. More than 75% of road traffic casualties are economically productive young adults. Pedestrians and passengers are the most vulnerable; they account for 80% of the deaths. Buses and matatus are the vehicles most frequently involved in fatal crashes. Characteristics of crashes vary considerably between urban and rural settings: pedestrians are more likely to be killed in urban areas, whereas passengers are the majority killed on intercity highways that transverse rural settings. Road safety interventions have not made any measurable impact in reducing the numbers, rates and consequences of road crashes. Despite the marked increase in road crashes in Kenya, little effort has been made to develop and implement effective interventions. Impediments to road traffic injury prevention and control include ineffective coordination, inadequate resources and qualified personnel, and limited capacity to implement and monitor interventions. There is need to improve the collection and availability of accurate data to help in recognising traffic injury as a priority public health problem, raising awareness of policymakers on existing effective countermeasures and mobilizing resources for implementation. Establishment of an effective lead agency and development of stakeholder coalitions to address the problem are desirable. *http://www.ncbi.nlm.nih.gov/pubmed/12772486*

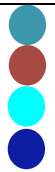
No.	Country	Topic	Citation	Summary
121	**KE**		Odhiambo, F., Beynon, C., Ogwang, S., Hamel, M., Howland, O., van Eijk, A., Norton, R., Amek, N., Slutsker, L., Laserson, K., De Cock, K., Phillips-Howard, P. 2013. Trauma-Related Mortality among Adults in Rural Western Kenya: Characterising Deaths Using Data from a Health and Demographic Surveillance System. *Plos One*. 8(11).	Information on trauma-related deaths in low and middle income countries is limited but needed to target public health interventions. Data from a health and demographic surveillance system (HDSS) were examined to characterise such deaths in rural western Kenya. Verbal autopsy data were analysed. Of 11,147 adult deaths between 2003 and 2008, 447 (4%) were attributed to trauma; 71% of these were in males. Trauma contributed 17% of all deaths in males 15 to 24 years; on a population basis mortality rates were greatest in persons over 65 years. Intentional causes accounted for a higher proportion of male than female deaths (RR 2.04, 1.37-3.04) and a higher proportion of deaths of those aged 15 to 65 than older people. Main causes in males were assaults (n=79, 25%) and road traffic injuries (n=47, 15%); and falls for females (n=17, 13%). A significantly greater proportion of deaths from poisoning (RR 5.0, 2.7-9.4) and assault (RR 1.8, 1.2-2.6) occurred among regular consumers of alcohol than among non-regular drinkers. In multivariate analysis, males had a 4-fold higher risk of death from trauma than females (Adjusted Relative Risk; ARR 4.0; 95% CI 1.7-9.4); risk of a trauma death rose with age, with the elderly at 7-fold higher risk (ARR 7.3, 1.1-49.2). Absence of care was the strongest predictor of trauma death (ARR 12.2, 9.4-15.8). Trauma-related deaths were higher among regular alcohol drinkers (ARR 1.5, 1.1-1.9) compared with non-regular drinkers. While trauma accounts for a small proportion of deaths in this rural area with a high prevalence of HIV, TB and malaria, preventive interventions such as improved road safety, home safety strategies for the elderly, and curbing harmful use of alcohol, are available and could help diminish this burden. Improvements in systems to record underlying causes of death from trauma are required. *doi: 10.1371/journal.pone.0079840*
122	**NG**		Ogazi, C. Edison, E. 2012. The Drink Driving Situation in Nigeria. *Traffic Injury Prevention*, 13(2), 115-119.	This study was carried out to assess the magnitude and nature of the drink-drive problem in Nigeria and evaluate the institutional capacities for preventing drinking and driving, using the methodology developed by the International Center for Alcohol Policies (ICAP) described in the overview article in this issue (Johnson 2012). Data and information were collected using existing reports and by consulting officials and experts from a number of key agencies. In 2008, 9572 people died in road crashes according to police statistics. However, according to World Health Organization statistical modeling, this figure is likely to be much higher, with deaths ranging from 34,000 to 78,000 in 2007 and a mortality rate of 32.3 percent. Not only is it likely that the police data underestimate the road crash problem but it was also found that the data from the police and the Federal Road Safety Commission (FRSC) were inadequate for estimating the extent of the drink-drive problem mainly because of the lack of alcohol testing equipment. One research study highlighted the problem of drivers of commercial vehicles; 67.2 percent of drivers admitting to drinking alcohol during the working day. Nigeria sets a legal limit of 0.05 g/100 mL blood alcohol concentration (BAC), but enforcement of the law is weak because alcohol testing equipment is unavailable. The FRSC is a federal agency dedicated to improving road safety and the clear lead agency in Nigeria. It runs publicity campaigns against drinking and driving with private sector support, especially toward the end of the year when there is increased vehicular traffic due to people travelling to celebrate the Christmas and New Year holidays, but these have not been evaluated. However, its combined enforcement and public education roles give it considerable potential for tackling the drink-drive problem in the future. This study recommended that priority should be given to strengthening the road crash and injury database and drink-drive enforcement, especially for drivers of commercial vehicles, and that the opportunities provided by the World Bank project supporting safe road corridors should be maximized. *doi: 10.1080/15389588.2011.645097*

No.	Country	Topic	Citation	Summary
123	**KE**		Ogendi, J., Aysis, J. 2011. Causes of injuries resulting in a visit to the emergency department of a Provincial General Hospital, Nyanza, western Kenya. *African Health Sciences*, 11(1) 255-261.	There is increasing importance of trauma not only as a major cause of surgical admissions, but also a significant cause of morbidity, mortality and disability. To document injury-related visits and hospitalization in a provincial hospital, western Kenya. On-site review of records of all patients who visited emergency department (ED) from January 2002 through December 2003, and admissions of year 2003. A total of 15365 patients visited the ED, of which 41% (6319/ 15395) were injury cases. The leading causes of injury were assault (42%), road traffic crashes (RTC) (28%), unspecified soft tissue injury (STI) (11%). Cut-wounds, dog-bites, falls, burns and poisoning were infrequently reported (each <10%). The age group 15-44 years formed the largest proportion (75%). A total of 3253 patients were admitted in 2003, of which 1010 (31%) were due to injuries. RTC were leading cause of hospitalization (49%) followed by assault (16%). Men were more likely to be hospitalized due to assault (OR=2.22; CI = 1.45 - 3.41) and not burns or poisoning (p<0.01). There were 64 (6.3%) injury-related deaths, mainly resulting from RTC (41.9%), burns (19.4%) and assault (16.1%). This study provides considerable information on major causes of injuries, useful for epidemiological surveillance and injury prevention campaigns. *http://www.ajol.info/index.php/ahs/article/view/68454*
124	**NG**		Ogunmodede, T. 2012. Factors influencing high rate of commercial motorcycle accidents in Nigeria. *American International Journal of Contemporary Research*, 2(11), 30-140.	This paper focused on factors influencing high rate of commercial motorcycle accidents in Oyo State, Nigeria. The purpose is to create awareness on how occurrence of accidents among commercial motorcyclist can be brought to a minimal level through the use of information. The total number of four hundreds and fifty commercial motorcycle riders was considered for the study; the same numbers were returned and found valid for analysis. The findings from this research work showed that demographic information has significant influence on the causes of road accidents among commercial motorcycle riders in Nigeria. Among factors that significantly contributing to increasing rate of commercial motorcycle accidents are overspeeding, wrong overtaking, bad roads, sudden mechanical defects, alcoholic intake etc. It was discovered that commercial motorcycle riders do not comply with Road Safety Highway Codes. The paper provides valuable information on causes of accidents especially among commercial motorcyclist in Nigeria and how those causal factors can be managed.
125	**NG**		Ohakwe, J., Iwueze, I., Chikezie, D. 2011. Analysis of Road Traffic Accidents in Nigeria: A Case Study of Obinze/ Nekede/ Iheagwa Road in Imo State, Southeastern, Nigeria. *Asian Journal of Applied Sciences, 4: 166-175.*	The increasing level of road traffic accident in Imo State and the consequent injuries and deaths strengthened the case for its regular analysis. Data on recorded cases of road traffic accidents were collected from the Motor Traffic Division (MTDRTR), the Nigerian Police Force, Divisional Headquarters Umuguma, Owerri West, Imo State Police Command. Using the method of time series decomposition, traffic road accidents were characterized to have an upward trend and significant seasonal influences. Using chi-square test of significance, it was discovered that there were significant differences among the various causes of accidents and accident cases (Minor, fatal and serious) with respect to types of vehicles involved over the years. Out of 5921 accident cases, reckless driving, inexperience and mechanical fault and road defects accounted for 30.3, 21.5 and 21.1%, respectively. Two motorcycles, motorcycle-vehicle and vehicle-vehicle crashes are the lead types and have resulted in 38.9, 37.5 and 14.9% of the total of 855 deaths recorded within the period of study. Furthermore, it was also found that private cars, minibuses and taxis accounted for most of the accidents with 94.7% of the total accidents. *doi: 10.3923/ajaps.2011.166.175*
126	**NG**		Okeniyi J., Oluwadiya K., Ogunlesi T., Oyedeji O., Oyelami O., Oyedeji G., Oginni L. 2005. Motorcycle Injury: An Emerging Menace to child Health in Nigeria. *Internet Journal of Paediatrics and Neonatology*. 5(1).	In Nigeria, road traffic injuries (RTI) are among leading causes of morbidity and mortality and motorcycles have become a major means of transportation. To study the pattern and features of childhood motorcycle injuries (MCI) seen in Ilesa; a semi-urban community and compare the results with those of non-motorcycle vehicular injuries (NMCVI).A 12-month prospective study of consecutive childhood RTI attendances and admissions into the Children Emergency Room (CHER). Data was obtained and analysed on the children and the vehicles as well as the circumstances, mechanism, nature, severity and outcome of the injuries. RTI accounted for 8.0% of overall CHER attendances and 17.6% of deaths. Over half (50.2%) of the 263 RTI were due to MCI (83.5% of which were for commercial commuter use). Compared with NMCVI, statistically significant numbers of the children with MCI tended more to be pedestrians, younger, unaccompanied and more severely injured. MCI accounted for 88.5% of the 26 RTI deaths. MCI contribute significantly to the high childhood RTI incidence, morbidity and mortality in this community. Appropriate education of school pupils and teachers, parents, motorcyclists and other road users should be undertaken and backed with road safety measures. Perhaps use of motorcycles for municipal transportation should be de-emphasised. *http://ispub.com/IJPN/5/1/6160*

