Journal of Transport & Health 12 (2019) 105–114

Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Risk-taking behaviours and timing to first motorbike collision in the Upper West Region of Ghana

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ARTICLE INFO

Keywords:
Road traffic collisions
Risk-taking behaviours
Timing to first motorbike collision
Upper West Region
Ghana

ABSTRACT

Introduction: Road traffic collisions kill more than many diseases in Sub-Saharan Africa with the youth, particularly those between 15–29 years, being the most vulnerable group due to their risk-taking behaviours. In Ghana, about six people die daily from road traffic collisions. This study examines the relationship between risky behaviours and time to first motorbike collision in northern Ghana with the aim of informing policy and contributing to the Sustainable Development Goals (SDGs).

Methods: We collected data from a representative sample of 818 respondents aged 18 years and older from three districts in the Upper West Region of Ghana. We fitted log-normal models to estimate time ratios and hazard graphs, which identified the most at risk group in timing to first collision.

Results: The results show that limited knowledge of speed limit (TR = 0.75, $P < 0.001$), ever had alcoholic beverage (TR = 0.62, $P < 0.01$), know someone died of collision (TR < 0.64, $P < 0.05$), and male (TR = 0.37, $P < 0.001$) were significant predictors of time to first motorbike collision. Those in the 25–30 age group (TR = 0.41, $P < 0.001$) were more at risk compared with those less than 20 years.

Conclusion: The implications of the study findings are that for Ghana to achieve target 3.6 of the SDGs, there is the need to intensify existing road safety campaigns on speed limits and alcohol abuse, while enforcing regulations against use of motorbike by unlicensed/under aged riders. It is also crucial to enforce helmet use, particularly among third party riders, who are often not the priority for road safety.

1. Introduction

Road Traffic Collisions (RTCs) are becoming a global public health concern (Sharma, 2008). In Sub-Saharan Africa, RTCs are a cause of mortality than many diseases such as malaria (Broughton and Walter, 2007). The World Health Organization (WHO) posits that, mortalities from motorbike collisions (MBCs) account for approximately a quarter of global traffic deaths, with over 1.2 million people dying annually and about 50 million more people sustaining non-lethal injuries (WHO, 2015). In fact, RTCs are one of the leading causes of preventable deaths especially among those aged between 15 and 29 years. RTCs are currently ranked the ninth leading cause of death for all age groups globally, but is also projected to become the seventh leading cause of deaths by 2030 (WHO,

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https://doi.org/10.1016/j.jth.2019.01.001
Received 10 June 2018; Received in revised form 28 November 2018; Accepted 3 January 2019
Available online 10 January 2019

2015). The prevalence rate is projected to continue rising if current trends remain unchecked. In developing countries including Ghana, there is a rise in death rate through MBCs owing to the increasing popularity of motorbikes as the main means of transport. The WHO declared the period 2010–2020 as the 'Decade of Action for Road Safety' (WHO, 2016). Apart from being a public health concern, RTCs also have economic implications as developing economies such as Ghana lose about 3% of Gross Domestic Product through road traffic crashes annually (WHO, 2015).

In Ghana, road transport accounts for 96% national freight tonnage and 97% passenger traffic (Afukaar et al., 2003; Nanga et al., 2017). The Ghana National Road Safety Commission (GNRSC) indicated that about six people die daily from RTCs. In the first quarter of 2018, a total of 592 commuters perished while 3343 sustained serious injuries from RTCs (GNRSC, 2018). This represents about 11.7% upsurge in mortality rate for the same period in the previous year. Specific to the Upper West Region (UWR) where motorbikes are the dominant means of transport, the total number of RTCs increased by 12.5% between 2016 and 2017 while the number of road deaths increased by 13% for the same period (GNRSC, 2017). In fact, these numbers could be under reported given the burgeoning rurality of motorbike usage in the region and the high rate of unreported collision cases from such rural areas.

