Prevalence, precision, and road safety implications of using faulty speedometers among commercial drivers in Ghana

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ABSTRACT
Vehicular speed is a significant risk factor for road crashes globally. The first objective was to establish the proportion of motorists who drive with faulty speedometers. Second, the study sought to establish procedures used to determine speeds when speedometers are defective. The third objective was to establish the precision with which motorists determine driving speeds with faulty speedometers. Convenience sampling was used to interview 124 professional drivers at 16 bus terminals in Kumasi to understand their speeding behaviors and perceptions on the accuracy of using defective speedometers. Secondly, drivers using defective speedometers were purposively nested for real-life driving tests in which their self-reported speeds were concurrently compared with actual speed measurements made with android-speedometers. Results show that 58% of drivers used defective speedometers. Ninety-six percent of the drivers with defective speedometers were confident that they could precisely tell their travelling speeds through procedures such as driving experiences, personal judgment, intruding wind, engine sound, and poking hands outside cars, thereby underestimating their actual speeds. In the driving tests, mean self-reported speed (58.7 ± 5.2 km/h) was significantly lower than measured speed (64.6 ± 8.9 km/h; p = 0.0003). This research has implications for road safety enforcement, education, and advocacy.

Background
Speeding is a major risk factor for road traffic injury severity over the world. Research has shown that there is an exponential relationship between vehicle speeds and road traffic fatalities. This means that a small increase in speed will result in a more than proportionate increase in traffic fatalities. Specifically, a 10% increase in vehicle speeds will result in a corresponding 40% increase in road traffic fatalities (Elvik, 2013; Elvik et al., 2004). Consequently, countries which have chalked remarkable laurels in road safety have prioritized speed control and have introduced research-driven countermeasures to counteract excessive speeding in their countries.

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Nevertheless, speeding is pervasive in Ghana. Research on vehicle speeds in Ghana indicates that over 90% of motorists exceed the speed limit in built-up areas where there are no traffic-calming measures (Damsere-Derry et al., 2008; Derry et al., 2007) while at least 60% of motorists typically exceed the speed limit on all categories of rural highways (Damsere-Derry et al., 2008). It is not clear whether this grotesque speeding behavior being exhibited by motorists in Ghana is intentional or not. Neither do we also know whether the motorists exhibiting the speeding habits know about the potential ramifications of their behaviors. Nonetheless, the impact of speeding is daunting on road safety in Ghana. For instance, over 60% of all pedestrian fatalities are attributable to speeding in this country (Damsere-Derry et al., 2010).

Speed control can take different dimensions. Apart from the traditional methods such as enforcement and traffic-calming measures that are widespread in this country; non-conventional speed control strategies like moral appeals, advocacies, and road safety education can supplement these traditional efforts to improve road safety. In the early 1990s, the Norwegian Public Roads Administration introduced the ‘Speak Out’ campaign strategy targeting older teenagers (Regan & Mitsopoulos, 2001). The aim of this programme was to assign active roles to passengers to positively influence driver speeding behavior in other to enhance driver and passenger safety. The passenger speak out campaign programme succeeded in changing drivers’ behavior like excessive speeding and improving road safety in Norway. Unfortunately, these unorthodox road safety approaches are lacking in developing countries. With the high incidence of speeding in Ghana, road safety advocates and policymakers such as the National Road Safety Authority (NRSA) have proposed ‘the passenger speak up’ campaign programme (NRSC, 2022; 2022). Similar to the Norwegian Speak Out strategy, the Passenger Speak up advocacy strategy in Ghana seeks to empower passengers to politely prompt drivers anytime they notice that the speeds of the vehicle they are travelling on are higher than recommended. Apparently, this advocacy and other moral appeals regarding speed prevention will work well when the speedometers of the vehicles they are using for their journeys are working properly and secondly, when the drivers and passengers know the advisory speed limits for all road environments such as school zones, market and church areas, residential areas, and rural highways.