No.	Country	Topic	Citation	Summary
127	**NG**		Olubomehin, O. 2012. The Development and Impact of Motorcycles as Means of Commercial Transportation in Nigeria. *Research on Humanities and Social Science*, 2(16), 231-239.	The collapse of public intra-city transport system paved way for the rise of motorcycles as means of public transportation in Nigeria. Popularly referred to as Okada, motorcycles are used for public transportation in most Nigerian towns and cities. In many places, they have displaced the use of motor cars for public intra-city transportation. It is patronised by the populace because of the advantages it has over taxis and buses. Its use for commercial purposes has impacted significantly on the economy and society. Writing from an historical perspective, this paper discusses the emergence of motorcycles a s means of commercial transportation, looks at the nature of Okada business and its impact on the economy and society The challenges associated with its use are discussed and recommendations are given on how to regulate the activities of the Okada riders to make them contribute more positively to the society. *http://www.iiste.org/Journals/index.php/RHSS/article/view/2395*
128	**NG**		Oluwadiya, K., Kolawale, I., Adegbehingbe, O., Olasinde, A, Agodirin, O., Uwaezouke, S. 2009. Motorcycle crash characteristics in Nigeria: implication for control. *Accident Analysis and Prevention*, 41, 294–298.	Despite being the second most common cause of road traffic injuries (RTIs) in Nigeria, no study had examined the peculiarities of motorcycle crash site characteristics. We examined and interviewed 363 motorcycle RTI patients in three tertiary hospitals in southwest Nigeria. All the motorcycles are small with capacities between 80 and 125cm. Some 68.9% of the patients sustained their injuries while working or going to work and 23.4% on their way to school. 176 (48.5%) of the crashes were with moving vehicles and in 83 (22.3%) cases, either the motorcycle or the other vehicle is moving against the traffic. 37.8% of all crashes occurred at junctions with no roundabout versus 5% at junctions with roundabout. Some risky practices of the patient included carrying more than 2 persons (15.02%), travelling without headlight at night (31.7%) and not wearing helmets (96.5%). This study showed that risky behavior among motorcycle riders, chaotic traffic and road design faults accounted for most of the motorcycle crashes. Implications for the prevention and control of motorcycle injuries were discussed. *doi:10.1016/j.aap.2008.12.002*
129			Olvera, L., Plat, D., Pochet, P., Maidadi, S. Motorbike taxis in the "transport crisis" of West and Central African cities. *EchoGeo*, 20, 2-15.	Motorized two-wheelers have been appropriated for a commercial activity, the motorbike taxi, in a number of Sub-Saharan African cities. The aim of this paper is to determine the conditions that have made it possible for motorized two-wheelers to become a major public transport mode, and to highlight their role in daily travel. The rise of motorbike taxis can be explained by the shortage of transport supply, the availability of factors of production and the permissiveness of the regulatory framework. Motorbike taxis extend access to motorized modes of transport to larger groups whose travel needs are not satisfied by the other modes of public transport. *doi : 10.4000/echogeo.13080*
130			Onywera, V., Blanchard, C. Road accidents: a third burden of 'disease' in sub-Saharan Africa. *Global Health Promotion*, 20, 52(4) 52-55.	Road traffic injuries (RTIs) continue to be a major cause of death and disability throughout low- and middle-income countries (LMICs). The aim of this commentary is highlight some of the major causes of RTIs in sub-Saharan Africa and suggests strategies for better road safety. *doi: 10.1177/1757975913502688*
131	**ET**		Osman, M., Kebede, Y., Anberbir, S. 2003. Magnitude and pattern of injuries in North Gondar administrative zone, Northwest Ethiopia. *Ethiopian Medical Journal*, 41(3), 213-220.	A prospective study was carried out between April and July 2000 in North Gondar administrative zone, Northwest Ethiopia, to assess the magnitude, pattern, outcome and burden of injuries. All trauma victims presenting to twenty health institutions were included Of 3 7026 patients registered, 1982 (5.4%) presented with injury as main complaint. Trauma constituted about 46% of surgical patients, which shows a significant burden to the institutions. Seventy three percent of the injured patients were males. The leading cause of injury was assault (48.5%) followed by fall down injury (18.6%) and road traffic injuries (14.7%). Of the vehicle related injuries, 59.6% were caused by commercial vehicles. Admission was required in 15.2% of the injured patients. An average of 4.2 hours was required for initial outpatient management. The average hospital stay for the admitted patients was twelve and half days. In this and other parts of Ethiopia, injury prevention efforts should focus on assault, falls and transport safety with special attention to commercial vehicles. A community-based study is also recommended to explore the burden of trauma on the general community. *http://www.ncbi.nlm.nih.gov/pubmed/15227886*

No.	Country	Topic	Citation	Summary
132	**KE**		Otieno, T., Woodfield, J., Bird, P., Hill, A. 2004. Trauma in rural Kenya. *Injury-International Journal of the Care of the Injured*, 35(12), 1228-1233.	Trauma in Africa is an increasingly significant problem. The aims of this study were to document the epidemiology and clinical, management of trauma in a rural Kenyan hospital and from this to highlight important areas for the medical training of doctors managing trauma in similar situations. Prospective audit of 202 consecutive trauma patients admitted to Kijabe Hospital. The mean patient age was 31, 77% were males. The median Injury Severity Score (ISS) was nine. The median distance to hospital was 60 km, with a 9 h delay in presentation. Injury mechanisms included road traffic accidents 52%, fall 22%, assaults 13% and burns 6%. The main injuries were limb fractures, soft tissue injuries, head injury and haemo/pneumothorax. Common interventions included fracture management, wound debridement, chest drain insertion, blood transfusion and skin grafting. The overall mortality rate was 3.5%. With appropriate resources and training, good trauma outcomes are possible. The importance of access to hospital care and orthopaedic training are highlighted.
133	**ZA**		Parkinson, F., Kent, S., Aldous, C., Oosthuizen, G., Clarke, D. 2013. Road traffic crashes in South Africa: The burden of injury to a regional trauma centre. *South African Medical Journal*, 103(11), 850-852.	Globally, 90% of road traffic crash (RTC) deaths occur in low- and middle-income countries. To document the mortality and morbidity associated with RTCs managed at a busy regional hospital in South Africa and investigate potentially preventable factors associated with RTCs. This was a prospective study of all patients presenting to Edendale Hospital following a RTC over a 10-week period from late 2011 to early 2012. All fatalities recorded at the police mortuary for the same period were included. Medical records were reviewed and all admitted patients were interviewed about the circumstances of the accident. We calculated an injury pyramid to compare our data with European data. A total of 305 patients were seen over the study period, 100 required admission and there were 45 deaths due to RTCs in the area. Of the patients admitted, 41 were pedestrians involved in pedestrian vehicle crashes (PVCs) and 59 motor vehicle occupants involved in motor vehicle crashes (MVCs). The majority (n=58) of crashes involved a private vehicle. Only 17% of MVC patients were wearing a seatbelt and 8 were allegedly under the influence of alcohol. On average, RTC patients spent 19 days in hospital and 62 patients required at least 1 operation. According to our injury pyramid, the number of severe and fatal injuries was higher than in Europe. Our results demonstrate a high incidence of RTCs associated with a high injury score and significant morbidity. Most crashes were associated with a number of high-risk behaviours.
134	**ZA**		Parkinson, F., Kent, S., Aldous, C., Oosthuizen, G., Clarke, D. 2014. The hospital cost of road traffic accidents at a South African regional trauma centre: A micro-costing study. *Injury-International Journal Of The Care Of The Injured*, (45)1, 342-345.	Road traffic crashes are responsible for a vast amount of death and disability in developing countries. This study uses a bottom up, micro-costing approach to determine the cost of road traffic related crashes in South Africa. Using the data from one hundred consecutive RTC related admissions to a regional hospital in South Africa we performed a bottom up costing study. To calculate costs patients were reviewed every 48 h and all interventions were recorded for each individual patient. Prices of interventions were obtained from hospital pricelists. A total cost was calculated on an individual basis. The total cost of in-patient care for these patients was US $6,98,850. Upper limb injuries were the most expensive, and the total cost increased with the number of body regions injured. The biggest expenditure was on ward overheads ($2,81,681). Ninety operations were performed - the total cost of theatre time was $1,48,230 and the cost of orthopaedic implants was $1,26,487. The cost of care of a RTC victim is significant. In light of the high numbers of RTC victims admitted over the course of the year this is a significant cost burden for a regional hospital to bear. This cost must be taken into account when allocating hospital budgets. *doi: 10.1016/j.injury.2013.04.007*

No.	Country	Topic	Citation	Summary
135	**ET**		Persson, A. 2008. Road traffic accidents in Ethiopia: magnitude, causes and possible interventions. *Advances in Transportation Studies an international Journal* Section A 15.	Although road traffic accidents are a major global public health problem, most of it occurs in low- and middle-income countries including Ethiopia. Pedestrians and passengers of commercial vehicles are the most vulnerable in Ethiopia, whereas in high-income countries crashes involve primarily privately owned vehicles with the driver being the main car occupant injured or killed. In the United States of America, for instance, 60% of the fatalities account to car drivers, while in Ethiopia, 5% account to drivers. This implies that in one crash the number of people killed or injured in Ethiopia is about 30 times higher than in the US. This study aims at identifying the main causes of the problem; and at giving recommendations based on the findings. It focuses on Ethiopia's road traffic accidents magnitude, causes and possible interventions. The Haddon Matrix, which explains injuries in terms of factors (Host-Agent – Environment) and also in terms of a time sequence (Pre-crash, Crash, Post-crash), was used to classify the key determinants of road traffic accidents in Ethiopia and also used to make the analyses. Poor road network; absence of knowledge on road traffic safety; mixed traffic flow system; poor legislation and failure of enforcement; poor conditions of vehicles; poor emergency medical services; and absence of traffic accident compulsory insurance law have been identified as key determinants of the problem. There is currently no national policy on the prevention of road traffic accidents; however, there are draft strategies on road safety. Road traffic accidents are a huge public health and development problem in Ethiopia. Its current situation requires a high level political commitment, immediate decisions and actions in order to curb the growing problem. Otherwise, it will get worse from day-to-day as motorization and population increase rapidly. This study recommends the Ghanaian and Colombian "hands-on" experiences, which are feasible to be implemented in Ethiopia.
136			Pierse N., Rushton L., Harris R., Kuehni C., Silverman M., Grigg J. 2006. Locally generated particulate pollution and respiratory symptoms in young children. *Thorax,* 61, 216–220.	Particulate matter <10 µm (PM_{10}) from fossil fuel combustion is associated with an increased prevalence of respiratory symptoms in children and adolescents. However, the effect of PM_{10} on respiratory symptoms in young children is unclear. The association between primary PM_{10} (particles directly emitted from local sources) and the prevalence and incidence of respiratory symptoms was studied in a random sample cohort of 4400 Leicestershire children aged 1–5 years surveyed in 1998 and again in 2001. Annual exposure to primary PM_{10} was calculated for the home address using the Airviro dispersion model and adjusted odds ratios (ORS) and 95% confidence intervals were calculated for each $\mu g/m^3$ increase. Exposure to primary PM_{10} was associated with the prevalence of cough without a cold in both 1998 and 2001, with adjusted ORs of 1.21 (1.07 to 1.38) and 1.56 (1.32 to 1.84) respectively. For night time cough the ORs were 1.06 (0.94 to 1.19) and 1.25 (1.06 to 1.47), and for current wheeze 0.99 (0.88 to 1.12) and 1.28 (1.04 to 1.58), respectively. There was also an association between primary PM_{10} and new onset symptoms. The ORs for incident symptoms were 1.62 (1.31 to 2.00) for cough without a cold and 1.42 (1.02 to 1.97) for wheeze. In young children there was a consistent association between locally generated primary PM_{10} and the prevalence and incidence of cough without a cold and the incidence of wheeze which was independent of potential confounders. *doi: 10.1136/thx.2004.036418*
137			Porter, G. 2002. Living in a walking world: Rural mobility and social equity issues in sub-Saharan Africa. *World Development*, 30(2), 285-300.	Accessibility and mobility are embedded in the development nexus in far-reaching ways. Field studies of mobility among women and men in rural settlements with poor road access illustrate the frustrations and costs of living off-road. They are frequently marginalized and invisible, even to local administrations. State decentralization appears to have had little positive impact in reducing "tarmac bias" and improving rural service delivery. A range of potential interventions, from Intermediate Means of Transport to electronic communications is reviewed, and opportunities for building social capital in off-road areas through nurturing improvements in state-civil society relations are considered. doi*: 10.1016/S0305-750X(01)00106-1*