There are remarkable differences between southern and northern Ghana in terms of transport dynamics. Unlike in southern Ghana where the use of commercial vehicles commonly called 'trotro' is the dominant mode of transport, the use of motorbikes/tricycles is common place in northern Ghana including the UWR. With the lack of a good public transport system coupled with the poor nature of roads, and the relative high cost of acquiring and maintaining private vehicles, many residents in northern Ghana resort to motorbikes/tricycles (Teye-Kwadjo, 2011; Anastasopoulos et al., 2012). Apart from those who purchase personal motorbikes, non-motorbike owners often rely on commercial tricycles. These motorbikes/tricycles therefore become multi-purpose vehicles with uses including commercial, leisure, commuting to work and even ambulances in some rural areas. According to the Ghana Driver and Vehicle Licencing Authority, the number of registered motorbikes in the UWR was 9921 in 2015 representing an increase of 17.5% from 2014. Invariably, an increase in the proportion of automobiles on the road also increases the frequency of collisions and quickens the timing to first collision particularly for novice and first-time motorcyclists (Keng, 2005). Furthermore, because motorcyclists are not protected the same way as car users, collision victims tend to receive the full kinetic energy of resultant impacts and are most likely to sustain injuries or die from MBCs (Branas and Knudson, 2001; Keng, 2005). Moreover, the implementation of the age limit regulation on the use of automobile is often not enforced for motorcyclists. In the UWR, it is common to see individuals below the legal riding age of 18 years using motorbikes. Adam et al. (2016) posit that, of the 11% hospitalized patients who died from head injuries in northern Ghana, 90% were as a result of RTCs. Yet the enforcement of helmet use by motorcyclists has come to be understood as the responsibility of the main rider, and other persons he/she might be carrying are typically not required to wear helmet. The enforcement of helmet use even becomes more complicated given the rise in the use of tricycles which are middle-of-the-road automobiles between motorcycles and vehicles. Although they take more than two passengers and are mostly use like vehicles, by design, these tricycles have no seatbelts and doors, neither do passengers put on helmets. These underlying dynamics all have an influence on both the frequency of accidents and timing to first collision.

In the Ghanaian context, existing empirical studies on RTCs have however, focused on understanding the causal role of alcohol consumption among drivers (Nanga et al., 2017), the gender of drivers, conditions of vehicles and roads (Bawah et al., 2014) and the use of helmet or seatbelts (Akaateba et al., 2015), with little attention on timing to first collision and the underlying risky behaviours that influence these collisions. Moreover, anecdotal evidence in the UWR of Ghana suggests that the youth are more likely to die from MBC because they are often novice riders. To the best of our knowledge, there has been no study that has examined timing to first MBC in the context of other risk factors. We therefore aim to contribute to the literature by examining risky behaviours and timing to first collision among motorcyclists in the region with the ultimate aim of informing transport and public health policy.

2. Theoretical framework

This study is informed by theoretical constructs from the Health Belief Model (HBM). The HBM is a key theory in health behaviour related research. It was originally developed by Hochbaum et al. (1952) to predict and explain health outcomes especially those related to attitudes on health seeking behaviours and their associated consequences on health (Janz and Becker, 1984; Siddiqui et al., 2016). This model is appropriate for this study given its theoretical underpinning that health-related behaviours are a reflection of a person's perceived level of threat and the fear reduction potential of taking preventive action (Green and Murphy, 2014). It can therefore be argued that motorcyclists perceived level of threat will inform their risk-taking behaviours. The HBM suggests that, perceived susceptibility to a given health problem, its severity, the perceived benefits of undertaking a particular health seeking behaviour, the perceived barriers, and self-efficacy of the individual involved, unitarily or interactively influence peoples' risk-taking and (or) health seeking behaviours (Rosenstock, 1974; Razmara et al., 2018).

In relation to motorbike use and RTCs, perceived susceptibility depicts a motorcyclist's subjective evaluation of their risk of suffering a collision subject to their behaviour and the behaviour of other road users (Rosenstock, 1974; Razmara et al., 2018). Consequently, motorcyclists who perceive they are vulnerable to RTC will most likely engage in safety behaviours that can eliminate or reduce the risk of collision. Perceived severity focuses on a motorcyclists' subjective judgement of the brutality of a collision and the potential negative consequences on health thereof (Razmara et al., 2018). Perceived benefits in the context of this study refer to motorcyclists' evaluation of the benefits of observing safety practices such as observing speed limits and wearing of helmet to minimize the risk and severity of collisions. Individual motorcyclists who perceive engaging in such behaviours will reduce their susceptibility to risk are more likely to adopt those behavioural practices. Perceived barriers on the other hand refers to individuals' evaluation of the drawbacks to changes in risky behaviours. Motorists who envision particular behaviours to be risky and believe particular safety practices can reduce the threat of that risk may face certain barriers in the effective adoption of those precautionary

measures (Razmara et al., 2018). For instance, motorcyclists who wear helmet as a protective strategy may still encounter the obstacle of careless or drunk riders. Moreover, in the Ghanaian context where helmets are usually not sold together with motorbikes, others may perceive buying helmet as an extra cost they cannot afford. Finally, self-efficacy refers to individuals' innate conception about their ability to successfully execute a particular action such as display of skills with the motorbike (Glanz et al., 2008).

