Spatial Implications of the Yamoransa-Mankessim Coastal Highway on Pedestrian Safety

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Abstract

The study examined spatial and safety implications of the Yamoransa-Mankessim coastal highway section of the Trans-West Africa coastal highway linking Ghana, Cote d'Ivoire and Togo. Although this road network was constructed mainly to facilitate faster and safer movement of goods and services between the affected countries, sections of the highway, specifically the Yamoransa-Mankessim stretch, have witnessed increasing cases of vehicle-human collision. This study attributes the rising rate of vehicle-human collisions to the location of the highway as it passes through some coastal settlements and in some cases almost dividing such settlements into two equal halves. Geo-statistical mapping was done to portray the relationships between location of the highway and frequency of vehicle-human collisions reported between 2005 and 2009. Correlation analysis and statistical test were also performed on data on observed collisions over the period. The results showed that pedestrian carelessness other than excessive speeding is the major cause of the vehicle-human collisions on the highway. It is recommended that overhead foot bridges and metal barricades be provided in the affected communities by the Mfantseman Municipal Assembly and the Ghana Highway Authority in order to facilitate easy crossing of the highway and reduce the risk of vehicle-human collisions.

Introduction

Most developing countries like Ghana are experiencing increasing incidence of car-human collision (see Abane, 2010, 2004, 1994; Damsere-Derry, Ebel, Mock, Afukaar & Donkor, 2010; Mabunda, Swart & Seeda, 2008; Sun, Zhou, Jia, Yan, Huang & Xiang, 2006; Garder, 2004). This phenomenon has persisted over the past decade irrespective of numerous attempts by governments of Ghana to reduce the occurrence of car-human collisions on the country's roads and highways. Advances in transportation, mainly the availability of modern and fast moving vehicles and relatively good highways, which has been provided to improve communication and development have rather contributed to the increasing reported cases of accidents, particularly car-human collisions that Ghana has experienced during the past decade (Ivers, Stevenson, Norton & Yu, 2008; Mabunda, Swart & Seeda, 2008; Wells, 2007).

The availability of road signs, appropriate street markings such as pedestrian crossings, and speed-check facilities on Ghanaian highways, notwithstanding, the incidence of car-human collision is on the increase relative to other forms of road accidents (Damsere-Derry et al., 2010; Sun et al., 2006**)**. Although the literature largely attributes the increasing incidence of car-human

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collisions to deviant behaviours of drivers especially excessive speeding and reckless overtaking, this study presents additional causative factors of car-human collisions that need to be investigated. For instance, Damsere-Derry et al. (2010) indicate in their study on pedestrians' injury patterns in Ghana that the size of cars other than car speed largely accounts for a relatively higher incidence of car-human collision in Ghana. Similarly, they note that bus-human collisions are more likely to cause fatalities than saloon car-human collisions when the speed of cars involved in the car-human collisions is controlled for. In this instance, the degree of injury may be attributed to differences in the sizes of vehicles involved in the crashes and other spatio-economic, social and psychological factors when car speed and other physical features of the road on which the crashes occur (eg. nature of road and road markings) are controlled for.

Spatial-wise, most highways avoid passing through human settlements. This helps to protect their dwellers from possible collision (pedestrian safety) with high-speed moving vehicles. Nonetheless, Ghana's coastal section of the Trans-West African highway passes through many settlements, notably between Yamoransa and Mankessim (the study area). The construction of the coastal Ghana highway in its present location was primarily motivated by the economic and spatial benefits of road construction with relatively little regard for pedestrian safety.

First, the Government of Ghana was largely concerned with cost minimization in respect of the construction of this highway because of the limited availability and access to funds for building an entirely new highway that was to run parallel to the existing coastal road network. Consequently, some sections of the Trans-West African coastal highway represent an expansion of some existing coastal road network notably the Cape Coast–Accra section of the network (http://en.wikipedia.org/wiki/Trans%E2%80%93West_African_Coasal_Highway).

Second, the old coastal road network passed through towns and villages as a means of improving connectivity and socio-economic interaction between affected communities rather than facilitating efficient and fast transportation of goods and services between Ghana on one hand and La Cote d'Ivoire and Togo on the other. The Yamoransa-Mankessim segment of the Cape Coast-Accra coastal highway typifies an expansion of the old coastal road network that linked most towns and villages in the coastal areas of southern Ghana initially constructed to increase economic and social interaction between the affected communities (http://en.wikipedia.org/wiki/Transport_in_Ghana). Indeed, this coastal highway portrays a line that divides affected towns and villages (Yamoransa, Biriwa, Anomabo, Egyaa, Abandze, Koromanste, Saltpond, Anokyi, Abonko, and Mankessim) into two parts with some towns and villages (Biriwa, Anomabo, Abandze, Koromanste, and Abonko) almost divided into two equal parts. The dichotomous division of towns and villages of the study area by the coastal highway increases pedestrian crossing of the highway in the absence of footbridges and has largely contributed to the increasing trend in vehicle-human interaction and collision in the study area.