No.	Country	Topic	Citation	Summary
138	**TZ**		Porter, G., Tewodros, A., Bifandimu, F., Gorman, M., Heslop, A., Sibale, E., Awadh, A., Kiswaga, L. 2013. Transport and mobility constraints in an aging population: health and livelihood implications in rural Tanzania. *Journal of Transport Geography*, 30, 161-169.	This paper offers a rare examination of older people's mobility in a developing country context. It presents findings from a recent mixed-methods study of the transport and mobility constraints faced by older people in 10 settlements in Kibaha district Tanzania and is concerned, in particular, with the interconnections between transport, health and livelihoods. The study demonstrates the diverse ways in which older people's health, livelihoods and access to transport are interconnected, the growing importance of motorcycle-taxi services for rural connectivity, and how the relationality between older people and younger generations contributes to the shaping of mobility patterns. *doi: 10.1016/j.jtrangeo.2013.05.001*
139			Porter, G. 2014. Transport Services and Their Impact on Poverty and Growth in Rural Sub-Saharan Africa: A Review of Recent Research and Future Research Needs. *Transport Reviews*, 34(1), 25-45.	This paper reviews recent transport services research in rural sub-Saharan Africa, with reference to the crucial significance of transport services for reducing poverty and encouraging growth. It focuses on issues key to improved well-being: generation of direct employment, broader economic effects on agricultural and off-farm activities, and social effects regarding health and education. Throughout, the emphasis is on implications for vulnerable groups. Attention is drawn to the potential of recent developments, notably connectivities associated with motorcycle taxis and the rapid expansion of mobile phones. Significant knowledge gaps in the transport services arena are identified, from impacts of climate change, conflict and pedestrian porterage to the economic valuation of transport, village transport operations and road safety. Suggestions are made regarding the type of studies and methods which could help to reduce some of these gaps. *doi: 10.1080/01441647.2013.865148*
140	**ET**		Quisumbing, A., Yohannes, Y. 2004. How Fair is Workfare? Gender, Public Works, and Employment in Rural Ethiopia. *International Food Policy Research Institute, Washington, DC.*	Quisumbing and Yohannes use the Ethiopian Rural Household Survey to examine the gender dimensions of public works. They use three rounds of a panel conducted in 1994–95 to explore the determinants of participation in, days worked, wages, and earnings from wage labor, food-for-work (FFW), and self-employment. Then they analyze public works data collected in 1997, together with program data collected in 2003. FFW operates in a similar fashion with other labor markets in Ethiopia where female participation is low. Gender differences are important in the participation decision, but operate differently in different types of labor markets. Better-educated women are more likely to participate in the wage labor market, while higher livestock holdings diminish participation more for women. Females with more schooling are also more likely to participate in FFW. Men's and women's participation in FFW and self-employment responds differently to household and community shocks. After controlling for selection in which gender plays an important role, gender disadvantages in the wage labor market and FFW are insignificant. Returns to schooling and height are consistently positive in both wage labor and FFW, suggesting returns to human capital investment, even in the low-skill labor markets of rural Ethiopia. Program characteristics significantly affect participation, with differential effects on men and women. Participation, days worked, wages, and earnings vary according to the type of project. Relative to infrastructure projects, water, social services, and other projects decrease participation probabilities. Distance has a strong negative effect on women's participation relative to men's. This paper—a product of the Gender Division, Poverty Reduction and Economic Management Network—is part of a larger effort in the network to integrate gender issues into economic policy. *http://dx.doi.org/10.1596/1813-9450-3492*

No.	Country	Topic	Citation	Summary
141	**ZA**		Rao, S., Chirkov, V., Dentener, F., Van Dingenen, R., Pachauri, S., Purohit, P., Amann, M., Heyes, C., Kinney, P., Kolp, P., Klimont, Z., Riahi, K., Schoepp, W. 2012. Environmental Modeling and Methods for Estimation of the Global Health Impacts of Air Pollution. *Environmental Modeling & Assessment*, 17(6), 613-622.	Air pollution is increasingly recognized as a significant contributor to global health outcomes. A methodological framework for evaluating the global health-related outcomes of outdoor and indoor (household) air pollution is presented and validated for the year 2005. Ambient concentrations of PM2.5 are estimated with a combination of energy and atmospheric models, with detailed representation of urban and rural spatial exposures. Populations dependent on solid fuels are established with household survey data. Health impacts for outdoor and household air pollution are independently calculated using the fractions of disease that can be attributed to ambient air pollution exposure and solid fuel use. Estimated ambient pollution concentrations indicate that more than 80% of the population exceeds the WHO Air Quality Guidelines in 2005. In addition, 3.26 billion people were found to use solid fuel for cooking in three regions of Sub Saharan Africa, South Asia and Pacific Asia in 2005. Outdoor air pollution results in 2.7 million deaths or 23 million disability adjusted life years (DALYs) while household air pollution from solid fuel use and related indoor smoke results in 2.1 million deaths or 41.6 million DALYs. The higher morbidity from household air pollution can be attributed to children below the age of 5 in Sub Saharan Africa and South Asia. The burden of disease from air pollution is found to be significant, thus indicating the importance of policy interventions. doi: 10.1007/s10666-012-9317-3
142	**ZA**		Ribbens, H. 2003. Strategies to promote the safety of vulnerable road users in developing and emerging countries - South African experience. *Transportation Research Record*, 1846, 26-40.	Road casualties are discussed from a worldwide perspective. More than 80% of annual traffic casualties occur in developing and emerging countries in Asia, Latin America, the Caribbean, sub-Saharan Africa, and the Middle East. Vulnerable road users such as pedestrians and bicyclists are a major road safety problem in these countries. In Asia, Africa, the Caribbean, and the Middle East, more than 40% of annual road fatalities involve pedestrians compared with less than 20% in Europe and the United States. The focus of this study is South Africa's strategy to promote the safety of vulnerable road users. The extent of casualties among vulnerable road users and contributing factors are highlighted. Over the last decade, pedestrian fatalities have gradually and steadily declined in South Africa. This study describes the various policies, strategies, and action plans developed and implemented by different government levels in South Africa to promote road traffic safety, particularly the safety of vulnerable road users such as pedestrians and bicyclists. Barriers to successful implementation are also pointed out. Apart from applying a holistic approach by involving all relevant disciplines, a coordinated and sustained effort of all government levels was encouraged. Joint-venture funding projects among different government levels was emphasized to improve hazardous pedestrian locations. The role of the private sector in South Africa to promote pedestrian safety is also discussed. Practical guidelines are presented for developing and emerging countries to promote the safety of vulnerable road users.
143	**GH**		Rooney, M., Arku, R., Dionisio, K., Paciorek, C., Friedman, A., Carmichael, H., Zhou, Z., Hughes, A., Vallarino, J., Agyei-Mensah, S., Spengler, J., Ezzati, M. 2012. Spatial and temporal patterns of particulate matter sources and pollution in four communities in Accra, Ghana. *Science of the Total Environment*, 435, 107-114.	Sources of air pollution in developing country cities include transportation and industrial pollution, biomass fuel use, and re-suspended dust from unpaved roads. We examined the spatial patterns of particulate matter (PM) and its sources in four neighborhoods of varying socioeconomic status (SES) in Accra. PM data were from 1 week of morning and afternoon mobile and stationary air pollution measurements in each of the study neighborhoods. PM2.5 and PM10 were measured continuously, with matched GPS coordinates. Data on biomass fuel use were from the Ghana 2000 population and housing census and from a census of wood and charcoal stoves along the mobile monitoring paths. We analyzed the associations of PM with sources using a mixed-effects regression model accounting for temporal and spatial autocorrelation. After adjusting for other factors, the density of wood stoves, fish smoking, and trash burning along the mobile monitoring path as well as road capacity and surface were associated with higher PM2.5. Road capacity and road surface variables were also associated with PM10, but the association with biomass sources was weak or absent. While wood stoves and fish smoking were significant sources of air pollution, addressing them would require financial and physical access to alternative fuels for low-income households and communities. *doi: 10.1016/j.scitotenv.2012.06.077*