Motorcyclists' adoption of precautionary measures such as the use of crash helmet is largely influenced by their perceived susceptibility and the severity of potential collisions. For instance, in Turkey, Şimşekoğlu et al. (2013) find that perception of traffic hazards is associated with the uptake of precautionary measures such as the use of seatbelt, helmet and riding within speed limits. Helmets in particular have proven to be an effective intervention strategy for reducing the risk of head injury (Hazen and Ehiri, 2006). A systematic review by Liu et al. (2003) revealed that standard helmets not only reduced the risk of head and neck injury by 72% but the risk of mortality as well. Following the ratification of mandatory helmet laws in Taiwan in 1997, motorbike fatalities and non-fatalities decreased by 14% and 31% respectively.

The literature has also exemplified risky behaviours such as over speeding, poor overtaking, under estimating curves, fast and recurrent changing of lanes at an unauthorized distances as common factors that quicken motorcyclists' rate of experiencing collision and the severity of those collisions (Shams et al., 2011). The WHO defined speeding as exceeding the safe and acceptable speed limit on a particular stretch of the road. Speeding is an established cause of RTCs in developing countries and influences the probability, severity of injuries sustained and timing to first collision (Afukaar, 2003). Between 1998 and 2000, speeding accounted for about half of all RTCs in Ghana and was also responsible for about 44% of all reported RTCs in Kenya (Odero et al., 2003). Another most common cause of motor traffic collisions related to speeding is failing to look properly often referred to as "looked but failed to see" in the road safety literature (Herslund and Jørgensen, 2003). This is particularly common when other vehicles are on the road or also on high speed.

Further, riding after consuming alcohol is another risk-taking behaviour among motorcyclists in northern Ghana (Damsere-Derry et al., 2018). Alcohol consumption and motorbike usage is an established risk-taking behaviour even though data has been sparse in developing countries like Ghana (Hazen and Ehiri, 2006). A study of hospitalized patients in Kenya revealed that, of those under injury related treatment, 20% of pedestrians and 40% of drivers were under the influence of alcohol at the time of the collision (Odero et al., 2003). Similarly, one third of hospitalized motorists self-reported riding under the influence of alcohol in New Delhi (Peden et al., 2004). Riding under the influence of alcohol reduces the judgement of a rider and by extension, his/her perceived susceptibility and severity of MBC.

Motorcyclists' perceived susceptibility to a collision as well as the perceived severity of that risk largely influence their precautionary measures which may delay or hasten their experiencing of first motorbike collision once they enter the risk set. In low and middle income countries including Ghana, the failure to observe precautionary measures has been attributed to inadequate education on safety practices, poor law enforcement and victims perceived susceptibility of risk (Li et al., 2008). We draw on these theoretical conceptualizations of the HBM to explain the risk factors that influence the timing to first MBC in northern Ghana.

3. Methods

3.1. Data collection

The data for this study was collected between July and August 2017 from the Lawra district, Wa east district and Wa Municipal. The Wa Municipal, which is also the regional capital was purposefully selected due to its population size and relative high rate of MBCs. Using simple random sampling technique, all the remaining ten Districts were assigned unique numbers and then mixed thoroughly. Lawra and Wa east districts were then randomly selected. Using this approach guaranteed that the selected sample is representative of collision dynamics in the UWR. The survey collected information on participants' history of motorcycle use and timing to their first collisions, perceptions on causes of road traffic collisions, knowledge on road safety, personal collision experiences, general health, and socioeconomic and demographic characteristics. The Ghana National Population and Census Enumeration Clusters were used to select communities proportional to the population within each District. Six communities were selected from Lawra district, Seven from Wa east district and twelve from Wa municipal. Within each community, every fifth house starting from the entrance of the community was selected. Following O'Rourke and Blair (1983), within each household, the member eighteen years and older whose birthday was closest to the date of the data collection was then selected to respond to the survey. Overall, we identified 889 households and successfully interviewed 818 household representatives (Lawra district = 140, Wa east district = 186, Wa Municipal = 492) giving a response rate of 92%. Given that individuals who were yet to experience MBC could not have been observed in our analysis, they were right-censored in the survival analysis as the analytic sample was the entire sample. Ethics for this study was obtained from the University of Western Ontario Non-Medical Research Ethics Board.