Related to the spatial division of towns and villages in the study area by the Yamoransa-Mankessim transect of the coastal highway is the division of local societies that are often polygamous apart from the fact that they represent subsistence fishing communities that are relatively compact and closely knitted by the functions of their social institutions such as marriage, traditional practices and beliefs. The social arrangements of settlements and living quarters, especially in polygamous and extended family societies are among some of the major social institutions that largely get impacted by the dividing nature of coastal highways. As communities get divided some married couples and families that do not maintain the same living quarters get separated by the highway. This results in a higher frequency of road crossing from one side of the divided community to the other in order to attend to their daily routines of life. For instance, some wives and husbands necessarily cross the dividing highway to visit their spouses and attend to family issues on daily basis. Children and people under care are often left with no option but to cross the dividing highway to parents or other family members to seek assistance and care.

In addition to the separation of living quarters is the separation of social amenities by the dividing highway. Consequently, local inhabitants who wish to use social, cultural and religious amenities such as place of convenience, schools, recreational or playgrounds, community centres, fetish shrines and churches are compelled to cross the highway before they gain access to these social facilities. This increases the frequency of highway crossing in the communities and invariably affects the level of vehicle-human collisions (see also, Nordfjarn & Rundmo, 2009; Mabunda, Swart & Seeda, 2008; Sharma, 2008; Poudel-Tandukar, Nakahara, Ichikawa, Poudel & Wakai, 2006).

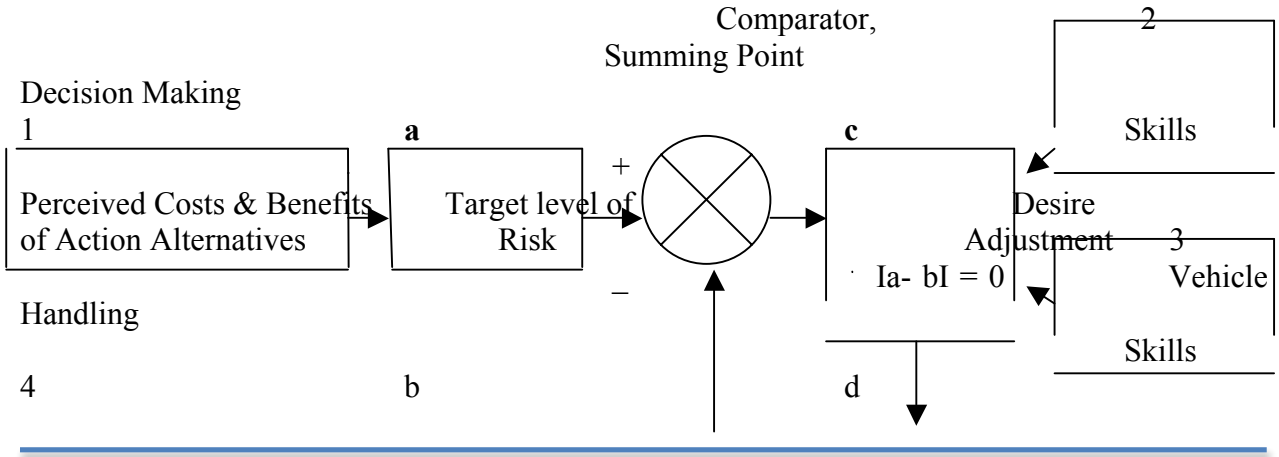
Although excessive speeding through communities (over 50 km/hour) is known as one of the major causes of vehicle and human collisions in Ghana and in the study area (Abane, 2010, 2004; Garder, 2004; Ministry of Roads and Transport, 1974), this study discusses the effects of some psycho-social factors on the increasing rate of vehicle-human collisions on the coastal Ghana highway. Psycho-social factors such as absent-mindedness that results from stress and other social problems affect the cognitive ability of humans. These factors including excessive intake of alcohol, family problems, and lack/want of basic necessities of life affect negatively the road crossing ability of pedestrians as well as the judgment of drivers at all times of the day, particularly at night time and at dawn (Abane, Akyea-Darkwa & Amenumey, 2010; Lund & Aaro, 2004; Ministry of Roads and Transport, 1974; Association of Schools of Public Health, 1963). Sometimes due to absent-mindedness drivers that use the coastal Ghana highway and other roads fail to heed to road warning signs, especially when they pass through communities. In their absent mindedness state they often drive less cautiously and less defensively even when they drive at the required speed of 50 km per hour. At a speed of 50 km per hour a bus or a truck can cause substantial injury to a pedestrian if the driver fails to drive cautiously or defensively due to absent-mindedness. Related to diver absent-mindedness is pedestrian absent-mindedness

that largely affects pedestrians' ability to cross and use the highway safely. Pressures of life and the prevailing harsh socio-economic environment make pedestrians focus more on their personal needs than their safety when crossing the coastal highway, which exposes them to a higher risk of vehicle-human collision. Also, at some sections of the highway, especially in sharp curves and bends, drivers have difficulty in seeing pedestrians that cross the road at these relatively dangerous sections early enough to avoid them. Even where pedestrian crossing and other road signs are available, at night some pedestrians fail to comply with and use the available road signs and markings to their benefit due to their state of absent mindedness (poor cognitive abilities or carelessness) (Abane, Akyea-Darkwa & Amenumey, 2010; Lund & Aaro, 2004).