No.	Country	Topic	Citation	Summary
144	**SA**	● ●	Roordt, L. 2012. Application of the Highway Safety Manual 2010 to Two Road Section in Western Cape. Proceedings of the 31st Southern Afric Transport Confernece (SATC 2012). Pretoria, 9-12 July, 2012.	The Highway Safety Manual 2010 provides a new set of methodologies to evaluate or predict safety performance on road sites. It is based on crash data from the United States of America. The paper gives a brief introduction to the Highway Safety Manual 2010 and its methodologies. The applicability of these methodologies has not yet been evaluated for South African conditions. Two sections of route R44 (provincial road M 27) were analysed. Section 1 - between Klapmuts and Stellenbosch - is a single carriageway with shoulders and Section 2 - between Stellenbosch and Somerset West - is a dual carriageway road with at grade intersections. The respective safety performance functions (SPFs), modified by crash modification factors (CMF) were used to estimate the number of crashes. These were compared to the average number of crashes reported over the last 5 years, subject to the proviso that the reported crash data may not be as accurate as that of the USA. On Section 1, the single carriageway road section, the observed number of crashes was 0,67 times higher than the predicted number, but the observed number of crashes for the intersections and road segments were 0,12 and 0,95 of the predicted number respectively. The total number of crashes observed for Section 2 on the dual carriageway link sections. was about 4,7 times higher than number predicted. The number of crashes at stop controlled intersections was predicted, but as these intersections were not specified in the accident statistics, the values were added to the sections. The number of observed crashes at traffic signal controlled intersection was 1,1 times higher than the number of predicted crashes. The evidence presented in this paper indicates that the safety performance functions that were investigated cannot be transferred to the South African situation directly from the USA where they were developed. The logic of the HSM 2010 methodologies seems to be robust. The ranges of values of crash modification factors seem acceptable. This study did not attempt to explain the reasons why the predicted crash frequency differed from the actual number of crashes, as the road sections on which it was tested is not a representative sample. Local research into the shape and size of the safety performance factors and the calibration of crash modification factors should be promoted. The basis of such research is collision statistics, and every effort should be made to improve the quality of our data capturing system. *http://repository.up.ac.za/handle/2263/20227*
145	**KE**	● ● ●	Saidi, H., & Kahoro, P. 2001. Experience with Road Traffic Accident Victims at the Nairobi Hospital. *East Africa Medical Journal,* 78(8), 441-444.	To evaluate the clinical and epidemiological data on automobile injuries and to assess the adequacy of road trauma documentation at the Nairobi Hospital. A retrospective descriptive study. Medical records of randomly selected road trauma patients who presented at The Accident Centre between 1st July 1997 and 31st August 1998 were analysed. The mean age was 32 years with a peak incidence in the 21-30 year age group. Males comprised 63.1% of the injured. The predominant category of the road user injured was the vehicle occupant (70%). Pedestrians only constituted 21.3%. Major city roads or highways were the commonest scenes of injury (38.3%). Most of the responsible vehicles were small personal cars (65.8%). The public service minibuses (popularly known as matatu) caused 20% of the injuries. Most of the injuries were mild and transport of the injured to hospital was uniformly haphazard. A quarter of the injuries were severe enough to warrant admission. Trauma documentation was poor with less than 30% accuracy in most parameters. The pre-hospital and initial care of the injured is not systematized. The study calls for re-orientation of trauma care departments. http://www.ncbi.nlm.nih.gov/pubmed/11921570

No.	Country	Topic	Citation	Summary
146	**KE**		Saidi, H., Mutiso, B., Ogengo, J. 2014. Mortality after road traffic crashes in a system with limited trauma data capability, Journal of Trauma Management & Outcomes 8:4	Africa has 4% of the global vehicles but accounts for about one tenth of global vehicular deaths. Major trauma in Kenya is associated with excess mortality in comparison with series from trauma centers. The determinants of this mortality have not been completely explored. To determine the factors affecting mortality among road users in Nairobi, Kenya. Cross-sectional study of prospectively collected data of trauma admissions at the Kenyatta National Hospital over a calendar year (2009–2010). Information collected included age, gender, road user type, principal anatomical region of injury, admission status, admission blood pressure and GCS, disposition destination, Injury Severity Score (ISS), injuries sustained, treatment and mortality at two weeks. Major or severe injury was defined as injuries of ISS > 15. Groups based on in-hospital survival were compared using determinants of mortality using X^2 or students *t*-test as appropriate. Logistic regression was used to assess the independence of predictive variables. One thousand six hundred forty seven (1647) patients were admitted for trauma during the study period. Traffic admissions were 1013 (61.7%) and males predominated (79.8%). The average age of patients admitted was 31.7 years. Pedestrians, vehicle occupants and motorcyclists represented 43.3%, 27.2% and 15.2% of the road users injured. The proportion of patients with ISS > 15 was 10.9%. The overall mortality was 7.7%. Mortality for ISS > 15 was 27.6%. The following factors significantly predicted mortality on univariate analysis: head injury, abdominal injury, transfer in status, blood transfusion, ICU admission, age > 60 years, Glasgow coma scale (GCS) and injury severity. Trauma mortality rates in this study exceed those from mature trauma systems. Head injury and injury severity based on the ISS are independent predictors of mortality after traffic trauma. Improvements in neurosurgical and critical care services ingrained within wider primary and secondary prevention initiatives are logical targets. *http://link.springer.com/article/10.1186/1752-2897-8-4*
147	**GH**		Salifu, M., Ackaah, W. 2012. Under-reporting of road traffic crash data in Ghana. *International Journal of Injury Control and Safety Promotion*, 19(4), 331-339.	Having reliable estimates of the shortfalls in road traffic crash data is an important prerequisite for setting more realistic targets for crash/casualty reduction programmes and for a better appreciation of the socio-economic significance of road traffic crashes. This study was carried out to establish realistic estimates of the overall shortfall (under-reporting) in the official crash statistics in Ghana over an eight-year period (19972004). Surveys were conducted at hospitals and among drivers to generate relevant alternative data which were then matched against records in police crash data files and the official database. Overall shortfalls came from two sources, namely, non-reporting and under-recording. The results show that the level of non-reporting varied significantly with the severity of the crash from about 57% for property damage crashes through 8% for serious injury crashes to 0% for fatal crashes. Crashes involving cyclists and motorcyclists were also substantially non-reported. Under-recording on the other hand declined significantly over the period from an average of 37% in 19971998 to 27% in 20032004. Thus, the official statistics of road traffic crashes in Ghana are subject to significant shortfalls. *doi: 10.1080/17457300.2011.628752*
148	**MW**		Samuel, J., Sankhulani, E., Qureshi, J., Baloyi, P., Thupi, C., Lee, C., Miller, W., Cairns, B., Charles, A. 2012. Under-Reporting of Road Traffic Mortality in Developing Countries: Application of a Capture-Recapture Statistical Model to Refine Mortality Estimates. *PLOS One*, 7(2), e31091, PAGES.	Road traffic injuries are a major cause of preventable death in sub-Saharan Africa. Accurate epidemiologic data are scarce and under-reporting from primary data sources is common. Our objectives were to estimate the incidence of road traffic deaths in Malawi using capture-recapture statistical analysis and determine what future efforts will best improve upon this estimate. Our capture-recapture model combined primary data from both police and hospital-based registries over a one year period (July 2008 to June 2009). The mortality incidences from the primary data sources were 0.075 and 0.051 deaths/1000 person-years, respectively. Using capture-recapture analysis, the combined incidence of road traffic deaths ranged 0.192-0.209 deaths/1000 person-years. Additionally, police data were more likely to include victims who were male, drivers or pedestrians, and victims from incidents with greater than one vehicle involved. We concluded that capture-recapture analysis is a good tool to estimate the incidence of road traffic deaths, and that capture-recapture analysis overcomes limitations of incomplete data sources. The World Health Organization estimated incidence of road traffic deaths for Malawi utilizing a binomial regression model and survey data and found a similar estimate despite strikingly different methods, suggesting both approaches are valid. Further research should seek to improve capture-recapture data through utilization of more than two data sources and improving accuracy of matches by minimizing missing data, application of geographic information systems, and use of names and civil registration numbers if available. *doi: 10.1371/journal.pone.0031091*

No.	Country	Topic	Citation	Summary
149	**NG**		Sangowawa, A., Alagh, B., Ekanem, S., Ebong, I., Faseru, B., Adekunle, B., Uchendu, O. 2010. An observational study of seatbelt use among vehicle occupants in Nigeria. *Injury Prevention*, 16(2), 85-89.	The use of seatbelts reduces the likelihood of death and severe injuries to crash-involved vehicle occupants by 45-60%. Several countries, including Nigeria, have laws mandating the use of seatbelts but compliance is not universal. This study was conducted to determine rates of use of seatbelts among vehicle occupants in Ibadan municipality. An observational study was conducted. A selected petrol station in each of the five local government areas in Ibadan municipality was used as an observation site. Observations were documented by trained research staff between 08: 30 and 18: 00 hours over a 6-day period. 5757 occupants in 2870 vehicles were observed. Approximately 90% of drivers were men. Driver seatbelts were installed in approximately 90% of vehicles. Overall seatbelt use was 18.7; 31.7% among drivers and 10.3% and 0.4% among front and rear-seated adults, respectively. Only one child (0.7%) was restrained. Significantly more female drivers 47.3% used their seatbelts compared with men, 30.3% ($p<0.001$). An adult passenger was more likely to be restrained when riding with a female driver ($p = 0.007$) and when the driver was restrained ($p = 0.000$). The study showed that seatbelt use among vehicle occupants was low. Further research into reasons for the non-use of restraints needs to be conducted so that these can be incorporated into programmes aimed at improving seatbelt use. *doi: 10.1136/ip.2009.023242*
150	**BW**		Sebego, M., Naumann, R., Rudd, R., Voetsch, K., Dellinger, A., Ndlovu. 2014. The impact of alcohol and road traffic policies on crash rates in Botswana, 2004–2011: A time-series analysis. *Accident Analysis and Prevention*, 70, 33-39.	In Botswana, increased development and motorization have brought increased road traffic-related death rates. Between 1981 and 2001, the road traffic-related death rate in Botswana more than tripled. The country has taken several steps over the last several years to address the growing burden of road traffic crashes and particularly to address the burden of alcohol-related crashes. This study examines the impact of the implementation of alcohol and road safety-related policies on crash rates, including overall crash rates, fatal crash rates, and single-vehicle nighttime fatal (SVNF) crash rates, in Botswana from 2004 to 2011. The overall crash rate declined significantly in June 2009 and June 2010, such that the overall crash rate from June 2010 to December 2011 was 22% lower than the overall crash rate from January 2004 to May 2009. Additionally, there were significant declines in average fatal crash and SVNF crash rates in early 2010. Botswana's recent crash rate reductions occurred during a time when aggressive policies and other activities (e.g., education, enforcement) were implemented to reduce alcohol consumption and improve road safety. While it is unclear which of the policies or activities contributed to these declines and to what extent, these reductions are likely the result of several, combined efforts. *http://dx.doi.org/10.1016/j.aap.2014.02.017*
151			Schepers, P., Hagenzieker, M., Methorst, R., van Wee, B., Wegman, F. 2014. A conceptual framework for road safety and mobility applied to cycling safety. *Accident Analysis and Prevention*, 62, 331-340.	Scientific literature lacks a model which combines exposure to risk, risk, and the relationship between them. This paper presents a conceptual road safety framework comprising mutually interacting factors for exposure to risk resulting from travel behaviour (volumes, modal split, and distribution of traffic over time and space) and for risk (crash and injury risk). The framework's three determinants for travel behaviour are locations of activities; resistances (generalized transport costs); needs, opportunities, and abilities. Crash and injury risks are modelled by the three 'safety pillars': infrastructure, road users and the vehicles they use. Creating a link in the framework between risk and exposure is important because of the 'non-linear relationship' between them, i.e. risk tends to decrease as exposure increases. Furthermore, 'perceived' risk (a type of travel resistance) plays a role in mode choice, i.e. the perception that a certain type of vehicle is unsafe can be a deterrent to its use. This paper uses theories to explain how the elements in the model interact. Cycling is an area where governments typically have goals for both mobility and safety. To exemplify application of the model, the paper uses the framework to link research on cycling (safety) to land use and infrastructure. The model's value lies in its ability to identify potential consequences of measures and policies for both exposure and risk. This is important from a scientific perspective and for policy makers who often have objectives for both mobility and safety. *http://dx.doi.org/10.1016/j.aap.2013.03.032*