3.2. Measures

The outcome variable in "timing to first MBC" was constructed from two questions that asked respondents: 1) whether they have ever been involved in a MBC and 2) if so, when was your first MBC in years since you started riding? Four main focal independent variables that capture risky behaviours related to MBC including knowledge on the safety of helmet use, knowledge of speed limits on various roads, whether respondents knew someone who died of RTC coded as (yes, no), and whether respondents ever had alcoholic beverage (yes, no) were measured. Considering that knowledge is a multifaceted concept, we employed additive scale to construct a simple summative scale. Specifically, five helmet use knowledge-related and eleven speed limit knowledge-related variables with

Table 1
Descriptive statistics of time to first motorcycle collision in northern Ghana, 2017.

	Motorbike collision		Total sample (N = 818) percent
	Yes (n = 428) Percent	No (n = 390) Percent	
Timing to first motorcycle accident (in years)[a]	5.3(2.1)	–	–
Knowledge on the safety of helmet use[a]	1.79(1.4)	1.54(1.3)	1.27
Knowledge of speed limit[a]	2.79(1.7)	2.34(1.4)	2.58
Ever had alcoholic beverage			
No	46	61	53
Yes	54	39	47
Know someone died of road accidents			
Yes	88	81	86
No	12	19	14
Gender			
Female	14	39	26
Male	86	61	74
Ownership of motorbike			
No	31	67	47
Yes	69	33	53
Common transport			
Other	24	37	30
Motorbike	76	63	70
Household wealth quintiles			
Poorest	19	22	20
Poorer	21	19	20
Middle	23	17	20
Richer	19	21	20
Richest	19	21	20
Level of education			
No tertiary education	35	47	41
Tertiary education	65	53	59
Employment status			
Unemployed	69	66	32
Employed	31	34	68
Age of respondents			
Less than 20	15	29	22
20–24	20	30	26
25–30	33	19	26
Above 30	32	22	28
Marital status			
Single	48	61	54
Married	52	39	46
Location of residence			
Rural	39	41	40
Urban	61	59	60
Alcoholism causes increase in MBC			
Yes	77	78	78
No	23	22	22

[a] Mean and Standard deviation (SD) reported for continuous variables.

Cronbach alpha of 0.64 and 0.60 were loaded into the scale. Informed by Nunnally and Bernstein (1978), assertion of a Cronbach alpha of 0.6 as the minimum acceptable value for any analysis we combined these variables to create our scales. As each knowledge variable was binary coded, (yes = 0 and no = 1), higher scores on knowledge on the safety of helmet use and of speed limit implied lower levels of knowledge, while lower scores indicate higher levels of knowledge. We further included ten theoretically relevant control variables including; gender, place of residence, age of respondents, motorbike ownership, level of education, employment status, marital status, alcoholism (whether respondents think current rate of collisions is due to alcohol), common means of transport and household wealth.

3.3. Data analysis

Univariate analysis was conducted to understand the sample characteristics. We also employed bivariate and multivariate analyses to estimate the gross and net impacts of behavioural variables on timing to first MBC respectively. We conducted survival analysis to identify the most at risk groups (those highly likely to be involved in their first accident). We used the log-normal model since our interest was to estimate timing to first MBC, hence we report the findings with Time Ratios (TRs), which are often reported with fully parametric models (Harrell et al., 1996). We also observed the lowest score on Akaike Information Criterion compared to other fully parametric models. This tend to indicate the best model fit for the log-normal model. The multivariate models were built

sequentially. In Model 1 we included behavioural factors, while the theoretically relevant control variables were further added in Model 2. To interpret the results, a TR greater than 1 implies that in the context of covariates, respondents were slower to experience first MBC, while those less than 1 indicate faster timing to first MBC.

4. Results

Table 1 shows findings from the descriptive statistics. About half of the respondents reported that they have experienced MBC (51%). The average timing to first MBC is 5.3 years. Also, knowledge on the safety of helmet use is lower (1.79) for those who have experienced MBC compared to the overall sample (1.27). Similarly, knowledge of speed limit is lower for those who have experienced MBC (2.79) than the overall sample (2.58) (higher score means lower knowledge). The percentage of ever consuming alcoholic beverage is also higher for those who have experienced MBC (54%) compared to the overall sample (47%). Further, those who experienced MBC (88%) have slightly higher percentage of knowing someone died of MBC than the overall sample (86%).

