Exploring differences in driving behaviour across age and years of education of taxi drivers in Addis Ababa, Ethiopia

ABSTRACT

Despite statistics indicating that the African region has the highest road traffic fatality rate globally, there is limited scientific literature identifying the determinants of driving behaviour. In this study, we explore differences in self-reported driving behaviour across age groups and years of education in a population of 213 drivers from Addis Ababa, Ethiopia.

We hypothesize that younger, less educated drivers will report engaging in more unsafe driving behaviours compared to older, more educated drivers. Contrary to expectations, we found the opposite effect, whereby older, more educated drivers reported engaging in more unsafe driving behaviours than younger, less educated drivers. We explain these findings by describing key characteristics of the sample and cultural ideologies of the region. The findings of this study offer some practical guidance for intervention to address the burden of road traffic injury and death in the African region.

INTRODUCTION

Road traffic injuries are one of the leading causes of death globally with an estimated fatality rate of 18 per 100 000 population (World Health Organisation, 2013). The fatality rate is not distributed equally, with large disparity in rates between countries with low-income countries having rates nearly three times higher than high income countries (18.6 per 100 000 population compared to 6.3 per 100 000 population). For example, the risk of dying as result of a road traffic injury in the African region is 24.1 per 100 000 population and 10.3 per 100 000 population in the European Region. In fact, the African region has the highest road traffic fatality rate, globally (World Health Organisation, 2013). Thus, research is needed to understand the factors contributing to road traffic injury and death.

Ethiopia is one among many low-income countries in Africa and, like other developing countries it has a high rate of road traffic crash related injury and death (Persson, 2008). Current road crash statistics in Ethiopia suggest a fatality rate of 17.6 per 100,000 population (World Health Organisation, 2013) and 68 fatalities per 10,000 vehicles using Police report figures. Both of these estimates are important to consider in evaluating the extent of the problem. However, it is important to note that the statistics of fatalities per 100,000 inhabitants do not accurately reflect the magnitude of road crashes due to the low level of motorisation and road network density in the country. The majority of the Ethiopian population (83% of the population) live in the countryside and away from the road network; thus, a small percentage of the population has contact with vehicular traffic which suggests that the rate of fatalities per 10,000 vehicles may more accurately reflect the magnitude of the road traffic burden in Ethiopia.

In Addis Ababa, the capital of Ethiopia, road traffic injury and death is at a critical level. A report from The Addis Ababa Transport Authority Branch Office of the Federal Transport Authority (2010) indicated that from 2009-2010, 651 residents of the city lost their

lives as a result of a road traffic crashes. In this same period, 624 serious crashes (required hospitalisation), 669 minor crashes (no hospitalisation required) and 4,674 property damage only crashes were recorded.

It has been suggested that approximately 86% of the crashes are attributed to driver error, excluding unclassified crashes which accounted for 7.43% in 2010 (Federal Police Commission of Ethiopia, 2011). With the exception of a few papers (Dixey, 1999; Kouabenan, 1998; Peltzer & Renner, 2003), there is limited scientific literature investigating the determinants of driving behaviour in Ethiopia. This absence in the research literature represents an important limitation in current knowledge, theory and practice, as evidence-based intervention is needed to address the burden of road traffic injury and death in this region. In this study, we will explore differences in driving behaviour across key demographic variables in a population of drivers from Addis Ababa, Ethiopia.

In particular, we focus on investigating differences in driving behaviour across age groups and years of education. Research conducted in Ethiopia suggests that younger and less educated drivers engage in more unsafe driving behaviours than older and more educated drivers. For instance, Tulu, Washington, & King (2013) characterised six years police-reported crashes in the country and found that drivers aged between 18-30 and less educated (i.e., junior school or below) were overrepresented in the crash statistics. In support, a study conducted in Addis Ababa revealed that less years of education and drivers between the ages of 18-30 years had the highest crash involvement (Mebrahtu, 2002; Misganaw & Gebre-Yohannes, 2011). This research suggests that younger, less educated drivers are problematic in road traffic safety in Ethiopia and that they are more likely to engage in unsafe driving behaviours compared with older, more educated drivers. Thus, it is hypothesised that:

1. *Younger drivers will report more unsafe driving practices than older drivers.*

2. *Drivers with less years of education will report more unsafe driving practices than drivers with more years of education.*

METHODS

Participants

A total of 216 drivers participated in the study. The large majority of the sample was classified as work-related drivers (98% mini-bus taxi-drivers) as defined by driving at least once per week for work-related purposes (Murray et al., 2003). All drivers were male and aged between 19 and 60 years (SD = 6.9), with an average age of 32 years.