This study sought to assess the spatial, social, and psycho-social factors accounting for the increasing vehicle-human collisions in the study area (Figure. 3), relying on reported road traffic crash data for the period 2005-2009. The need for such a study is underpinned by the daily reported cases of road crashes and related consequences as well as the impact these crashes have on the nation's socio-economic development.

Conceptual framework

The study adopted aspects of the three-factor typology of the causes of road traffic crashes by Jorgensen and Abane (1999) and Wilde's (2001) risk homeostasis theory. Homeostasis as a concept was proposed in 1929 by Walter Cannon, an American physiologist, to describe the dynamic process discovered 70 years earlier by the French physician Claude Bernard (1859). According to the theory, any action performed after a choice has been made (e.g. policy change from left to right-hand drive; decision to live across opposite sides of a road) carries some objective likelihood of accident risk, which in quantitative terms could be greater or smaller than the risk level prior to the change. The sum total of all the performed actions, along with the objective risk of each of them across all road users in a jurisdiction and over an extended period of time (e.g. a year), will determine some amount of traffic crash loss in the jurisdiction concerned for that year (Figure. 1).



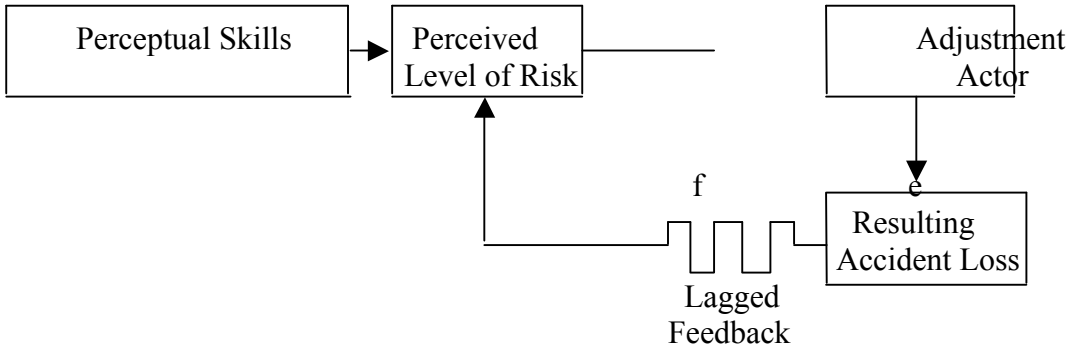


Figure 1: Homeostatic model based on the theory of risk homeostasis

Source: Wilde, G. J. S (2001).

In simple terms, individual road users try to keep their road accident risk per time unit of exposure in equilibrium with their prevailing target level of risk. As the target level of risk becomes greater than zero, the individual road user runs an inevitable risk of traffic crash. If the individual is involved in the accident and it turns out to be fatal, that individual road user is no longer able to make any subsequent adjustment actions. However, the individuals in the population of survivors can. Each road traffic crash which occurs therefore adds an increment to the perceived level of crash risk. In effect, surviving members of the population become very well aware of possible road crash risk, in a general and quantitatively diffused manner, by virtue of their everyday experiences on the roads and also through interactions with others in their communities as well as through reports on crashes in the media.

Although the theory was not specifically tested in the study, elements of it were considered. In particular, the issue of risk of a human-vehicle collision and introduction of policies and programmes by state institutions responsible for road safety as well as the effects of these actions were examined with respect to individual and collective risk occurrences and associated fatalities in the study area.

In a comparative study of road traffic crashes in the urban environments of Accra (Ghana) and Trondheim (Norway), Jorgensen and Abane (1999) adapted and applied Meade et al's (1988) three-factor typology on factors causing diseases. According to the original model, diseases are caused mainly by three factors: the population, behaviour and the habitat (i.e. environmental risk factors). Jorgensen and Abane (1999) made a heuristic adjustment of the original model to fit into a road traffic crash situation, with the vehicle corresponding to the vector in disease ecology; the environment representing the road system and wider physical and built-up environment; and the behaviour of the population representing the socio-demographic

characteristics of the population including the various attitudes and behaviour displayed on the road (Figure 2).