No.	Country	Topic	Citation	Summary
152	**ZA**		Schoor, O., van Niekerk, J., Grobbelaa, B. 2001. Mechanical failures as a contributing cause to motor vehicle accidents — South Africa**.** *Accident Analysis and Prevention*, 62, 331-340.	Over the past decades motor vehicles became the primary mode of transportation in developing countries. At the same time an improvement in automotive engineering and manufacturing as well as the phenomena of urbanisation have resulted in more vehicles spending more time on the road at higher speeds. Invariably this leads to driving scenarios where safety critical manoeuvres have to be performed that rely on the mechanical condition of the vehicles. In developing countries, where economic realities force the population to make use of older and less reliable vehicles, the risk of accidents caused by some sort of mechanical failure increases. The casualty rate (events causing death and/or serious injuries) for road traffic accidents in South Africa is amongst the highest in the world. This trend has persisted with little variation over the years, despite the efforts of local road safety organisations and research institutes to decrease them. The main goal of this study was to establish the contribution of mechanical failures to motor vehicle accidents, and furthermore, to compare it with international trends. Data obtained from accident response units (ARU) indicate that tyres and brakes were the main contributors to mechanical failures resulting in accidents in the Pretoria region (Gauteng Province). However, the reported percentage of approximately 3% is comparable to similar statistics from developed countries. Detailed information on the condition of road-going vehicles was then collected in this area. The roadside survey (potential mechanical defect tests (PMDT)) indicated that 40% of the vehicles surveyed on the suburban road and 29% of the vehicles surveyed on the highway had mechanical defects that contravened current road and traffic regulations in South Africa and may, therefore, be at risk of causing an accident due to a mechanical failure. In the Minibus (taxi) survey, large irregularities in tyre inflation pressure were identified as a cause of concern. The main conclusion from this work is that *tyres* and *brakes* are the two most dominant components that contribute to the mechanical defects causing accidents, with *overloading* an additional factor to consider. It is important to acknowledge that these three factors can easily be monitored during simple roadside inspections. *http://dx.doi.org/10.1016/S0001-4575(00)00083-X*
153			Smith. K. 1993. Fuel Combustion, Air Pollution Exposure, and Health: The Situation in Developing Countries. *Annual Review of Energy and Environment,* 18, 529-566.	As described in the Appendix, there are a number of recent studies of air pollution in developing-country cities (2-5, 17, 99, 100), each of necessity relying heavily on the one available source of comparative international ambient monitoring data, Global Environment Monitoring System (GEMS) (6ab-IO). In this review, therefore, rather than simply reproduce the GEMS data, I have chosen to examine developing-country air pollution from the standpoint of a useful analysis technique that has been under development in recent years: "Total Exposure Assessment." *http://ehs.sph.berkeley.edu/krsmith/publications/fuelcombustionairpollutionexposureandhealth.pdf*
154	**CM**		Sobngwi-Tambekou, J., Bhatti, J., Kounga, G., Salmi, L., Lagarde, E. 2010. Road traffic crashes on the Yaounde-Douala road section, Cameroon. *Accident Analysis and Prevention*, 42(2), 422-426.	Developing countries account for more than 85% of all road traffic deaths in the world. Our aims were to estimate road morbidity and mortality and to describe the main characteristics of road traffic crashes on a heavy traffic road section in Cameroon. We conducted a study of police reports of the 2004-2007 period retrieved from the 13 police stations in charge of the 243 km Yaounde-Douala road section in Cameroon. The estimated overall number of people killed per 100 million kilometres driven was 73, more than 35 times higher than on similar roads in the US or Europe. The most severe crashes were those involving vulnerable road users (97 deaths) and vehicles travelling in opposite directions (136 deaths). The main causes of fatal crashes were mechanical failures (28%), two-thirds being tyre problems, hazardous overtaking (23%), and excessive speed (20%). The burden of road traffic injuries on heavy traffic roads in Cameroon calls for urgent interventions. Traffic calming measures and control of vehicle condition appear to be the most cost-effective interventions. *doi: 10.1016/j.aap.2009.09.003*

No.	Country	Topic	Citation	Summary
155	**NG**		Solagberu B., Ofoegbu C., Nasir A., Ogundipe O., Adekanye A., Abdur-Rahman L. 2006. Motorcycle injuries in a developing country and the vulnerability of riders, passengers, and pedestrians. *Inj. Prev.*, 12(4), 266-268.	At a Nigerian university hospital, none of the motorcyclists who presented over a 12 month period had been wearing a helmet, and of the eight patients who died, seven had head injuries. Of the five collision types described, the rate of motorcycle-other vehicle collisions was highest at 40.6%, while the motorcycle-pedestrian rate was 23.4%. Measures to prevent these collisions might reduce overall crashes by 64%; in addition, helmet law should be enforced. *doi: 10.1136/ip.2005.011221*
156			Starkey, P. Ellis, S., Hione, J., Ternell, A. 2002. *Improving Rural Mobility. Options for Developing Motorized and Nonmotorized Transport is Rural Areas.* World Bank Technical Paper No. 525. World Bank, Washington, DC.	Many inhabitants of rural areas in developing countries lack adequate and affordable access to transport infrastructure and services. Poor access to transport constrains economic and social development and contributes to poverty. Better transport services can stimulate economic activity and social improvement, leading to easier access and a virtuous circle that reduces poverty and improves the lives of poor rural residents. Improving rural people's access to essential services requires better mobility through transport infrastructure and services as well as the location, price, and quality of facilities. This report focuses on improving rural mobility by facilitating the provision of affordable means of transport and transport services. There are many obstacles to cheaper, more efficient rural transport, and many factors influence efforts to promote rural transport services. Despite massive spending, many government and donor efforts to improve rural transport have not met the needs of rural residents. The market has not provided transport services to areas with low demand and to the poorest and least mobile segments of the community. To deliver significant economic and social benefits, investment in transport must take an integrated approach. Rather than focus solely on expanding road networks, it should also pay attention to smaller roads, paths, and tracks; the use of private and commercial means of transport; and the importance of transport hubs and markets. Transport planners need to take a holistic approach that involves all stakeholders in a participatory process of assessing needs within a clear policy framework based on the interdependence and complementarity of different means of transport. In addition, favorable policies and operating environments can enable the private sector and NGOs to play important roles in new initiatives. Pilot activities can be used to promote lower technology, IMT, which can enhance local productivity in low-density, low-income areas. Planning efforts should consider the needs of women and disadvantaged groups. Monitoring and evaluation involving stakeholders is also important, as is local, national, and international networking. Based on these efforts, governments and project planners can take steps in three areas, financial, regulatory, and complementary, to promote increased ownership of intermediate means of transport and the private provision of rural transport services. *http://www.ssatp.org/sites/ssatp/files/publications/WorldBank-TechnicalPapers/TP525.pdf*
157			Starkey, P. 2007. The rapid assessment of rural transport services. A methodology for the rapid assessment of the key understanding required for informed transport planning. SSATP Working Paper No. 87-A.	Rural transport services are often inadequate. Passenger and goods transport needs improving to stimulate rural economies and reduce poverty. Understanding existing rural transport systems and constraining factors is a precondition for appropriate policy action. The Sub-Saharan Africa Transport Policy Program (SSATP) commissioned a study to develop and test a methodology for the rapid assessment of rural transport systems. The guidelines specified passenger and freight transport for distances of 5-200 km, encompassing much rural transport, but excluding within-village transport, long-distance national transport and international corridors. Rural transport systems operate on hub and spoke systems at several levels. Key rural hubs are provincial/regional towns, market/district towns and villages. The various spokes and hubs have characteristic combinations of transport, including trucks, buses, minibuses, pickups and intermediate means of transport (IMTs). The smallest spokes are footpaths while national spokes form transport corridors. The methodology surveys transport types, operators, users and regulators at sampled hubs and spokes, stratified by hub hierarchy and remoteness. This provides a rapid overview of rural transport systems, highlighting key constraints, stakeholder views and proposals for improvements. This document contains practical advice relating to local observations, interview techniques, survey opportunities and traffic counts. *http://www.ssatp.org/sites/ssatp/files/publications/SSATP-WorkingPapers/SSATPWP87-A.pdf*

No.	Country	Topic	Citation	Summary
158			Starkey. P. Njenga, P. Kemstop, G., Willilo, S. 2013. *Rural Transport Service Indicators: Work in progress paper.* African Community Access Programme, Project AFCAP/GEN//060, Crown Agents, Surrey UK.	This paper reports the progress of Phase 1 of the project to develop indicators to 'measure' the adequacy of rural transport services for meeting the access needs of rural people. The AFCAP-funded project is implemented by an IFRTD team led by Paul Starkey and Peter Njenga. Phase 1 (Apr-Sep 2012) aimed to develop and test a methodology to acquire the information required to develop indicators. In Phase 2 (Oct-Mar), the methodology for data collection, analysis and reporting will be further developed and tested. Initial indicators will be identified in discussion key stakeholders. This document introduces the context of rural transport services and the aims of the project. The paper discusses previous work relating to transport indicators and highlights some of the essential features of indicators. The paper then presents initial suggestions for the types of data that need to be collected to develop rural transport services indicators. *http://r4d.dfid.gov.uk/PDF/Outputs/AfCap/AFCAP-GEN060-RTSi-IFRTD-Work-in-Progress-Report.pdf*
159			Stiijn, D. 2014. Road safety in a globalised and more sustainable world: Current issues and future challenges. *Accident Analysis and Prevention*, 62, 329-330.	Although many countries have had considerable success in reducing traffic injuries over recent decades, there are still some fundamental problems in this area. At the same time, there is increasing focus on road safety research and policy development in the context of globalisation, sustainability, liveability and health. This special section presents a selection of papers that were presented at the annual ICTCT workshop held on the 8th and 9th of November 2012 in Hasselt, Belgium, and accepted for publication in Accident Analysis and Prevention following the journal's reviewing procedure. The aim of the ICTCT workshop was to analyse road safety facts, data and visions for the future in the wider context of current issues and future challenges in road safety. *http://dx.doi.org/10.1016/j.aap.2013.10.004*
160	**ZA**		Sukhai, A., Jones, A. 2013. Understanding geographical variations in road traffic fatalities in South Africa. *South African Geographical Journal*, 95(2), 187-204.	South Africa (SA) faces an unprecedented burden of injuries from road traffic crashes, yet the distribution of these events has not yet been studied using a geographical approach in order to help understand the importance of putative social and environment drivers. Such an approach was used in this study to investigate the correlates of spatial variations in road traffic fatalities (RTFs) in SA. Variations in RTFs between 2002 and 2006 were studied for 993 police areas. A wide range of explanatory variables comprising physical, environmental and socio-demographic characteristics were generated, and multilevel negative binomial regression models were fitted to identify those associated with RTFs. An area measure of violence and crime was shown to be a significant predictor of RTFs in SA in addition to a range of factors associated with driver behaviour, traffic exposure and socio-economic deprivation. Our research provides new insights into the correlates of road traffic mortality in this less developed country, and our findings have implications for the development of integrated resource-efficient strategies that allow for enforcement and other broader structural interventions to target injuries and crime. doi: 10.1080/03736245.2013.847802
161			Tanimowo, M. 2000. Air pollution and respiratory health in Africa: A review. *East African Medical Journal*, 77(2), 71-75.	To bring into focus the existence of respiratory hazards due to air pollution as a result of industrialisation, tobacco smoking (personal pollution), domestic pollution and vehicular fuel combustion on the African continent; and to stimulate health workers, and the various governments in Africa, to devote more attention to the subject of air pollution by engaging in and encouraging multidisciplinary research so that appropriate and effective control measures can be put in place. Medline literature search through internet using the keywords: air pollution, cigarette smoking, domestic pollution, respiratory morbidity, Africa. The author's contributions to the subject of air pollution and respiratory morbidity are included. Relevant studies or articles from eastern, western, northern, southern and central parts of Africa are included in the review. Evidence of respiratory hazards sequel to the four main sources of air pollution in each part of Africa, are synchronised under the headings: introduction, respiratory impairment and the future. Respiratory impairment from the four main sources of air pollution is a major but highly neglected problem on the African continent. There is need for concerted efforts on the part of African governments, health administrators and health workers to ensure that necessary attention is given to multidisciplinary research on the subject so that meaningful control measures can be formulated. *http://www.ajol.info/index.php/eamj/article/view/46396*