Procedure

Drivers were selected from the Addis Ababa Transport Authority Branch Office of the Federal Transport Authority. All taxi drivers in Addis Ababa are registered with the transport authority and are assigned to operate within designated routes of five zones, namely West Zone (Ayertena), Central zone (Makelawi), Eastern Zone (Megenagna), Southern Zone (south zone) and Northern zone (Asko). In fact, minibus taxis operate 106 routes in Addis Ababa (IBIS Transport Consultants Ltd, 2005). Moreover, they rotate and are randomly assigned on other routes every three months.

A list of licence plate numbers from vehicles who were assigned to drive exclusively on two specific routes [i.e., Megenagna-British embassy-Arat Kilo-Pisa-Interstate bus terminal (Merkato) and Interstate bus terminal-Mesalemia-Asrasment ring road roundabout-Lucanda] was obtained from the Transport Authority. These driving routes are characterized by their high traffic volume and, thus, were ideal zones to select a broad range of participants for this study.

A total population of 880 licence plate numbers were assigned these driving routes and 220 licence plates were randomly selected (via lottery method) by the researchers to participate in completing a self-report questionnaire. Drivers of the selected vehicles were

approached by researchers at Mekelle University at zone coordinating offices when they were not driving. After obtaining consent from each driver, a self-report questionnaire was distributed. From a total of 220 questionnaires distributed, 216 surveys were returned (98% response rate). This study was conducted with approval from the Monash University Human Ethics Committee.

Measures

Driving Behaviour: The Occupational Driver Behaviour Questionnaire (ODBQ; Newnam et al., 2011) was utilised to measure work-related driving behaviour. The ODBQ consists of a twelve item scale that contains four subdimensions: speeding, inattention, rule violation and driving while tired. Each behaviour was measured with three items and each item was prefaced with the statement "In a typical week how often do you…" Example items included "deliberately exceed the speed limit on a residential road?" (speeding), ''fail to use your indicators to change lanes" (rule violation), ''drive while thinking about how to get to your destination" (inattention), and "drive while tired" (tiredness while driving). Items were measured on a 5-point Likert scale, ranging from rarely or never (1) to very often (5). The composite score for each of the subdimensions was used in the final analysis.

Demographic information: Spaces were provided on the questionnaire for participants to report their age and their highest level of education. In the analysis, age and years of education were categorised into two groups. Based on Erikson's Stages of Development (1968), age was categorised into 18-35 year olds (Intimacy vs. Isolation) and 36-60 year old (Generativity vs. Stagnation) groups. Educational level was categorised into grades 1-8 and 9-12 groups.

Control measures: Drivers were asked to indicate how many hours they drove per day for work-related purposes. A space was provided on the questionnaire for participants to report the total number of hours driven per day.

Analysis of data

The main purpose of this study was to test the differences in driving behaviour between age and years of education. Multivariate analysis of variance (MANOVA) modelling was adopted. The data was analysed using SPSS.

RESULTS

Descriptive data showed that the average level of education was grade 9 (SD=1.85; range = grade 1 to 12) and driving experience[1] since obtaining a probationary licence was 6.2 years (SD=4.5; range=.11 to 31 years). Participants drove an average of 8.5 hours per day (SD = 2.69; range = 0.5–14 hours/day).

Table 1 provides descriptive information and correlations between the study variables. The bi-variate correlations show significant relationships between age and inattention (r=.22, p=.001) and tiredness (r=.21, p=.003) and, education level and inattention (r=.23, p=.001) and tiredness (r=.27, p<.000). Contrary to expectations, these findings suggest that older, more educated drivers were more likely to report engaging in more inattention and more tiredness while driving in comparison to younger, less educated drivers. It was also surprising that no significant relationship was identified between age (r=-.04, p=.59) and speeding and, educational level and speeding (r=.00, p=.99), given that research has identified younger, less educated drivers to be overrepresented in crash statistics (Tulu et al., 2013; Mebrahtu, 2002; Misganaw et al., 2011)[2].

To address our hypotheses, differences in driving behaviour between age and years of education were tested with two MANOVA models. Hours driven per week were used as co-

[1] The minimum driving age in Ethiopia is 18 years (Hassen et al., 2011).