A speedometer or speed meter is a gauge that measures and displays the instantaneous speed of a vehicle. Speedometers are regarded as standard equipment that are universally fitted to motor vehicles to enable motorists determine their travelling speeds accurately. In Ghana, many of the vehicles in use are secondhand cars and their speedometers are defective. Anecdotal evidence suggests that some motorists drive their vehicles with defective speedometers. Prior research has shown that motorists typically underestimate their travelling speeds when their speedometers are concealed (Hussain, Alhajyaseen, Brijs et al., 2019). In other words, drivers always have the wrong perceptions that they are travelling slower than their actual travelling speeds when their speedometers are covered or not working (Hurwitz et al., 2005; Hussain, Alhajyaseen, Pirdavani et al., 2019). Underestimating vehicular speeds may lead to over-speeding and speed-related crashes. Fixing faulty speedometer is, however, not a priority for motorists in Ghana. Therefore, this research was intended to find out the proportion of drivers using faulty speedometers, how motorists determine their travelling speeds and the accuracy of using defective speedometers to determine speeds. We hypothesize that motorists with faulty
speedometers will significantly underestimate their travelling speeds. Therefore, this study explores motorists’ knowledge, attitudes, and practices regarding speeding as a risk factor for road crashes and the road safety implications of using faulty speedometers to drive cars. Much of the research on speed perceptions are mainly concentrated on self-report (Elias, 2018), video records (Wu et al., 2017) and simulator research (Ben-Bassat and Shinar, 2011; Brooks et al., 2011; Kemeny & Panerai, 2003). To the best of our knowledge, this report is one of the first reports on drivers’ perceived speeds compared with actual speeds from android speedometers. It is also one of the first to assess the percent of vehicles with functioning speedometers.

The main objectives of this research are three-fold. The first objective is to establish the proportion of motorists who drive with faulty speedometers in the Kumasi Metropolitan Area. The second objective is to establish the methods that motorists use to determine their travelling speeds when their speedometers are not functioning. Third, the research sought to establish the precision with which motorists determine their driving speeds with faulty speedometers.

**Methodology**

**Apparatus**

The equipment used for this study were the in-vehicle speedometers and global positioning system (GPS) speedometers for android. A speedometer or speed meter is a gauge that measures and displays the instantaneous speed of a vehicle. Conventionally, speedometers are regarded as standard equipment that are universally fitted to motor vehicles since car manufacturers began commercial production. In this report, a speedometer is described as faulty when it is totally broken-down; the dial is down and does not give any readings. On the other hand, the GPS speedometer for android hereinafter referred to as android speedometer was developed by AppSourceHub, which can be downloaded from android play store. This device shows journey in different units with head up display (HUD) feature in one up. The android speedometer shows distance travelled from start to end and in addition to speed parameters such as average, minimum, and maximum speeds can also display weather, altitude, and compass data (AppsourceHub, 2021). These devices are activated on android phones and can accurately measure the travelling speeds of vehicles. According to the manufacturers, the android speedometer measures speed with a high-level accuracy with a margin of error of ± 2 km/h.

**Approach**

The approach used in this research was the mixed-method strategy. Firstly, interviews were conducted in-person at 16-lorry terminals in the Kumasi Metropolis, the capital town of the Ashanti Region of Ghana. The interviews were conducted by trained research assistants from the Building & Road Research Institute (BRRI). The research assistants have university degrees and are trained in administering questionnaires and conducting interviews. Permissions were obtained from the station officers who were managing the terminals. In all, 130 commercial (professional) drivers were contacted for the interviews and 95% (n = 124) consented to participate. Averagely, the interviews lasted for
40 minutes but a few lasted longer when the drivers interrupted the interviews to take their turns in conveying passengers to their destinations. Such interviews were rescheduled to a later time on the same day. Some of the issues discussed in the interview include conditions of drivers’ speedometers, knowledge of the speed limits, driving experience, perception on driving with faulty speedometers and how motorists determine their travelling speeds when their speedometers are broken-down. Questionnaire comprised both open-ended and close-ended questions.