No.	Country	Topic	Citation	Summary
162	**ZA**		Tanser, F., Gijsbertsen, B., Herbst, K. 2006. Modelling and understanding primary health care accessibility and utilization in rural South Africa: An exploration using a geographical information system. *Social Science & Medicine*, 63(3), 691-705.	Physical access to health care affects a large array of health outcomes. yet meaningfully estimating physical access remains elusive in many developing country contexts where conventional geographical techniques are often not appropriate. We interviewed (and geographically positioned) 23.000 homesteads regarding clinic usage in the Hlabisa health sub-district, KwaZulu-Natal. South Africa. We used a cost analysis within a geographical information system to estimate mean travel time (at any given location) to clinic and to derive the clinic catchments. The model takes into account the proportion of people likely to be using public transport (as a function of estimated walking time to clinic), the quality and distribution of the road network and natural barriers, and was calibrated using reported travel times. We used the model to investigate differences in rural, urban and peri-urban usage of clinics by homesteads in the study area and to quantify the effect of physical access to clinic on usage. We were able to predict the reported clinic used with an accuracy of 91%. The median travel time to nearest clinic is 81 min and 65% of homesteads travel I h or more to attend the nearest clinic. There was a significant logistic decline in usage with increasing travel time ($p < 0.0001$). The adjusted odds of a homestead within 30 min of a clinic making use of the clinics were 10 times (adjusted OR = 10: 95 CI 6.9-14.4) those of a homestead in the 90-120 min zone. The adjusted odds Of Usage of the clinics by urban homesteads were approximately 20/30 times smaller than those of their rural/peri-urban Counterparts. respectively. after controlling for systematic differences in travel time to clinic. The estimated median travel time to the district hospital is 170 min. The methodology constitutes a framework for modelling physical access to clinics. *doi: 10.1016/j.socscimed.2006.01.015*
163			Tartakovsky, L., Baibikov, V., Czerwinski, M., Gutman, M., Kasper, Popescu, D., Weinblat, M., Zvirin, Y. 2012. In-vehicle particle air pollution and its mitigation. *Atmospheric Environment*, 64, 320-328.	This work presents results of particle mass, number and size measurements inside passenger cars (PCs), vans and urban buses. Effects of the in-cabin air purifier on particle concentrations and average size inside a vehicle are studied. Use of the air purifier leads to a dramatic reduction, by 95-99%, in the measured ultrafine particles number concentration inside a vehicle compared with outside readings. Extremely low particle concentrations may be reached without a danger of vehicle occupants' exposure to elevated CO2 levels. The lowest values of particle concentrations inside a PC without air purifier are registered under the recirculation ventilation mode, but the issue of CO2 accumulation limits the use of this mode to very short driving events. Lower PM concentrations are found inside newer cars, if this ventilation mode is used. Great differences by a factor of 2.5-3 in PM10 concentrations are found between the PCs and the buses. *doi: 10.1016/j.atmosenv.2012.10.003*
164			Thompson, T., Saari, R., Selin, N. 2014. Air quality resolution for health impact assessment: influence of regional characteristics. *Atmospheric Chemistry and Physics*, 14, 969-978.	We evaluate how regional characteristics of population and background pollution might impact the selection of optimal air quality model resolution when calculating the human health impacts of changes to air quality. We use a regional chemical transport model (CAMx) and a health benefit mapping program (BenMAP) to calculate the human health impacts associated with changes in ozone and fine particulate matter resulting from an emission reduction scenario. We find that the human health benefits associated with changes in ozone concentrations are sensitive to resolution. This finding is especially strong in urban areas where we estimate that benefits calculated using coarse resolution results are on average two times greater than benefits calculated using finer scale results. In three urban areas we analyzed, results calculated using 36 km resolution modeling fell outside the uncertainty range of results calculated using finer scale modeling. In rural areas the influence of resolution is less pronounced with only an 8% increase in the estimated health impacts when using 36 km resolution over finer scales. In contrast, health benefits associated with changes in PM2.5 concentrations were not sensitive to resolution and did not follow a pattern based on any regional characteristics evaluated. The largest difference between the health impacts estimated using 36 km modeling results and either 12 or 4 km results was at most +/- 10% in any region. Several regions showed increases in estimated benefits as resolution increased (opposite the impact seen with ozone modeling), while some regions showed decreases in estimated benefits as resolution increased. In both cases, the dominant contribution was from secondary PM. We found that the health impacts calculated using several individual concentration-response functions varied by a larger amount than the impacts calculated using results modeled at different resolutions. We conclude that, when estimating the human health benefits associated with decreases in ozone and PM2.5 together, the benefits calculated at 36 km resolution agree, within errors, with the benefits calculated using fine (12 km or finer) resolution modeling when using the current methodology for assessing policy decisions. *http://www.atmos-chem-phys.net/14/969/2014/acp-14-969-2014.pdf*

No.	Country	Topic	Citation	Summary
165	**TZ**		Titcombe, M., Simcik, M. 2011. Personal and indoor exposure to PM2.5 and polycyclic aromatic hydrocarbons in the southern highlands of Tanzania: a pilot-scale study. *Environmental Monitoring and Assessment*, 180(1-4), 461-476.	Personal and indoor exposure to PM2.5 and polycyclic aromatic hydrocarbons (PAHs) were measured in households in the Njombe district of Tanzania. Cooking is conducted indoors in this region due to its high elevation, cool climate, and heavy seasonal rainfall. Kitchens are often poorly ventilated, resulting in high exposures to combustion-related pollutants. Sampling sites were selected to represent typical cooking practices across regional socio-economic divisions. These include the use of open wood fires, charcoal, a mix of charcoal and kerosene, and liquid petroleum gas (LPG) for cooking fuels. Inhalable pollutants are present at unacceptably high levels, exceeding indoor air quality standards for all but LPG fuels. Relative results provide an exposure profile for rural East Africa and support the feasibility of conducting a larger scale smoke exposure campaign in the region. The use of "fuel efficient" wood stoves for the reduction of PM2.5 and PAH exposure was measured in a local secondary school. Proper use of "fuel efficient" wood stoves reduced personal and indoor exposure to measured pollutants by more than 90%, supporting further investigation into the applicability of this technology to significantly improve indoor air quality. *doi: 10.1007/s10661-010-1799-3*
166	**NG**		TRANSAID. 2013. *Linking Rural Communities with Health Services: Assessing the Effectiveness of the Ambulance Services in Meeting the Needs of Rural Communities in West Africa.* African Community Access Programme, UK.	It is increasingly accepted in our understanding of maternal healthcare in Africa that poor physical access is reducing the effectiveness of measures to reduce maternal mortality. This project developed an evaluation framework that combined transport measures with health condition assessment methods of the Vital Signs approach and the Glasgow Coma Score to assess differences in patient condition when being referred from local health centres to higher-level referral facilities. Surveys were undertaken of 704 women from 40 communities across Katsina State, Northern Nigeria. It was found that whilst the majority took 1-2 hours between being referred and arriving at the referral facility many took up-to 7 hours. Whilst using the Glasgow Coma Score, the study found no statistical relationship between health condition and how a patient arrived at the referral facility or how long it took to arrive. However, using the Vital Signs approach, statistical associations were found between a number of vital signs and how women arrived at the referral facility and how long it took to be referred. As a result, improvements to how women travel to referral facility and the time referral takes can have positive impacts on the severity of patients managed by referral facilities. Efforts by a range of countries across West Africa to establish widespread ambulance provision may be effective in contributing to reducing maternal mortality. This study shows they may have a positive impact on the skills, resources and equipment emergency obstetric care facilities needed to reduce maternal mortality. *http://r4d.dfid.gov.uk/pdf/outputs/AfCap/AFCAP-GEN%20-60-Linking%20rural-communitieis-with-health-services-Final-Report.pdf*
167	**ET**		Tule, G. Washington, S., King, M. 2013. Characteristics of Police-reported Road Traffic Crashes in Ethiopia over a Six Year Period. *Proceedings of the 2013 Australasian Road Safety Research, Policing & Education Conference 28th – 30th August, Brisbane, Queensland.*	Ethiopia has one of Africa's fastest growing non-oil producing economies and an increasing level of motorisation (AfDB, OECD, UNDP, & UNECA, 2012). This rapidly increasing mobility has created some unique road safety concerns; however there is scant published information and related commentary (United Nations Economic Commission for Africa, 2009). The objective of this paper is to quantify police-reported traffic crashes in Ethiopia and characterise the existing state of road safety. Six years (July 2005 - June 2011) of police-reported crash data were analysed, consisting of 12,140 fatal and 29,454 injury crashes on the country's road network. The 12,140 fatal crashes involved 1,070 drivers, 5,702 passengers, and 7,770 pedestrians, totalling 14,542 fatalities, an average of 1.2 road user fatalities per crash. An important and glaring trend that emerges is that more than half of the fatalities in Ethiopia involve pedestrians. The majority of the crashes occur during daytime hours, involve males, and involve persons in the 18-50 age group—Ethiopia's active workforce. Crashes frequently occur in mid blocks or roadways. The predominant collision between motor vehicles and pedestrians was a rollover on a road tangent section. Failing to observe the priority of pedestrians and speeding were the major causes of crashes attributed by police. Trucks and minibus taxis were involved in the majority of crashes, while automobiles (small vehicles) were less involved in crashes relative to other vehicle types, partially because small vehicles tend to be driven fewer kilometres per annum. These data illustrate and justify a high priority to identify and implement effective programs, policies, and countermeasures focused on reducing pedestrian crashes.