[2] It was also interesting to find a non-significant bi-variate correlation between educational level and age (r=-.01, p=ns). Ethiopia has the lowest ratio of overall enrolment of education compared to other sub-Saharan African countries. Recently, enormous progresses have been made to achieve the millennium development goals of the UN by increasing the education coverage in the country. Specifically, the net enrolment rate in primary school has increased from 36 in 1999 to 86 in 2011 (UNISCO, 2013). The increment in the overall enrolment is radical. Based on this data, the bi-variate correlation between age and educational identified in this study is consistent with the statistics suggesting that older drivers had less education than younger drivers.

variates in both models. In regards to hypothesis one, the results showed a significant main effect for years of education, $F(4, 196) = 3.26$, $p < .05$, $\eta = .06$. Further examination revealed significant differences in rule violations, $F(1, 199) = 3.66$, $p < .05$, $\eta = .09$, inattention $F(1, 199) = 9.55$, $p<.05$, $\eta = .02$ and tiredness while driving, $F(1, 199) = 8.35$, $p<.05$, $\eta = .02$. As reported in Table 2, the mean values found that drivers with less years of education (grades 1-8) reported engaging in lower rule violations, inattention and tiredness while driving compared with drivers who received more years of education (grades 9-12). Thus, contrary to expectations, Hypothesis 1 was not supported.

In regards to hypothesis two, the results showed a significant main effect for age, $F(4, 196) = 3.89$, $p < .05$, $\eta = .07$. Further examination revealed significant differences in rule violations, $F(1, 200) = 8.72$, $p < .05$, $\eta = .04$, inattention $F(1, 200) = 12.12$, $p<.05$, $\eta = .06$ and tiredness while driving, $F(1, 200) = 7.27$, $p<.05$, $\eta = .04$. As reported in Table 3, the mean values indicated that younger drivers (18-34) reported engaging in fewer rule violations, less inattention and less tiredness while driving compared with older drivers (35-60). Thus, contrary to expectations, Hypothesis 2 was not supported.

[Insert Tables 1-3 here]

DISCUSSION

The aim of this study was to explore differences in driving behaviour across age groups and years of education. Contrary to expectations, it was found that younger, less educated drivers reported more safe driving behaviour than older, more educated drivers. These findings appear inconsistent with previous research examining the characteristics of road traffic crashes in Ethiopia over the past six years (e.g., Tulu et al., 2013).

There is a possible explanation for these findings. The sample under investigation in this study included only work-related drivers. There is emerging research in western industrialised countries to suggest differences in driving behaviour based on purpose of journey (i.e., driving for work or personal purposes). Specifically, research conducted by Newnam, Watson and Murray (2002) found that work-related drivers reported higher crash involvement in their work vehicle (per kilometre travelled) than their personal vehicle. This finding suggests the existence of a 'work-related driver effect' whereby, work-related drivers are over-involved in road crashes and engage in a variety of less safe driving behaviours than the general driving population (Downs et al., 1999; Haworth et al., 2000; Newnam et al., 2002). Thus, it is possible that the findings of this study are indeed representative of the differences in driving behaviour based on purpose of journey in Ethiopia.

There is also some evidence in the literature to support the findings of this study. In particular, a study conducted in Ethiopia found that taxi driver characteristics, including high educational status and high average monthly income were significant predictors of risky driving behaviour (Hassen et al., 2011). Although Hassen's study did not find any evidence to support differences in risky driving behaviour between age groups, this study does provide some support for our explanation of a 'work-related driver effect'.

Practical applications

Some practical applications emerge from this study for road traffic safety in Ethiopia. Whilst in western industrialised countries, the 'work-related driver effect' has been found to be efficiently managed through providing a strong safety climate within the organisation that drivers are employed (see, Newnam, Lewis, & Watson, 2012; Newnam, Griffin, & Mason, 2008: Newnam et al., 2011; Newnam, Watson, & Murray, 2004), the same system of rewarding and punishing work-related driving behaviour does not exist in Ethiopia. Rather,

enforcement of work-related driving behaviour is regulated by the Addis Ababa Transport Authority Branch Office of the Federal Transport Authority. Thus, many drivers self-manage their own behaviour rather than being managed by a supervisor within a 'traditional' organisational context.

Thus, the findings of this study suggest that cultural factors may need to be identified and addressed to improve the safe driving behaviour of the work-related driving population in Ethiopia. Research conducted in parts of Africa [ie., Nigeria (Dixey, 1999), South Africa (Peltzer & Renner, 2003), Ivory Coast (Kouabenan, 1998), Ghana (Yankson et al., 2010)] suggests that professional drivers perceive road traffic crashes as acts of God due to bad luck and not under the control of the driver. Similar results have also been found for drivers in Pakistan (Kayani, Fleiter & King, 2013). In the context of this study, it is possible that older, more educated drivers are more highly influenced by this perception than younger, less educated drivers due to the introduction of modern driver training programs for learner professional drivers in Ethiopia in 2005 (proclamation 468/2005). As part of proclamation 468/2005, licensing schemes were introduced to make competitive, safe, efficient and effective use of the transport system in the country. Private owned driver training centres were established and required that all professional drivers have minimum theoretical and practical knowledge of safe driving before they are given a driving competency certificate by the transport authority in Ethiopia. Thus, it could be suggested that driver training programs have been effective in bringing about a cultural shift in the perception of the causes of crashes and strategies to avoid crash involvement.