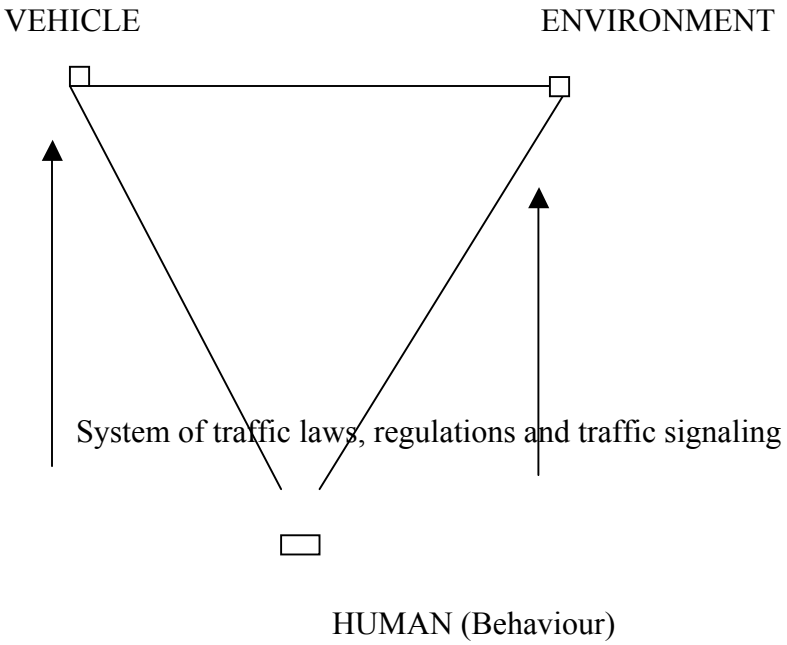


Figure 2: Main factors causing road traffic accidents
Sources: Meade et al (1988); Jorgensen and Abane (1999)

Although such categorization makes it possible to isolate key variables for purposes of planning and policy, it is still the case that the factors generally interact, making most of the crashes a combination of various circumstances including individual poor road crossing behaviour, drunkenness, inadequate knowledge of road signs/markings and youthfulness of the road user. These factors were also considered in the use of the road by community members in the study area. Related to community behaviour in response to the availability of road in the study area, particularly within the Mankessim section of the southern coastal highway is the increased situation of frequent road crossing around the Mankessim market and roundabout by hawkers, retailers and customers. Although traditionally the availability of road influences the behaviour of members of communities nearby to locate and relocate close to the available roads in order to maximize the socio-economic benefits that new roads provide, in the case of Mankessim the market and other housing and retail infrastructure were available before the southern coastal highway was routed in its present location. Nonetheless, some notable developments including a supermarket and hardware stores have developed along the left and right flanks of the highway around the Mankessim market and roundabout in waterlogged areas regardless of the potential negative environmental consequences that these developments pose.

Study area

The study area covered 10 settlements located along the Yamoransa-Mankessim transect of the coastal Ghana highway that runs from Eliubo (La Cote d'Ivoire-Ghana boarder) in the Western Region through Dzodze in the Volta Region to Togo. These towns and villages are located within the jurisdiction of the Mfantseman Municipal Assembly with Saltpond serving as the capital town. In geo-spatial terms, half of the towns and villages in the study area (Yamoransa, Egyaa, Anokyi, Abonko, and Mankessim) are located further inland away from the ocean (Gulf of Guinea) where farming and trading are the predominant prevailing economic activities. The remaining five towns and villages (Biriwa, Anomabo, Abandze, Koromantse, and Saltpond) lie along the coast of the Gulf of Guinea and are predominantly fishing communities with the exception of Saltpond. The coastal highway passes through Biriwa, Anomabo, Abandze, Koromantse, and Abonko and almost divides these communities into two equal halves, thus exposing pedestrians in these communities to serious risks of vehicle-human collisions than in the remaining communities (Yamoransa, Egyaa, Saltpond, Anokyi, and Mankessim) where the highway passes along their outskirts (Figures 3 and 4).

Sources of data

The study used mainly secondary data and information. The secondary data were obtained from the Road Accident Unit of the Saltpond District Police Service. This data set covered the dates of vehicle-human collisions, locations where the collisions occurred, type of vehicles involved in the collisions, extent of injuries sustained in the collisions, number of pedestrians affected, and causes of the collisions. These data components were retrieved from the ledger entries of vehicle-human collisions reported cases compiled between 2005 and 2009. This type of data source was preferred because police records provide credible source of information that largely accounts for legal and ethical considerations regarding data collection and data reporting (Cho, Rodriguez & Khattak, 2009).

Methodology

First, geo-spatial analysis based on geo-statistical mapping was performed to portray the location of the section of the coastal Ghana highway that passes through the study area (Yamoransah-Mankessim transect) in relation to the number of collisions that occurred in the affected communities and the extent of injuries or deaths that were recorded in the respective communities that form the study area.