In the second phase, of the research, 60 of the motorists whose speedometers are broken-down were nested out from the general sample of those driving with defective speedometers for an on road participant observation. Conical warning triangles were used to demarcate portions of the test roads where participating motorists were required to drive at their desired speeds. Three test sites ranging between 100 and 150 m long were demarcated on either approach of traffic direction and located between 5 and 10 km apart depending on adequate site distances. The distance of 100–150 m was subjectively chosen by the authors as a distance for which drivers would agree to participate and during which they would concentrate on speed perception. In the participant observation, researchers sat in the test vehicles and used android speedometers to measure the actual speeds while the drivers drove their vehicles and reported their perceived speeds when they are told to do so at the selected road sections. Motorists were informed about what they are expected to do in the demarcated section of the road i.e. being a free-flowing vehicle and travelling at a constant speed until they are out of the test site. Each driver who participated in the driving experiment reported their perceived speed at only one location whereupon researchers sitting in their vehicles simultaneously measured their actual speeds using the android devices.

Prior to embarking on the field observations, a validity test was conducted to verify the accuracy of the android speedometers. This validity test entailed 12 professional drivers who drove and reported their speeds from their functioning speedometers. These speeds were simultaneously compared with the speeds displayed by the android speedometers. There was a 98% concordance between the speeds measured by the drivers’ vehicles’ speedometers and speeds measured by the android speedometers thus, conforming to the manufacturers’ accuracy level of ± 2 km/h.

**Incentives**

There were monetary rewards for drivers for participation. Fifty Ghana cedis (GH¢50.00) was given to participants who moved their vehicles empty from the lorry stations to the test sites solely for the research. Twenty Ghana Cedis (GH¢ 20.00) reward was given to those drivers who loaded their vehicles with passengers and conveyed researchers alongside while ten Ghana cedis (GH¢ 10.00) was given to participants who only took part in the interviews. (N.B: USD 1 = GH¢ 4.4) as at June 2017, the period during which data collection took place and rewards paid.

**Sampling strategy and sample size**

Convenience sampling procedure was used to select participating motorists for the interviews after obtaining their verbal consents. After the interviews, a purposive sampling strategy was used to select motorists who use faulty speedometers in driving in
participant observations to ascertain the accuracy with which motorists are using faulty speedometers to measure their driving speeds. As indicated earlier, 124 professional drivers were interviewed and 72 of them drove with faulty speedometers and the remaining 52 used functioning speedometers.

**Demographics**

The demographic variables captured in the study include; highest educational level attained, number of years driven and age of driver. Public transport drivers in Ghana are almost all male.

**Condition of drivers’ speedometers**

Motorists were asked the question ‘over the past five years, have you driven a commercial vehicle which had a faulty speedometer? To which participants responded either yes or no. A follow-up open-ended question; if ‘yes’ what technique do you use to determine your travelling speeds while driving with the faulty speedometer and how accurate could this be? Another follow-up question, how safe do you think driving a vehicle with a faulty speedometer is? Potential answers to the last research question were; very safe, moderately safe, safe, unsafe and don’t know.

**Motorists’ perceptions on causes of road accidents and their accident history**

The research questions asked under this theme were as follows: over the last five years, have you ever been involved in a road crash as a driver to which you were the driver? What was the cause of the most recent crash in which you were the driver?

**Study period and area**

The field data collection was conducted between July and November, 2017. This research was conducted in the Kumasi Metropolis of the Ashanti Region of Ghana and the study participants were trotro and taxi drivers. Trotro are minibuses that offer intra-city and short journey transport services typically having about 20 seats. Taxis are saloon cars which take up to four passengers excluding the driver. Characteristically, taxis in Ghana are usually painted yellow on the sides of their booths and bonnets in addition to any preferred color of the owner. In many instances, taxis in Ghana are shared vehicles which ply predefined routes but can also be chartered to offer door-to-door services.

**Ethics**

The research protocol was approved by the Committee on Human Research, Publications, and Ethics (CHRPE) of the Kwame Nkrumah University of Science & Technology’s School of Medicine and Dentistry.
Results

In all, 130 public transport operators were contacted at 16 bus terminals among whom 95% (n = 124) consented to participate while 5% declined. The ages of drivers who participated in this survey ranged between 22 and 66 years with an average age of 39.3 ± 12.3 (standard deviation). These drivers have had various levels of driving experiences ranging between 1 and 43 years with a mean licensed driving years of 16 ± 11.8. The educational levels of the motorists were tilted towards lower ranks. The highest levels of education which participants completed were: up to basic level was 18%; up to Junior High School (JHS) was 44%, up to Senior High School (SHS) was 30%, up to tertiary-level education was 2% while 6% had no formal education. See, Table 1.