If this assumption is accurate, road traffic education programs could be introduced as part of an on-going driver safety maintenance initiative. One component of this initiative could focus on empowering drivers to take direct control of their own driving behaviour.

Overcoming the cultural ideologies associated with road traffic crashes being control by external forces could be achieved through worker participation programs (Gregersen, Brehmer, & Moren, 1996; Newnam & Watson, 2009) designed to discuss the causes of crashes and strategies to avoid crash involvement. The initiative could also be combined with driver training (Christie, 2001) to improve skill and manoeuvring techniques. To achieve the most effective result, this type of program could be implemented within junior schools.

Limitations of the Study

Although this study has a number of strengths, four limitations of the research need to be addressed. First, in this study we relied on self-report data for driving behaviour, which are open to socially desirable responding. However, research has found that self-report driving questionnaires are associated with minimal social desirability bias (Lajunen and Summala, 2003). Based on this argument, self-report driving behaviour was believed to be a suitable measure. To overcome this issue, however, future research could attempt to collect objective measures of driving behaviours. For example, driving infractions and attentional behaviours could be targeted by utilising in-vehicle telemetry devices which involve distal measurement such as eye-tracking (Young, Mitsopoulos-Rubens, Rudin-Brown, & Lenne, 2012). Another type of objective measurement to verify speeding and crash data is offence data from policing authorities.

Second, the self-report questionnaire was prepared first in English and then translated into the official language of Ethiopia (i.e. Amharic). As a result, some technical terms in English may not have been translated accurately and potentially biased the results. However, the translation was performed by University lecturers fluent in English and Amharic Languages; thus, the potential of bias was miminal.

A third limitation relates to the representativeness of the sampling population. In this study, we focused on only two driving zones in Amharic Ketena. Thus, the drivers in this study may not have been typical of all work-related drivers in Ethiopia. Further research should employ a broader sample of drivers across different driving zones to provide additional validity for the findings.

A fourth limitation relates to the low alpha reliability on the rule violation driving behaviour dimension. A possible explanation of this result is that the scale incorporated items that reflected road rules not relevant within Ethiopia or any (low) income country that could be classified as having poor infrastructure and road conditions to support safe driving practices. The OBDQ was normed within the Australian context and the rule violation dimension identifies behaviours relevant within most high-income countries; thus, participants may not have identified with the road rule items. Another possible explanation may be attributed to drivers misinterpreting the meaning of the items (eg., u-turn). Future research could perhaps conduct a cross-national study to identify the rule violations relevant within specific countries.

Conclusion

This study aimed to explore differences in driving behaviour across age and years of education in a population of drivers from Addis Ababa, Ethiopia. Contrary to our predictions, we found that older, more educated drivers reported more unsafe driving behaviours, compared to younger, less educated. The findings of this study suggest a ‘work-related driver effect’ which is predicated on the cultural ideologies of the country. The results of this study offer some practical suggestions for improving the safety of work-related drivers in Ethiopia.

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Table 1: Means, standard deviations, alpha reliabilities and correlations between study variables (n=213).

	M	SD	1	2	3	4	5	6	7
1. Speeding	2.59	.83	α=.70						
2. Rule violation	3.11	.75	.43**	α=.41					
3. Inattention	3.36	1.18	.21*	.42**	α=.85				
4. Tiredness	2.46	.99	.24**	.32**	.54**	α=.81			
5. Age	32.33	7.04	-.04	.12	.22**	.21**			
6. Education level	9.87	1.84	.00	.13	.23*	.27**	-.01		
7. Hours driving	8.54	2.71	-.07	.15*	.14*	.07	.25**	-.03	

* Significant at p<.05 ** Significant at p<.01

Table 2: Differences in driving behaviour across educational level

Driving behaviour	Grade 1 to 8 (*n*=45)		Grade 9 to 12 (*n*=157)	
	M	SD	M	SD
Speeding	2.62	.86	2.64	.79
Rule violation	2.96*	.54	3.20	.77
Inattention	2.88*	1.19	3.50	1.15
Tiredness	2.08*	.88	2.54	.95

* Significant at p<.05

Table 3: Differences in driving behaviour across age groups

Driving behaviour	Age 18-34 (*n*=58)		Age 35-60 (*n*=145)	
	M	SD	M	SD
Speeding	2.60	.86	2.71	.64
Rule violation	3.04*	.66	3.40	.83
Inattention	3.17*	1.18	3.84	1.04
Tiredness	2.32*	.94	2.73	.90

* Significant at $p<.05$