Second, statistical analysis based on the 2005-2009 vehicle-human collision data was performed using the SPSS software (version 16.0). Trend analysis, cross tabulations, and Pearson correlation analysis were performed to analyse the statistical distribution and relationships between the place of vehicle-human collisions and the frequency of occurrence of such collisions. Additionally, a test of statistical significance based on a Pearson correlation statistic

was performed to confirm the significance of the geo-spatial analysis portrayed. The test was important because not all spatial relationships that are portrayed by maps represent statistically significant relationships.

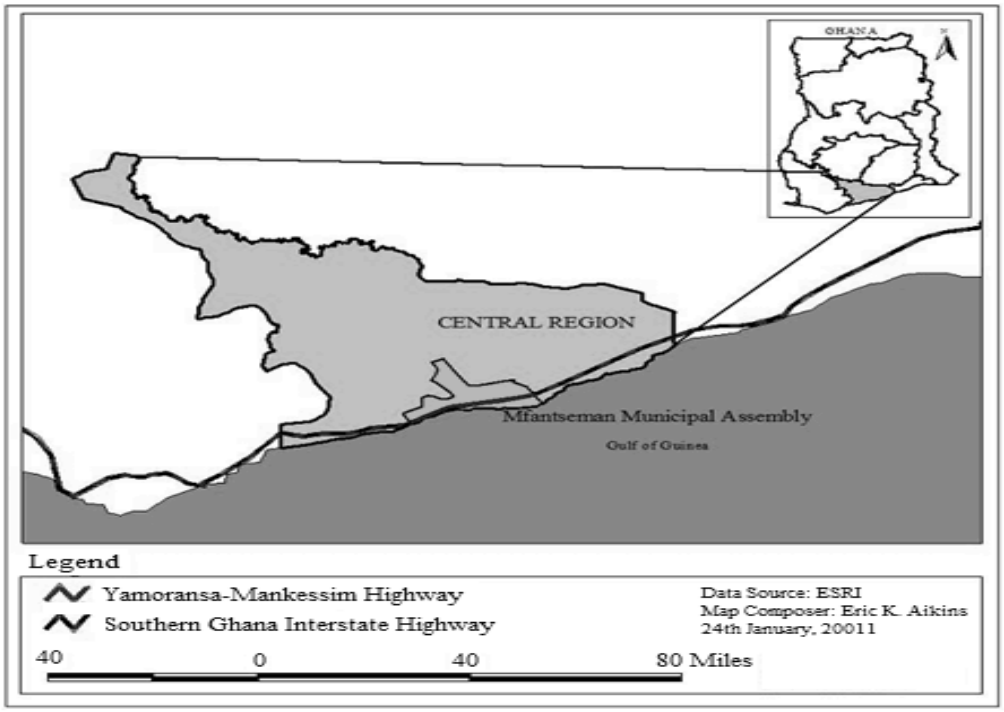


Figure 3: Central Region showing the Yamoransa-Mankessim coastal highway in the Mfantseman Municipal Assembly

Source: Authors construction, 2011

Results and discussion

The analysis was done in two parts: the first covered the geo-spatial issues while the second involved some statistical representation of the data extracted from the Police reports.

Geo-Spatial Analysis

The spatial distribution of communities located along the Yamoransa-Mankessim highway portrays a dichotomous division of these communities by the highway (Figure 4). Also, the geo-spatial analysis revealed that the coastal Ghana highway almost divides Biriwa, Anomabo, Abandze, Kormantse and Abonko into two equal halves. The highway therefore runs through these communities. Consequently, the frequency of road crossing is generally higher thereby putting pedestrians at a greater risk of car collisions than in communities such as Yamoransa, Egyaa, Saltpond, Anokyi, and Mankessim where the highway passes through these communities at their outskirts (bypass). Relatedly, relatively more cases of car-human collisions were

recorded at Kormantse, Abandze, Anomabo, and Birwa where the highway almost divides these towns into two equal halves than the other communities under study. For instance, Figure 4 shows that Kormantse, Abandze, and Anomabo experienced relatively large numbers of reported car-human collisions with varying degrees of injury and fatalities between 2005 and 2009. Specifically, Kormantse experienced the highest number of deaths (8) together with a relatively higher number of serious injuries (4) due to car-human collision. Also, Abandze experienced four serious injuries with two fatal (death) cases while Birwa and Anomabo recorded three and two fatal cases respectively.

In locations where the highway bypasses the affected communities such as Yamoransa, Egyaa and Saltpond relatively low cases of car-human collisions were recorded over the study period. The spatial distribution of car-human collision cases in these communities reveals a zero incidence at Yamoransa between the study periods with both Saltpond and Egyaa experiencing a relatively low incidence (a single fatal case each). The no car-human collision incidence at Yamoransa and the relatively low fatal, serious injury, and minor injury cases recorded at Saltpond and Egyaa between the study periods suggest that the location of the coastal (Ghana) highway is related to the degree of car-human collisions that have been recorded in the study area over the past five years.