Status of speedometers and techniques motorists use to determine travelling speeds with faulty speedometers

Among the motorists surveyed, 58% (n = 72) currently use faulty (broken) speedometers in their everyday driving. This group of motorists appear to be confident that they can accurately estimate their driving speeds using faulty speedometers in their vehicles. Generally, motorists were of the opinions that it is not a road safety issue to drive with a faulty speedometer.

As illustrated in Figure 1, majority of participants who drive with faulty speedometers 71% (n = 51) indicated that they rely on their driving experiences to tell their travelling speeds. Some of the statements which reflect this perspective were: ‘I have known how to drive a vehicle since 1985 (i.e. for 35 years). Without a working speedometer in my car, I can tell whether my vehicle is moving at 50 km/h or 100 [km/h]’. The driver further said ‘I know my normal speed and can accurately tell this through my driving experience. I can accurately do this through my own sense of judgment’.

Also, as shown in Figure 1, other rudimentary procedures which motorists reported they use to determine their traveling speeds when their speedometers got broken include: 8% (n = 6) personal (intuition) judgment, 7% (n = 5) sound of engine and 6% (n = 4) a piece for hand outside and intruding wind. The narratives which these motorists adduced to justify their reliance on these procedures when driving with faulty speedometers leave much to be desired and are summarized below. Among motorists who rely on the wind which enters into the vehicles through the car window (intruding wind) for instance, one of them said that: ‘it is really easy to tell my driving speed via the wind which blows through the windows [front driver side window] when the vehicle is moving. Sometimes, I poke my hand outside the window and the wind I feel around my arm determines whether I am moving slowly or fast’. Ninety-six percent (96%) of the drivers were of the opinions that the procedures they mentioned such as driving experience, intuition, sound of engine, wind intrusion and hand outside could be used to accurately determine their travelling speeds when their speedometers are spoilt. Some motorists also indicated that they use the wind which enters into the vehicles through the car window to determine their travelling speeds. The drivers said: ‘it is really easy to tell my driving speed via the wind which blows through the windows [front driver side window] when the vehicle is moving. Sometimes, I poke my hand outside the window and the wind I feel around my
arm determines whether I am moving slowly or fast’. Other motorists indicated that they use their car engine sounds to tell their travelling speeds. They were, however, not sure whether this technique was accurate or not. The following discourses were some of the arguments put forth to buttress their point of view: ‘For me, I use the sound from my car engine to determine my travelling speeds when my speedometer is not working. I don’t really know whether this procedure is precise. [However] what I know is that when I am moving faster, the pitch of the engine sound is faster and smoother than when I am moving slower’. Only a few motorists 4% (n = 5) were not sure whether the procedures they use to determine their travelling speeds were accurate or not. See, Figure 1 for more details.

Table 1. Drivers’ knowledge of speed limits and perceptions on using faulty speedometers.

| Variable/Research Question                                      | Number | Mean/percent |
|----------------------------------------------------------------|--------|--------------|
| Mean Age (years)                                                | 39.3   |              |
| Gender                                                          |        |              |
| Male                                                            | 124    | 100%         |
| Female                                                          |        | 0%           |
| Driving experience (mean years, SD)                            | 16.2 (12.3) |          |
| Highest Educational level attained*                             |        |              |
| None                                                            | 7      | 6%           |
| Primary                                                         | 22     | 18%          |
| Junior SS                                                       | 55     | 44%          |
| Senior SS                                                       | 37     | 30%          |
| Tertiary                                                        | 2      | 2%           |
| Vehicle Type                                                    |        |              |
| Taxi                                                            | 31     | 25%          |
| Trotro                                                          | 93     | 75%          |
| Have you driven a vehicle with faulty speedometer in past 5 years? |        |              |
| Yes                                                             | 107    | 86%          |
| No                                                              | 17     | 14%          |
| Does your current vehicle have a faulty speedometer?            |        |              |
| Yes                                                             | 72     | 58%          |
| No                                                              | 52     | 42%          |
| How accurately can you estimate your speed with a faulty speedometer?* |        |              |
| Very accurately                                                 | 12     | 10%          |
| Moderately accurately                                           | 12     | 10%          |
| Accurately                                                      | 47     | 38%          |
| Not accurately                                                  | 47     | 38%          |
| Do not know                                                     | 5      | 4%           |
| How safe do you think driving with a faulty speedometer is?     |        |              |
| Very safe/safe                                                  | 66     | 53%          |
| Very unsafe/unsafe                                              | 37     | 30%          |
| Do not know                                                     | 21     | 17%          |
| Legal speed limit in built up areas (50kph)?                    |        |              |
| Lower than actual                                               | 63     | 51%          |
| Exact                                                           | 36     | 29%          |
| Higher than actual                                              | 25     | 20%          |
| Legal speed limit for rural areas (80kph)?                      |        |              |
| Lower than actual                                               | 46     | 37%          |
| Exact                                                           | 53     | 43%          |
| Higher than actual                                              | 25     | 20%          |