Specific to the overall sample, about 59% had post-secondary education, 74% are male, and 68% are unemployed. About 28% of the sample are older than 30 years and 22% are less than 20 years. Household wealth quintile was evenly distributed across the five categories. Additionally, more than half of the respondents are urban residents (60%), and single (54%). These characteristics, largely reflect the region's population structure as reported in the 2010 Population and Housing Census (Ghana Statistical Service, 2014). With respect to mode of transport and perceptions of RTC, over two-thirds (70%) indicated that motorbike is their common means of transport, while 77.6% thought alcoholism is a main contributory factor to the current spate of motorbike collisions in the region.

Findings from bivariate analysis are shown in Table 2. We found significant association between behavioural variables on timing to first MBCs. Specifically, those with lower levels of knowledge on the safety of helmet use (TR = 0.84, $p < 0.05$) and speed limit (TR = 0.73, $p < 0.001$) were associated with faster timing to first MBC. Also, respondents who consume or ever had alcoholic beverage experienced their first MBC faster than those who do not or never had alcohol (TR = 0.51, $p < 0.001$). Similarly, those who knew of someone who had died of road collision were faster to experience their first MBC compared to individuals who did not (TR = 0.55, $p < 0.01$). For control variables, male (TR = 0.29, $p < 0.001$), age categories 20–24 years (TR = 0.29, $p < 0.001$), 25–30 years (TR = 0.48, $p < 0.01$), and ownership of motorbike (TR = 0.31, $p < 0.001$) were associated with faster timing to first MBC. Similarly, respondents who indicated motorbike as their common means of transport (TR = 0.51, $p < 0.001$), with post-secondary education (TR = 0.61, $p < 0.01$), and the married (0.67, $p < 0.05$) were also associated with faster timing to first MBC.

The results of the multivariate analysis are presented in Table 3. The findings were largely consistent with bivariate results, except for low knowledge on the safety of helmet use. In Model 1, lower levels of knowledge of speed limit (TR = 0.81, $p < 0.001$) was associated with faster timing to first MBC. Similarly, respondents who consume or ever had alcoholic beverage were faster to experience their first MBC when compared to those who do not or never had alcohol (TR = 0.53, $p < 0.001$). Knowing someone died from a traffic collision was also associated with faster timing to first MBC (TR = 0.54, $p < 0.01$). However, the significant relationship between timing to first MBC and knowledge on the safety of helmet use from the bivariate results was completely attenuated once knowledge of speed limit, ever had alcoholic beverage and knowing someone died of road collision were accounted for. But for knowing someone died of motorbike collision (TR = 0.64, $p < 0.05$), the findings in Model 2 were largely consistent with Model 1 results after controlling for theoretically relevant variables. In addition to behavioural variables, timing to first MBC was associated with other covariates. Male respondents were faster to experience their first MBC as compared to their female counterparts (TR = 0.41, $p < 0.001$). Respondents aged between 25 and 30 years old were the most at risk group and were most likely to experience their first MBC when compared with those younger than 20 years old (TR = 0.48, $p < 0.001$). Those who owned motorbike (TR = 0.34, $p < 0.001$) were also faster to experience their first MBC compared with those who do not have.

Fig. 1 shows the smoothed hazard estimates for the different age categories in terms of collision risk in the study context. The curves show that there is no significant risk probability difference between motorcyclists less than 20 years and those between 20 and 24 years old. The probability of their hazard rate however, is slightly higher than those above 30 years at the onset of motorbike riding. The most vulnerable age category was those between the ages of 25 and 30 years old. Their probability of experiencing collision is much higher than all other age categories until around the fiftieth percentile. The probability of experiencing MBC is much lower for those above 30 years old and asymptotically flattens out with increasing years of riding. Fig. 2 further shows the hazard estimates for the different age categories by gender. Generally, males have higher hazard rates. Within each age category, the hazard for females experiencing first time collision is lower compared with males. Male respondents aged between 25–30 years are the most vulnerable group followed by those less than 20 years most of whom are still novice riders. On the other hand, females between the ages of 20–24 are the most at risk group but shifts towards those between 25–30 years at about around the fiftieth percentile. Further analysis show that women generally delay their first use of motorbike compared with men. They are also less likely to own motorbike, and those who own motorbike do so at a relatively older age than men. This could explain why women between 20–24 years are at higher risk than those less than 20 years. Overall the probability of experiencing collision decreases with increasing years of riding.