It is therefore reasonable to argue that if the coastal highway were to bypass all communities within the Yamoransa-Mankessim transect, the area would have recorded near zero cases of car-human collisions over the past five years and this would have helped reduce the increasing rate of human resource loss in the affected communities through car-human collision. Finally, this study asserts that the location of the coastal Ghana highway has a bearing on the increasing number of car-human collisions in the affected communities, especially in communities along the Yanmoransa-Mankessim transect of the Mfansteman Municipal Assembly.

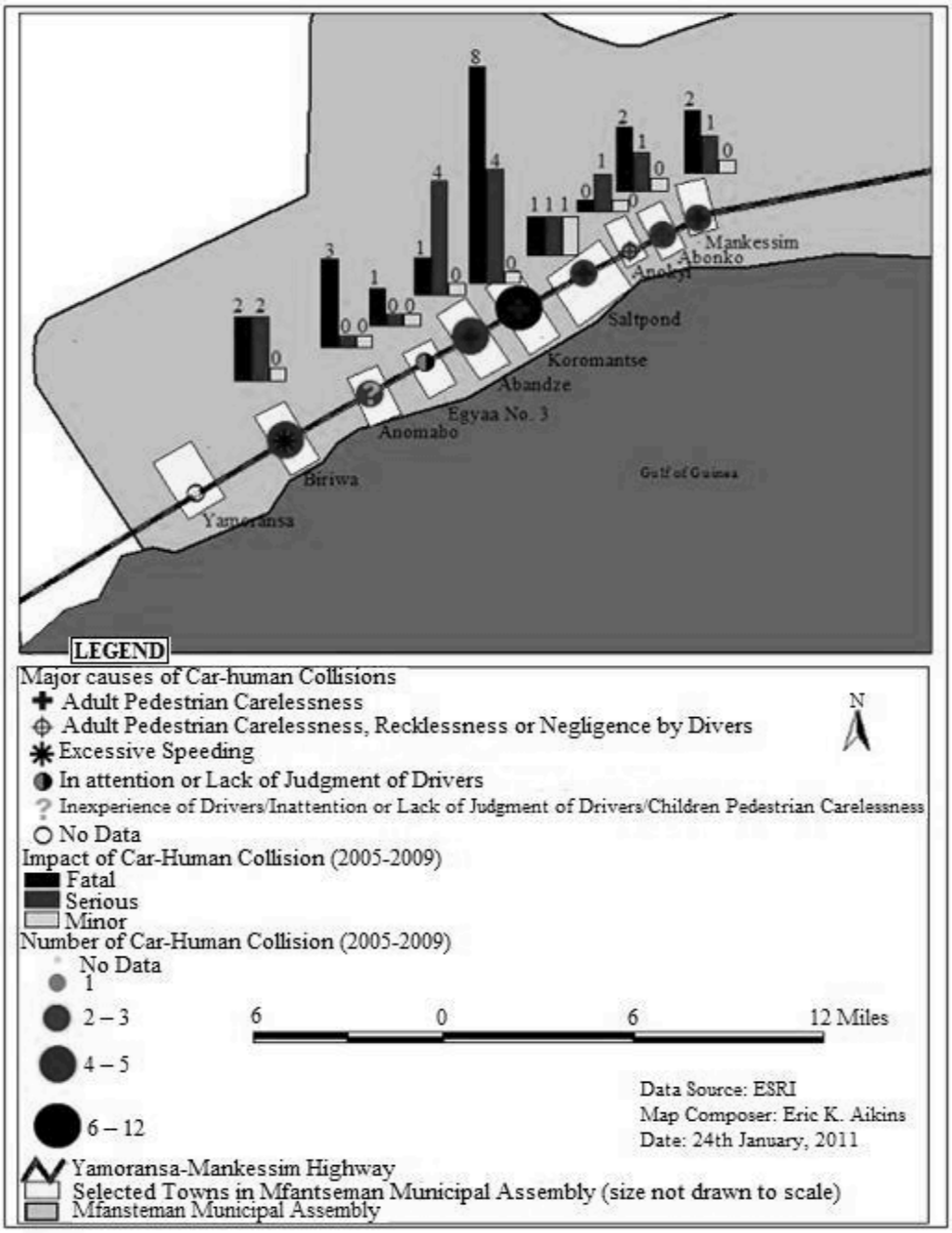


Figure. 4: Geo-spatial distribution of car-human collision cases on Yamoransa-Mankessim coastal highway, 2005-2009.
Source: Authors construction (2011)

Statistical Analysis

The statistical analysis section of this study validated the geo-spatial relationships that were portrayed in Figure 2. The statistical distribution of car-human collisions in the study area (Figure 5) reveals an increasing trend of car-human collision cases from 2005 to 2009. The periods 2007 and 2008 saw a slight decline in the number of car-human collision cases. The decline could be attributed to the regular road safety checks and campaigns that were carried out within the study period. It is a reflection of institutions such as the National Road Safety Commission (NRSC) and Driver and Vehicle Licensing Authority (DVLA) implementing a system of traffic laws and regulations along the highway and within the study communities as demonstrated in the Jorgensen and Abane (1999) model. However, there was no change (increase or decline) in the number of cases of car-human collisions in the study area between 2008 and 2009. Nationally, 2008 experienced a lot of activities in terms of road use due to the Parliamentary and Presidential elections. Numerous cases of road traffic crashes were reported and the study area was not excluded. The NRSC (2009) attributed a substantial proportion of the crashes to deviant driver/rider behaviours of various political party activists.