*One value missing for each of these variables.
Motorists' knowledge of speed limits in various road environments were also ascertained. The questions asked were: what are the speed limits for (i) rural undivided highway (rural highways) and (ii) built-up areas on the highways (urban highways). To these questions, while many respondents gave definitive answers, others gave their responses in ranges such as greater than 60 km/h. The answers to these questions were classified into three categories; i.e. lower, exact and higher than the legal speed limit for each road environment. In the urban road environment, motorists’ responses were 51% lower than, 29% exact and 20% higher than the 50 km/h speed limit for settlements on the highways. On the rural highway however, motorists’ responses were 37% lower than, 43% exact and 20% higher than the speed limit of 80 km/h for rural undivided highway. In both rural and urban road settings, 20% of public transport operators had a wrong knowledge of the speed limits. Among drivers who gave the legal speed limit to be higher than the statutory 80 km/h, some gave ranges such as more than 60 km/h while others gave grotesquely higher speed limits such as between 80 and 250 km/h. Not knowing the exact speed limit is a road safety concern. See Table 1.

### Knowledge of speed limits

The motorist's perceptions of the speed limits in various road environments were also ascertained. The questions asked were: what are the speed limits for (i) rural undivided highway (rural highways) and (ii) built-up areas on the highways (urban highways). To these questions, while many respondents gave definitive answers, others gave their responses in ranges such as greater than 60 km/h. The answers to these questions were classified into three categories; i.e. lower, exact and higher than the legal speed limit for each road environment. In the urban road environment, motorists’ responses were 51% lower than, 29% exact and 20% higher than the 50 km/h speed limit for settlements on the highways. On the rural highway however, motorists’ responses were 37% lower than, 43% exact and 20% higher than the speed limit of 80 km/h for rural undivided highway. In both rural and urban road settings, 20% of public transport operators had a wrong knowledge of the speed limits. Among drivers who gave the legal speed limit to be higher than the statutory 80 km/h, some gave ranges such as more than 60 km/h while others gave grotesquely higher speed limits such as between 80 and 250 km/h. Not knowing the exact speed limit is a road safety concern. See Table 1.

### Mean differences between observed versus self-reported speeds

We compared the self-reported speeds of 60 drivers with faulty speedometers to actual speed as measured with android speedometers. There was a significant difference between the perceived mean speed reported by motorists compared with the actual (observed) mean speed measured with android speedometers. The self-reported mean
speed among motorists who drove with faulty speedometers was 58.7 km/h ± 5.2 while the observed speed from the android speedometer devices was 64.6 km/h ± 8.9. The measured mean speed was thus 10% higher than the self-reported mean speed. In other words, motorists were actually travelling 10% higher than they perceived. A two sample mean comparison t-test shows that the mean difference between the observed mean speed was significantly higher than the self-reported mean speed (p = 0.0003).

**Perception on the safety and accuracy of using faulty speedometers**

The question on this theme: perceptions of motorists on using faulty speedometers were divided into two sub questions. The first part which was an open-ended question sought to establish whether using a defective speedometer for driving is a risky road safety behavior or not. The options of responses were either safe, very safe, do not know, unsafe and very unsafe. Fifty-three percent (53%) of the motorists indicated that this practice is safe or very safe, 30% said the practice was either unsafe or very unsafe while the remaining 17% said they do not know (unsure) of the road safety implications of the practice.