5. Discussion

Riding behaviour plays a significant role in ensuring traffic safety. It has been suggested that reduction in aberrant traffic behaviours offers a rare opportunity for reducing susceptibility to collision, and reducing road traffic fatalities (Manan et al., 2017; Møller and Haustein, 2016). In this study, we examined how individual risk-taking behaviour may be influencing disparities in timing to first collision among motorbike riders in the Upper West Region of Ghana. Timing to first accident in the context of understanding drivers of traffic collisions and identifying strategies for improving safety on the poor and undeveloped roads in low-income countries

Table 2
Bivariate survival analysis of time to first motorcycle collision in northern Ghana, 2017.

	TR (SE)
Knowledge on the safety of helmet use	0.84(0.07)*
Knowledge of speed limit	0.73(0.06)***
Ever had alcoholic beverage	
No	1.00
Yes	0.51(0.08)***
Know someone died of road accidents	
No	1.00
Yes	0.55(0.13)**
Gender	
Female	1.00
Male	0.29(0.06)***
Household wealth quintiles	
Poorest	1.00
Poorer	0.90(0.22)
Middle	0.80(0.20)
Rich	0.97(0.23)
Richest	0.97(0.25)
Place of residence	
Rural	1.00
Urban	0.92(0.15)
Level of education	
No tertiary education	1.00
Tertiary education	0.61(0.10)**
Marital status	
Single	1.00
Married	0.67(0.11)*
Ownership of motorbike	
No	1.00
Yes	0.28(0.04)***
Age of respondents	
Less than 20	1.00
20–24	0.71(0.17)
25–30	0.29(0.07)***
Above 30	0.48(0.11)**
Employment status	
Unemployed	1.00
Employed	1.03(0.18)
Common transport	
Other	1.00
Motorbike	0.51(0.09)***
Alcoholism	
Yes	1.00
No	0.91(0.17)

TR for time ratios; SE for standard errors.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

has been understudied. In this respect, this study not only expands our understanding of the roles of risky behaviours on motorbike collisions, but also highlights important areas that need to be addressed through policy for improving road safety in deprived contexts.

Use of helmet has been demonstrated to be an effective strategy for reducing neck and head injuries and death from motorbike crashes (Gupta et al., 2018; Keng, 2005; Kuo et al., 2017). Despite this fact, it is common to find motorcyclists without helmets in Ghana, or in the rare cases they have one, they fasten it to some part of the motorcycle only to be used in case the police are conducting road checks. Sadly, the approach of enforcing the regulation of helmet use by law enforcement agencies in the Ghanaian context tend to emphasize the use of helmet as a legal requirement as opposed to educating motorcyclists to understand the protective benefits helmets provide during collisions. Consequently, riders may have low knowledge of the protective role of helmets and to that extent tend to indulge in other risk-taking behaviours on the road including dangerous over-taking, which often result in collisions. Moreover, in cases where helmet use is enforced especially in urban areas with police presence, the emphasis is placed on the rider, such that it has almost become a convention that any other person he/she may be carrying is not mandated to put on a helmet. Haqverdi et al., (2015) observed that in contexts where the real essence of helmet use has not been 'preached' changing motorcyclists everyday behaviour becomes daunting as many see it unusual and unnecessary action. It is however, evident from our study that knowledge of the protective role of helmet use itself does not contribute to disparities in timing to first MBC in the UWR.

Table 3
Multivariate survival analysis of time to first motorcycle collision in northern Ghana, 2017.

	Model 1 TR(SE)	Model 2 TR(SE)
Knowledge on the safety of helmet use	1.00(0.07)	1.04(0.07)
Knowledge of speed limit	0.81(0.04)***	0.82(0.04)***
Alcohol intake		
No	1.00	1.00
Yes	0.53(0.08)***	0.60(0.09)***
Know someone died of accident		
No	1.00	1.00
Yes	0.54(0.12)**	0.64(0.14)*
Gender		
Female		1.00
Male		0.41(0.08)***
Household wealth		
Poorest		1.00
Poorer		1.09(0.25)
Middle		0.95(0.22)
Richer		0.91(0.22)
Richest		0.71(0.17)
Place of residence		
Rural		1.00
Urban		0.82(0.13)
Level of education		
No tertiary education		1.00
Tertiary education		0.80(0.13)
Marital status		
Single		1.00
Married		0.73(0.13)
Age		
< 20		1.00
20–24		0.67(0.16)
25–30		0.48(0.11)**
> 30		1.21(0.30)
Employment status		
Unemployed		1.00
Employed		0.88(0.15)
Motorbike ownership		
No		1.00
Yes		0.34(0.06)***
Means of transport		
Other		1.00
Motorbike		0.83(0.14)
Alcoholism		
Yes		1.00
No		0.91(0.16)
aic	2385.46	2255.21
Log Likelihood	−1186.7325	−1106.6074

Time ratio (TR), Standard error (SE), *P < 0.05 *P < 0.01 *P < 0.001.