Based on the overall trend in vehicle-human collision cases, this study asserts that if all the factors that contributed to the initial surge in the collisions between 2005 and 2007 are not controlled for, they may contribute to further increases in collisions in the study area in future times. Related to this assertion is the observation that the forces that contributed to the decline in vehicle-human collisions between 2007 and 2008 were not sustained between the 2008 and 2009 period. Consequently, this study suggests a critical examination and control of the factors that contributed to the increase in vehicle-human crash cases between 2005 and 2007 while the factors and policies that contributed to the decline in collisions between 2007 and 2008 need to be maintained and enforced concurrently. This will largely help reduce the increasing loss of human resource through car-human collisions (see also, Ivers, Stevenson, Norton & Yu, 2008).

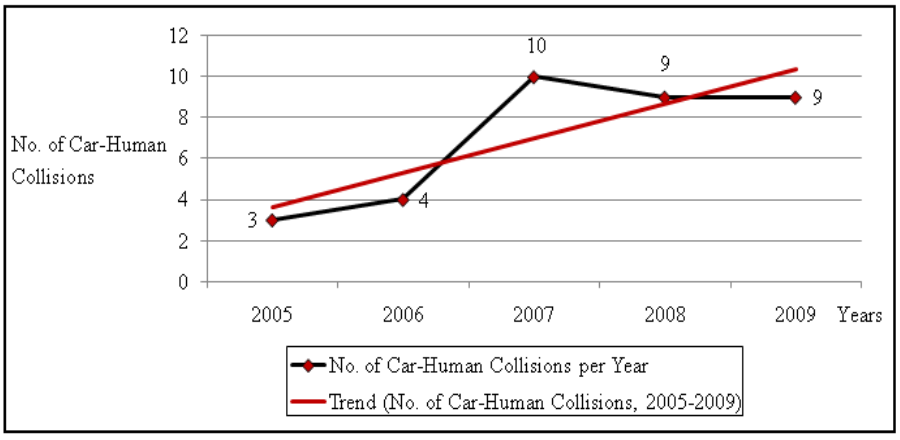


Figure 3: Number and trend of car-human collisions, 2005-2009

Source: Authors construction (2011)

In terms of the relationship between road location and the number of vehicle-human collisions that were recorded between the study periods, Table 1 indicates that more than 75% of the collisions occurred in communities where the coastal highway passes through the middle of the affected communities. Only 23% of them were recorded in communities where the highway passes through the outskirts of such communities. In communities where the highway passes through the middle of the towns and villages slightly more than 59% of the recoded cases resulted in the death of the affected pedestrians while the remaining 40.7% sustained serious injuries. On the other hand, in communities where the highway bypasses the towns and villages only four fatal vehicle-human collisions were recorded between the study periods. Additionally, Table 1 shows that relatively fewer cases of collisions resulting in serious (3) and minor (1) injuries were recorded in the bypass communities.

Table 1: Type of injury by t road location of car-human collision

Type of Injury	**Road Location**			
	Middle of the town		**Outskirt of the town (Bypass)**	
	No.	**%**	**No.**	**%**
Fatal	16	59.3	4	50.0
Serious	11	40.7	3	37.5
Minor	0	0.0	1	12.5
Total	**27**	**100**	**8**	**100**

Source: Authors, 2011

Table 2: Type of cars involved in car-human collision by extent of injury

Car Type	**Extent of Injury**					
	Fatal		**Serious**		**Minor**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Saloon	6	30.0	5	35.7	0	0.0
Bus	1	5.0	5	35.7	0	0.0
Pick-up and Trucks	7	35.0	1	7.1	0	0.0
Mini-Bus	3	15.0	2	14.3	1	100
Taxi	1	5.0	1	7.1	1	0.0
Unidentified	2	10.0	0	0.0	0	0.0

Total	**20**	**100**	**14**	**100**	**1**	**100**

Source: Field work, 2011

Regarding the type of vehicles that were involved in collisions in the study area, pick-ups and trucks (7) other than saloon cars (6) returned the highest number of collision cases that resulted in deaths (Table 2). In general, collisions involving pick-ups, trucks, bus, and mini-bus presented the highest number of both fatalities (11) and serious injuries (8) in the affected communities. This observation largely coincides with the findings of some studies that indicate that vehicle size (large) and type (commercial) accounts for most of the fatal cases that result from vehicle-human collisions in various parts of the country (Abane, 2010; Damsere-Derry et al., 2010).