No.	Country	Topic	Citation	Summary
168	**GH KE**		Weinberg, E. 2000. Urbanization and childhood asthma: An African perspective. *Journal of Allergy and Clinical Immunology*, 105(2) Part 1, 224-231	The increasing prevalence of childhood asthma in the developed world is a cause for concern. Much research is currently being conducted in an attempt to identify possible reasons for this occurrence. A so-called Western lifestyle has been the factor most commonly cited to explain this worrying increase in asthma prevalence. In essence, this implies a way of life where children are exposed from early infancy to a wide range of foods, infections, indoor and outdoor allergens, and irritants and to the effects of motor vehicle pollution. Until fairly recently, children in many African countries lived mainly in rural areas and were not exposed to the effects of a Western lifestyle. Early studies in a limited number of African countries showed a very low rural prevalence of childhood asthma, especially where children lived according to a traditional lifestyle. These same studies showed that asthma was not uncommon in urbanized African children. There has been an increasing tendency over the past 20 years for those in rural communities to move to the large urban centers. More recent childhood asthma prevalence studies, especially those from Kenya and Ghana, have confirmed the urban-rural differences but have shown a much narrower gap. In part this may be the result of exposure of rural children to agricultural pesticides and irritants as well as of an increasing tendency to adopt a more Westernized lifestyle such as the use of beds with mattresses, pillows, and blankets. These circumstances on the African continent provide a natural laboratory in the quest for factors that influence the development of asthma in susceptible children. Once more fully elucidated, it is possible that much valuable information will be available to combat the relentless increase in childhood asthma both here as well as in the developed world. *http://dx.doi.org/10.1016/S0091-6749(00)90069-1*
169	**NG**		Williams, N., Olatunji, O. 2012. Life Saving Information Behaviours of Commercial Motorcyclists in a Metropolitan City in Nigeria. *Libri*, 62(3), 259-275.	Okada (taxi motorcycle) is a popular means of moving humans and materials in Nigeria, but it is notorious for the risk it poses to public and road safety. Information education programmes dominate the current efforts by government and non-government organizations to ameliorate this situation. Using data collected from 301 okada operators through a questionnaire, this study examined the safety information needs and safety information sources of okada riders in Africa's largest semi-urban city, Ibadan, in Nigeria. The okada riders expressed a higher level of consciousness about their own safety than the safety of their passengers. They also have a high level of awareness about, and preferred, radio and television as sources of information much more than any other sources. In addition to improving radio and television programmes targeted at them, a strategy that might improve the efficiency of road safety information intervention programmes could be passenger education. Passengers should be empowered to demand helmets and also to caution the okada rider when his riding attitude is considered risky to one's life. *doi: 10.1515/libri-2012-0021*
170	**ZA**		Vanderschuren, M. 2008. Safety improvements through Intelligent Transport Systems: A South African case study based on microscopic simulation modeling. *Accident Analysis and Prevention*, 40(2), 807-817.	Intelligent Transport Systems (ITS) can facilitate the delivery of a wide range of policy objectives. There are six main objectives/benefits identified in the international literature: Safety (reduction of (potential) crashes), mobility (reduction of delays and travel times), efficiency (optimise the use of existing infrastructure), productivity (cost saving), energy/environment and customer satisfaction In the South African context, there is an interest for measures that can reduce (potential) crashes. In South Africa the number of year on year traffic related fatalities is still increasing. In 2005 the number of fatalities was 15 393 (from 14 135 in 2004) while the estimated costs for the same period increased from R8.89-billion to R9.99-billion [RTMC, 2007. Interim Road Traffic and Fatal Crash Report 2006, Road Traffic Management Corporation, Pretoria, SA]. Given the extent of the road safety problem and the potential benefits of ITS, the need for further research is apparent. A Study with regards to the potential of different types of models (macroscopic, mesoscopic and miscroscopic simulation models) led to the use of Paramics. Two corridors and three types of ITS measures were investigated and safety benefits were estimated.

No.	Country	Topic	Citation	Summary
171	**ZA**		van Garenne, O., van Niekerk, J., Grobbelaar, B. 2001. Mechanical failures as a contributing cause to motor vehicle accidents - South Africa. *Accident Analysis and Prevention*, 33(6), 713-721.	Over the past decades motor vehicles became the primary mode of transportation in developing countries. At the same time an improvement in automotive engineering and manufacturing as well as the phenomena of urbanisation have resulted in more vehicles spending more time on the road at higher speeds. Invariably this leads to driving scenarios where safety critical manoeuvres have to be performed that rely on the mechanical condition of the vehicles. In developing countries, where economic realities force the population to make use of older and less reliable vehicles, the risk of accidents caused by some sort of mechanical failure increases. The casualty rate (events causing death and/or serious injuries) for road traffic accidents in South Africa is amongst the highest in the world. This trend has persisted with little variation over the years, despite the efforts of local road safety organisations and research institutes to decrease them. The main goal of this study was to establish the contribution of mechanical failures to motor vehicle accidents, and furthermore, to compare it with international trends. Data obtained from accident response units (ARU) indicate that tyres and brakes were the main contributors to mechanical failures resulting in accidents in the Pretoria region (Gauteng Province). However, the reported percentage of approximately 3% is comparable to similar statistics from developed countries. Detailed information on the condition of road-going vehicles was then collected in this area. The roadside survey (potential mechanical defect tests (PMDT)) indicated that 40% of the vehicles surveyed on the suburban road and 29% of the vehicles surveyed on the highway had mechanical defects that contravened current road and traffic regulations in South Africa and may, therefore, be at risk of causing an accident due to a mechanical failure. In the Minibus (taxi) survey, large irregularities in tyre inflation pressure were identified as a cause of concern. The main conclusion from this work is that tyres and brakes are the two most dominant components that contribute to the mechanical defects causing accidents, with overloading an additional factor to consider. It is important to acknowledge that these three factors can easily be monitored during simple roadside inspections. doi *10.1016/S0001-4575(00)00083-X*
172			van Gemert, F., van der Molen, T., Jones, R., Chavannes, N. 2011. The impact of asthma and COPD in sub-Saharan Africa. *Primary Care Respiratory Journal*, 20(3), 240-248.	Many countries in sub-Saharan Africa have the highest risk of developing chronic diseases and are the least able to cope with them. To assess the current knowledge of the prevalence and impact of asthma and chronic obstructive pulmonary disease (COPD) in sub-Saharan Africa. A literature search was conducted using Medline (1995-2010) and Google Scholar. Eleven studies of the prevalence of asthma in sub-Saharan Africa were identified, all of which showed a consistent increase, particularly in urban regions. The data on asthma show a wide variation (5.7-20.3%), with the highest prevalence in 'westernised' urban areas. Only two studies of the prevalence of COPD in sub-Saharan Africa have been performed. Nevertheless, COPD has become an increasing health problem in sub-Saharan Africa due to tobacco smoking and exposure to biomass fuels. In most countries of sub-Saharan Africa, 90% of the rural households depend on biomass fuel for cooking and heating, affecting young children (acute lower respiratory infections) and women (COPD). This is the cause of significant mortality and morbidity in the region. Asthma and COPD in sub-Saharan Africa are under-recognised, under-diagnosed, under-treated, and insufficiently prevented. A major priority is to increase the awareness of asthma and COPD and their risk factors, particularly the damage caused by biomass fuel. Surveys are needed to provide local healthcare workers with the possibility of controlling asthma and COPD. *http://dx.doi.org.libdata.lib.ua.edu/10.4104/pcrj.2011.00027*

No.	Country	Topic	Citation	Summary
173	**ET**		Venn, A., Yemaneberhan, H., Lewis, S., Parry, E., Britton, J. 2005. Proximity of the home to roads and the risk of wheeze in an Ethiopian population. *Occupational and Environmental Medicine*, 62(6), 376-380.	There is widespread public concern that exposure to road vehicle traffic pollution causes asthma, but epidemiological studies in developed countries have not generally confirmed a strong effect and may have underestimated the risk as a result of relatively high and widespread exposure to traffic in everyday life. To investigate the effect of living close to a traffic bearing road on the risk of wheezing in Jimma, Ethiopia where road traffic is generally low and restricted to a limited network of roads. Data have been previously collected on respiratory symptoms, allergic sensitisation, and numerous demographic and lifestyle factors in a systematic sample of inhabitants of Jimma town. In 2003 the homes of these people were retraced; the shortest distance to the nearest surfaced road, and traffic flows on these roads were measured. Distance measurements were collected for 7609 (80%) individuals. The overall prevalence of wheeze was similar in those living within 150 m of a road compared to those living further away (3.9% v 3.7%), but among the 3592 individuals living within 150 m, the risk of wheeze increased significantly in linear relation to proximity to the road (adjusted odds ratio = 1.17 per 30 m proximity, 95% CI 1.01 to 1.36). This relation was stronger, though not significantly so, for roads with above median traffic flows. These findings indicate that living in close proximity to road vehicle traffic is associated with an increased risk of wheeze, but that other environmental factors are also likely to be important. *doi: 10.1136/oem.2004.017228*
174	**GH**		Yankson, I., Browne, E., Tagbor, H., Donkor, P., Quansah, R., Asare, G., Mock, C., Ebel, B. 2010. Reporting on road traffic injury: content analysis of injuries and prevention opportunities in Ghanaian newspapers. *Injury Prevention*, 16(3), 194-197.	In order to analyse traffic injury reporting in Ghanaian newspapers and identify opportunities for improving road safety, the content of 240 articles on road traffic injury was reviewed from 2005 to 2006 editions of two state-owned and two privately owned newspapers. The articles comprised reports on vehicle crashes (37%), commentaries (33%), informational pieces (12%), reports on pedestrian injury (10%), and editorials (8%). There was little coverage of pedestrian injuries, which account for half of the traffic fatalities in Ghana, but only 22% of newspaper reports. Only two articles reported on seatbelt use. Reporting patterns were similar between public and private papers, but private papers more commonly recommended government action (50%) than did public papers (32%, p=0.006). It is concluded that Ghanaian papers provide detailed coverage of traffic injury. Areas for improvement include pedestrian injury and attention to preventable risk factors such as road risk factors, seatbelt use, speed control, and alcohol use. *doi: 10.1136/ip.2009.024174*
175	**GH**		Zhou, Z., Dionisio, K., Verissimo, T., Kerr, A., Coull, B., Arku, R., Koutrakis, P., Spengler, J., Hughes, A., Vallarino, J., Agyei-Mensah, S., Ezzati, M. 2013. Chemical composition and sources of particle pollution in affluent and poor neighborhoods of Accra, Ghana. *Environmental Research Letters*, 8(4), 1-9.	The highest levels of air pollution in the world now occur in developing country cities, where air pollution sources differ from high-income countries. We analyzed particulate matter (PM) chemical composition and estimated the contributions of various sources to particle pollution in poor and affluent neighborhoods of Accra, Ghana. Elements from earth's crust were most abundant during the seasonal Harmattan period between late December and late January when Saharan dust is carried to coastal West Africa. During Harmattan, crustal particles accounted for 55 mu g m(-3) (37%) of fine particle. (PM2.5) mass and 128 mu g m(-3) (42%) of PM10 mass. Outside Harmattan, biomass combustion, which was associated with higher black carbon, potassium, and sulfur, accounted for between 10.6 and 21.3 mu g m(-3) of fine particle mass in different neighborhoods, with its contribution largest in the poorest neighborhood. Other sources were sea salt, vehicle emissions, tire and brake wear, road dust, and solid waste burning. Reducing air pollution in African cities requires policies related to energy, transportation and urban planning, and forestry and agriculture, with explicit attention to impacts of each strategy in poor communities. Such cross-sectoral integration requires emphasis on urban environment and urban poverty in the post-2015 Development Agenda. *doi: 10.1088/1748-9326/8/4/044025*