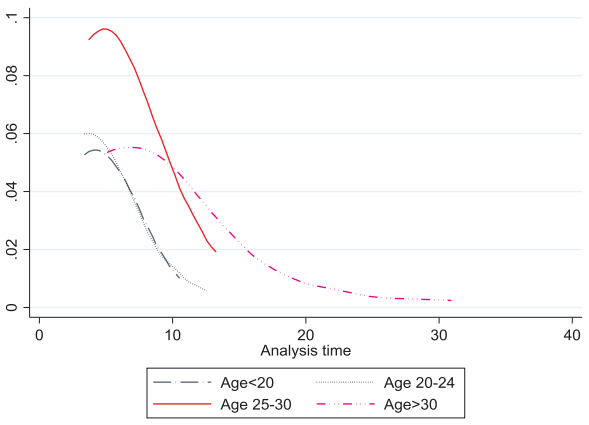

Fig. 1. Hazard estimates of motorcycle collision by age.

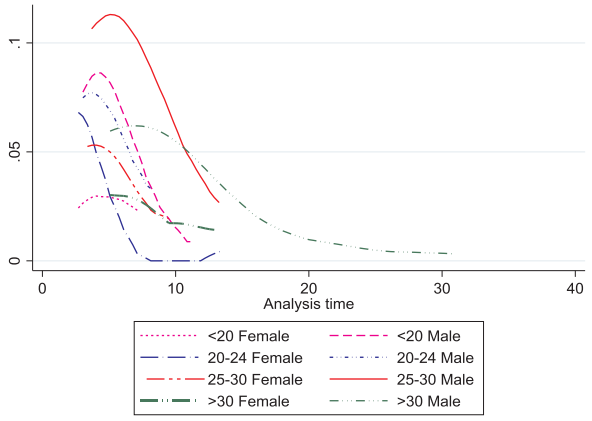

Fig. 2. Hazard estimates of motorcycle collision by gender and age.

Our finding that alcohol consumption is associated with traffic collision is consistent with other studies that showed that drunk riders are more prone to early and frequent MBC (Das et al., 2012; del Rıo et al., 2002). In the specific context of the UWR, consumption of locally brewed beer such as 'pito', hard gin like 'akpeteshie' and modern beer is a common practice (Luginaah and Dakubo, 2003). Anecdotal evidence indicates that, the youth are fond of moving with their motorbikes in groups in search of beer or pito from 'beer bar' to 'beer bar' or from 'pito-house' to 'pito-house'. Because this communal drinking is mostly done in the evening after daily work routines, it increases the likelihood of traffic collisions given the interactive effects of alcohol, reduced visibility at night and fatigue from work. Although alcohol consumption behaviour is symbolic of cultural and social norms in this context (Luginaah and Dakubo, 2003), poor enforcement of regulation against alcohol when riding only increases consumers vulnerability to traffic collision (Fell et al., 2016). It is therefore not surprising that riders who consume alcohol experienced early collision in the UWR. Even though controlling consumption of alcohol and riding could potentially reduce collisions in the UWR, the acceptable minimum level of alcohol concentration in the blood system that could lead to MBC is even a subject of debate. Moreover, with the current logistic inadequacies of the highway policing system in Ghana especially in the relatively deprived northern part of the country, the appropriate detection of alcohol level remains elusive. In places where the police are available, highway corruption also tend to obscure the enforcement of the law (Barnes et al., 2018; Foltz and Opoku-Agyemang, 2015). It is common place for persons found guilty of violating road traffic regulations to pay instant bribes to highway officers and get freed without prosecution which could serve as a deterrent to others. Also, with the advent of high-speed motorbikes, and the poor, narrow and congested nature of roads, the challenge of dealing with such risky behaviours has only become increasingly acute in the UWR.