Causes of the reported vehicle-human collisions and locations along the highway where they occurred were also examined. The data revealed that in communities where the highway passes through the middle of affected towns and villages, adult pedestrian carelessness (8) was the major cause of vehicle-human collisions (Table 3). In addition to adult pedestrian carelessness, children pedestrian carelessness (5) and excessive speeding (4) accounted for the second and third largest cases of car-human collisions in the non-bypass communities respectively. In the case of communities that the highway passes through their outskirt (bypass communities) adult pedestrian carelessness (5) and excessive speeding (2) emerged as the two main factors that accounted for almost all the collisions in the affected communities. This finding largely supports the argument indicated in the introduction that pedestrian carelessness due to absent-mindedness is bound to increase the number of vehicle-human collisions, especially in areas where a given highway passes through the middle of affected communities including the study area. It is also in tandem with various observations from previous studies that deviant human behaviour is a major variant of the vehicle-human collision equation in the country (see Abane, 2010, 2004, 1994; Afukaar, 2003, 2001; Afukaar, Antwi & Ofosu-Amaah, 2003; Jorgensen and Abane, 1999).

Table 3: Causes of car-human collisions by location of the accidents

Causes of car-human collisions	**Road Location**			
	Middle of town		**Outskirt of town (Bypass)**	
	No.	**%**	**No.**	**%**
Excessive speed	4	14.8	2	25.0
Inattention/Lack of judgment of drivers	2	7.4	1	12.5
Inexperience of drivers	1	3.7	0	0.0
Other recklessness/Negligence	3	11.1	0	0.0

Mechanical defects	1	3.7	0	0.0
Skid and road surface defects	1	3.7	0	0.0
Children pedestrian carelessness	5	18.5	0	0.0
Adult pedestrian carelessness	8	29.6	5	62.5
Recklessness/Negligence by drivers or horse drawn vehicle	2	7.4	0	0.0
Total	**27**	**100**	**8**	**100**

Source: Saltpond Police Service, 2010

The study tested the hypothesis that adult pedestrian carelessness is associated with increases in vehicle-human collisions in communities where the coastal interstate highway passes through the middle of affected communities. Pearson's correlation analysis performed on the data returned a weak but positive coefficient (0.286) that indicates that adult pedestrian carelessness is quite positively associated with the geo-location of the coastal Ghana interstate highway. The implication is that the closer a highway network is to the centre of a given community the higher the risk of vehicle-human collision in the affected community. Additionally, when the data were subjected to a statistical test, the hypothesis was found to be significant at the 0.05 level, implying that an association exists between the vehicle-human collision causative factors, specifically adult pedestrian carelessness and road location. This finding largely confirms the observation that the increasing rate of vehicle-human collisions on the Yamoransa-Mankessim section of the coastal Ghana interstate highway is substantially associated with the geo-location of the highway, especially in communities where the highway passes through the middle of the affected communities.

Conclusion and recommendations

First, the study observed that the increasing incidence of vehicle-human collisions that are reported in communities along the Yamorasa-Mankessim sections of the coastal Ghana interstate highway could be attributed mainly to the location of the highway. The study found that most of the affected communities where the highway passes through their centres recorded relatively higher incidences of vehicle-human collisions than communities where the highway passes through their outskirts.

Second, adult pedestrian carelessness was found to be the major cause of car-human collisions between the study periods. This indicates that pedestrian safety is generally low in communities where the coastal Ghana interstate highway passes through them, especially at the middle of such towns and villages. The prevailing relatively harsh social and economic environments that characterize most of these communities largely predispose a larger section of their adult population to a relatively higher degree of absent-mindedness, which also influences the frequent occurrence of car-human collisions in the affected communities.

Based on the findings, the following recommendations are made:

1. Overhead footbridges should be provided by the Mfantseman Municipal Assembly and Ghana Highway Authority for a safer and easier pedestrian crossing than is the case now in communities where the highway passes through their middle such as Biriwa, Anomabo, Abandze, Kormantse, and Abonko which all returned relatively higher cases of vehicle-human collisions between 2005 and 2009. Where resources are limited to provide all affected communities with overhead foot bridge,s communities such as Kormantse and Anomabo that recorded the largest number of fatal cases could be considered first before the remaining affected communities are considered later.
2. Metal barricades that prevent pedestrians from crossing the highway at the middle or dangerous sections of the roads (sharp curves) could be erected to protect pedestrians and help reduce the increasing occurrence of car-human collisions in the study area.
3. Periodic checks and update of available highway signs and markings need to be intensified by the Ghana Highway Authority and its related agencies to provide pedestrians and drivers with enough and appropriate information on the safest way of highway use. Also, law enforcement on the coastal Ghana interstate highway should be intensified to help reduce the increasing trend in car-human collision, especially along the Yamoransa-Mankessim section of this highway.

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