No.	Country	Topic	Citation	Summary
176	**GH GM**		Zhou, Z., Dionisio, K., Verissimo, T., Kerr, A., Coull, B., Howie, S., Arku, R., Koutrakis, P., Spengler, J., Fornace, K., Hughes, A., Vallarino, J., Agyei-Mensah, S., Ezzati, M. 2014. Chemical Characterization and Source Apportionment of Household Fine Particulate Matter in Rural, Peri-urban, and Urban West Africa. *Environmental Science & Technology*, 48(2), 1343-1351.	Household air pollution in sub-Saharan Africa and other developing regions is an important cause of disease burden. Little is known about the chemical composition and sources of household air pollution in sub-Saharan Africa, and how they differ between rural and urban homes. We analyzed the chemical composition and sources of fine particles (PM2.5) in household cooking areas of multiple neighborhoods in Accra, Ghana, and in pen-urban (Banjul) and rural (Basse) areas in The Gambia. In Accra, biomass burning accounted for 39-62% of total PM2.5 mass in the cooking area in different neighborhoods; the absolute contributions were 10-45 mu g/m(3). Road dust and vehicle emissions comprised 12-33% of PM2.5 mass. Solid waste burning was also a significant contributor to household PM2.5 in a low-income neighborhood but not for those living in better-off areas. In Banjul and Basse, biomass burning was the single dominant source of cooking-area PM2.5, accounting for 74-87% of its total mass; the relative and absolute contributions of biomass smoke to PM2.5 mass were larger in households that used firewood than in those using charcoal, reaching as high as 463 mu g/m(3) in Basse homes that used firewood for cooking. Our findings demonstrate the need for policies that enhance access to cleaner fuels in both rural and urban areas, and for controlling traffic emissions in cities in sub-Saharan Africa. *doi: 10.1021/es404185m*
177	**TZ**		Zimmerman, K., Mzige, A., Pascience, K., Museru, L., Guereereo, A. 2012. Road traffic injury incidence and crash characteristics in Dar es Salaam: A population based study. *Accident Analysis & Prevention*, 45, 201-210.	Road traffic injuries (RTI) are a public health threat and a major source of disability in developing countries. A population-based analysis of RTIs in a testimonially high-risk area of Dar es Salaam, the largest city in the East African country of Tanzania, was carried out with the goal of establishing an RTI incidence and to identify RTI characteristics that may be used for a targeted injury prevention program in these communities. Geographic cluster sampling was completed in 2 adjacent wards of Dar es Salaam with household surveys administered in person to determine a denominator. Any household members involved in an RTI within the previous 12 months received an in-depth questionnaire. Demographics, incident characteristics, medical attention, injuries and disability days were noted. These are described and compared to injury severity and age specific tendencies.Within the 30 clusters, 6001 individuals were interviewed. Of them, 196 were involved in non-fatal RTIs within the previous 12 months, resulting in a non-fatal incidence rate of 32.7 RTIs per 1000 person years. There were 4 deaths noted. Injuries resulting in a fracture correlated with a disability of more than 30 days. Children were injured as pedestrians 93% of the time and were more likely to be injured on small, unpaved side streets than adults. Most RTIs occurred on a highway and affected the lower extremitie s, required treatment at a hospital, and resulted in a police report being filed 50.2% of the time. In conclusion, RTIs in this urban East African setting are a major source of disability. This study provides incidence data and crash characteristics that may be used to construct prevention programs and could validate secondary data sources. *http://dx.doi.org/10.1016/j.aap.2011.06.018*

The African Community Access Programme (AFCAP) is currently working to identify rural transport issues in Sub-Saharan Africa (SSA) to be targeted for future research endeavors. These future research efforts are aimed at developing a more comprehensive understanding of the overall health impacts (crashes, pollution, healthcare access, etc.) associated with rural transport provision. Preliminary literature reviews and expert interviews have yielded a number of key issues.

We have developed a brief survey (11 questions) intended to gather additional professional opinion on these key issues. The questions are all short answer but there is an opportunity to provide more detailed input if you choose in the comment boxes. Feel free to skip any question(s) that you feel are outside of your expertise or about which you have no opinion. All responses are anonymous. You will be able to see a summary of previous responses upon completion of the survey.

Thank you very much for your interest and input.

1. In what SSA countries do you have professional experience?

2. Which of the following best describes your professional affiliation? (please check only one)

- ◯ Research/academics
- ◯ Governmental agency
- ◯ Public safety/law enforcement
- ◯ Private consultancy
- ◯ Non-profit or NGO
- ◯ Other (please specify)

3. Which of the following best describes your professional specialty? (please check only one)

- ◯ Road safety
- ◯ Environmental protection
- ◯ Public health
- ◯ Other (please specify)

4. In your opinion, which of the following transport modes is the most dangerous in rural Africa?

	Least dangerous	Dangerous	Most dangerous
Vulnerable road users (pedestrians, bicyclists, pushcarts, animal carts, etc.)	◯	◯	◯
Transport services (buses and minibuses)	◯	◯	◯
Motorcycles (including motorcycle taxis)	◯	◯	◯

Comments?

5. To the extent that road conditions contribute to rural road crashes in Africa, which of the following issues need *research* attention?

	Very unimportant - has already been adequately addressed or is not a major issue	Unimportant - warrants continued study as opportunities arise	Moderately important - should be included in future research plans	Important - should be addressed within the next 5 years	Very important - requires immediate attention
Condition of travelway (e.g., potholes and ruts that can cause vehicles to lose control or encourage drivers to leave their travel lane to avoid hitting	◯	◯	◯	◯	◯
Lack of adequate signage (e.g., warning signs for horizontal curves or other approaching hazards)	◯	◯	◯	◯	◯
Dust from unpaved roads obscuring visibility or resulting in risky driving behavior (e.g., overtaking vehicles to avoid following along in their dust)	◯	◯	◯	◯	◯

Other (please specify)

6. To the extent that risky driving behaviors contribute to rural road crashes, which of the following potential causal factors need immediate *research* attention?

	Very unimportant - has already been adequately addressed or is not a major issue	Unimportant - warrants continued study as opportunities arise	Moderately important - should be included in future research plans	Important - should be addressed within the next 5 years	Very important - requires immediate attention
Aggressive driving (speeding, overtaking)	◯	◯	◯	◯	◯
Driving under the influence (alcohol, drugs)	◯	◯	◯	◯	◯
Distracted driving (texting, talking on mobile phones)	◯	◯	◯	◯	◯
Non-use of safety equipment (seatbelts, helmets, child restraints)	◯	◯	◯	◯	◯
Poor driving (education/experience, licensing/regulation)	◯	◯	◯	◯	◯

Comments?

7. To what extent do you agree with the following statements?

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
Rural road crashes disproportionately impact women	◯	◯	◯	◯	◯
Rural road crashes disproportionately impact children	◯	◯	◯	◯	◯

8. Which of the following do you consider to be the most pressing accessibility issue in rural Africa?

Access to healthcare	Access to educational opportunities	Access to commercial activities
◯	◯	◯

Healthcare accessibility questions

9. With regard to the role transport plays in healthcare accessibility in rural Africa, please rank the following issues according to need for *research* attention (5 = highest need).

	1	2	3	4	5
Access to maternal/pre-natal care	◯	◯	◯	◯	◯
Access to general/preventitive care	◯	◯	◯	◯	◯
Access to pediatric care	◯	◯	◯	◯	◯
Access to disease/chronic condition care	◯	◯	◯	◯	◯
Access to emergency/trauma care	◯	◯	◯	◯	◯

Comments?

Education accessibility questions

10. With regard to the role transport plays in education accessibility in rural Africa, which of the following issues need immediate *research* attention?

	Very unimportant - has already been adequately addressed or is not a major issue	Unimportant - warrants continued study as opportunities arise	Moderately important - should be included in future research plans	Important - should be addressed within the next 5 years	Very important - requires immediate attention
Safety education/awareness for children and parents	◯	◯	◯	◯	◯
Provision of safer pedestrian facilities	◯	◯	◯	◯	◯
Provision of transport servcies for schoolchildren	◯	◯	◯	◯	◯

Comments?

Economic accessibility questions

11. With regard to the role transport plays in economic accessibility in rural Africa, which of the following issues most affect (or are affected by) road safety?

	No opinion	No relationship	Indirect relationship	Direct relationship	Strong relationship
Transport of agricultural goods to market	◯	◯	◯	◯	◯
Connectivity to service sector employment in nearby populated areas	◯	◯	◯	◯	◯
Natural resource extraction	◯	◯	◯	◯	◯

Comments?

Pollution questions

12. To what extent do you agree with the following statement?

Dust and other air pollution from rural roads in Africa have not received adequate attention from the research and policy communities.

Disagree	No opinion	Agree
◯	◯	◯

13. In your opinion, which of the following groups are most at-risk due to air pollution in *rural* Africa?

	Least vulnerable	Vulnerable	Most vulnerable
Individuals in the immediate roadway environment (pedestrians, cyclists)	◯	◯	◯
Occupants of residences and business operations close to the roadway (< 300m)	◯	◯	◯
Vehicle passengers (cars, buses, minibuses, motorcyclists)	◯	◯	◯

Comments?

Thank you page

Thank you very much for your insight. It is contributed knowledge such as yours that will make this project a success. If you have any questions or comments regarding the survey or the project as a whole, please feel free to contact me at your convenience.

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14. Interested in answering one last question?

- ◯ Yes
- ◯ No

Optional question

15. To what extent do you think the following play a role in promoting stability in fragile and conflict-affected regions in rural Africa?

	No opinion	No relationship	Indirect relationship	Direct relationship	Strong relationship
Building rural roads	◯	◯	◯	◯	◯
Provision of transport services	◯	◯	◯	◯	◯

Comments?