Disparities in knowledge of speed limit and timing to first collision signals the need for strategic ways of improving existing road safety education especially in rural areas where road safety infrastructure such as road signs are unavailable. Speed has been identified as a major deliberate risk-taking behaviour contributing to the rise in motorbike collision and the increasing severity of injuries and fatality associated with them. As indicated by the WHO, excess speed is associated with most accidents in urban settings, while inappropriate speeding on poor roads account for a greater part of the collisions in rural and poorly developed roads (WHO, 2015). In the UWR, speeding is a way of displaying self-efficacy particularly among the young men. Unfortunately, enforcement of motorbike riding within the speed limits though important in reducing RTCs, is lacking. Most of the roads lack road signs such as speed limit signage and it is not uncommon to find red flags or tree branches being used to signal broken bridges or sharp curves and faulty vehicles stationed on the road. Moreover, despite the rural nature of the UWR and the low literacy levels, road safety education is mostly in English. Consistent with the observation of Kansanga et al. (2018), mass media could be used to translate road safety messages into local dialects to reach the majority of the uneducated people in the region.

Surprisingly, knowing someone who died of traffic collision do not seem to deter risky behaviours as those in this category experienced motorbike collision faster. Although this finding may be counter intuitive and also defies the theory of experiential learning in which knowledge is created through the transformation of experiences that eventually define our behaviours (Kolb and Kolb, 2005), it is consistent with the context of the study. In the UWR, there is a long-held cultural belief that traffic collisions can be caused by spiritual beings or through witchcraft such that most collisions are attributed to some form of superstition, but not careless riding. It is a common adage that 'if your household does not offer you to the witches and wizards you cannot die from MBC'. It is also possible that individuals who witness fatalities from MBC could increasingly become desensitized to the dangers of risky behaviours on the road. Although not known in the road safety literature, the concept of desensitization in environmental health risk is well established (see Baxter and Greenlaw, 2005). It is therefore important to understand that witnessing/experiencing collisions could increasingly lead to development of desensitization to the problem of road collisions unless road safety education is intensified to remove myths and superstition around traffic collisions.

5.1. Limitations

There are several noteworthy limitations in this study worth emphasizing. Firstly, there were several missing responses in some

key variables that might have significantly improved our results if they could be accounted for in this analysis. For instance, we could not directly measure the relationship between riding immediately after consuming alcohol and timing to first MBC because of data issues. Given the cultural context of the study area and the social stigma of being associated with drunkenness, the question may not have been appropriate to most respondents, which probably explains why only 20% responded to the question. Secondly, we could not account for length of time spent riding because of data limitation. Similarly, this study by nature could not account for those who lost their lives in their first MBC and even those who survived but later died before this data was collected. The proportion of riders who experienced MBC may have been underestimated given that people who died through MBC could not be included in this study. The time ratios could have been faster and the average time to first collision might have been lower if these group of people could be accounted for. Lastly, even though the youth (15–30 years) appear to be overrepresented in this study, the WHO and the Ghana National Road Safety Commission recognized that they are the most vulnerable group to traffic collisions. Based on these limitations we recommend mix study approach that would explore both the quantitative and qualitative dimensions of alcohol consumption, perceptions of motorbike use and how they may influence risk and timing to collisions. Also, future studies can use national transport dataset especially from the Ministry of Health which may be devoid of these limitations to explore risk-taking behaviours and timing to collisions. Despite these limitations, our study is one of the few that have explored risk-taking behaviours and timing to first motorbike collision in the UWR of Ghana. In addition, the findings are largely consistent with the literature, and present relevant areas for public health and road safety policy in Ghana and in similar contexts.

5.2. Conclusion

For Ghana to achieve the Sustainable Development Goals, particularly Goal 3, the target 3.6, it is crucial to improve on the quality of roads, vigorously implement road safety education to change risky behaviours as well as enforce driving/riding regulations on alcohol consumption, helmet use and speed limits. This is most imperative, as road traffic collision has overtaken both malaria and HIV/AIDS as the leading cause of mortality and morbidity, particularly in the Upper West Region. Structural factors such as the underdeveloped nature of public transport system and the deplorable state of the few roads available to road users tend to compel many people into exploring alternative means of transport. It is our view that a well-developed public transport system will reduce the number of vehicles and motorbikes on our roads, which may eventually reduce the incidence of MBCs. Additionally, there is the need for youth-specific road safety programs given that this group is most vulnerable to motorbike collision. Road safety behaviours could be introduced into the educational curriculum at the basic school level, while enforcing the age limit for riding and other road safety regulations such as observing speed limits, and alcohol consumption. The recent introduction of ‘on the spot fines’ for traffic offenses may help deter riders from risky behaviours. Ultimately, effective and vigorous implementation of these policies could reduce the carnage on our roads.

Financial disclosure

The fieldwork for this study was funded by the Department of Geography, University of Western Ontario, Canada.

Conflict of interest

The authors report that they have no conflicts of interest.

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