**Risk perception and reasons for using faulty speedometers**

The second part of the question on motorists’ perceptions on using faulty speedometers sought to establish techniques, which drivers use to determine their travelling speeds when their speedometers become faulty. Among the motorists who were of the view that driving with a faulty speedometer is safe or very safe majority had the perceptions that their driving experiences guide them to tell their driving speeds even if their speedometers were broken. One of the motorists in answering the question as whether driving a vehicle without a working speedometer is a risky behavior indicated ‘I do not think this habit is risky. I think that once a motorist is able to drive a vehicle, they can easily determine their travelling speeds accurately even if their speedometers are not working. For instance, I have been driving this vehicle for some time now [9 years] and know its speed. I also have over 30 years driving experience. I see no reason why I should repair my speedometer because it does not seem to have any effect on road safety’. Some commercial drivers also said economic factors influence their decision to drive with faulty speedometers. One of those motorists said that ‘the main reason why I am driving with a faulty speedometer is that I do not have money to fix the faulty speedometer in my car and more to the point, it is not so urgent’. Other commercial drivers whose speedometer were not functioning indicated that functioning speedometers are only relevant for long journey travelers. For instance, one of those motorists said that: ‘having a working speedometer is only important for long distance journey motorists. For us trotro drivers, our radius of operation is short. As we do not travel far, I do not feel the urge to fix my speedometers if it goes faulty’.

On the other hand, motorists who were of the view that driving with a faulty speedometer is a risky road safety behavior adduced the following arguments to support their claim. Some of the drivers were of the view that if speedometers were not important, vehicle manufacturers will not have included them on the vehicles dashboards. ‘I think they are very important devices. That is why manufacturers fixed
them in the vehicles’. Other participants who were of the opinions that driving with a faulty speedometer is a risky behavior opined that speedometers are important road safety devices and should be kept functioning all the time. Thus, it is not appropriate for motorists to treat them as trivial components of vehicles. Some of the statements made to buttress this perspective of motorists are: ‘I think speedometers are important components of vehicles because they help drivers to determine the speeds they are travelling at’. Further, they stated that ‘This obviously has an implication on road safety. Keeping them [speedometers] in good conditions will prevent over speeding in the country. It is always important to obey the advisory speed limits. Without them [speedometers] it will be difficult to tell their travelling speeds’.

**Reasons why drivers speed**

The commercial drivers were asked to find out the motivation for which motorists speed in Ghana. Their responses were coded according to five themes, namely: personal aggrandizement, pressure from passengers and car owners, competition among drivers, weak enforcement and sensation seeking. Firstly, commercial drivers were of the opinions that one of the main reasons why motorists speed is to fulfill their personal aggrandizement motive. One of the drivers said: ‘I think that motorists have the penchant to make supernormal profit in their day to day business. They want to meet their mandatory daily sales obligations and other ancillary commitments such as washing vehicles, refueling and still keep ample money to themselves. Under normal circumstances, this can be achieved. However, some motorists desire to achieve as much as or more than their daily sales hence their speeding behavior’. Some of the drivers are of the opinion that passengers pressure them to speed. One of the drivers indicated that: ‘when passengers are running late for their appointments and work, they mount pressure on the drivers to speed to enable them arrive at their destinations on time. I don’t normally succumb to passengers’ request for speeding, but I know some drivers do’. Pressure may also come from car owners. The daily sales ceiling arrangement between car owners and drivers is sometimes too high and nonnegotiable. Therefore, motorists are always under this constant pressure to fulfill their mandatory sales obligations. One of the drivers said: ‘taxi and trotro drivers are always under the duress to meet their daily sales. Irrespective of what happens on the day, car owners will always take their fixed daily sales. Commercial drivers therefore speed to enable them make many trips to fulfill their minimum daily sales obligations so as to avoid incurring the displeasure of their masters’.

Competition among trotro drivers for passengers is another reason why drivers speed. One of the drivers said that: we compete among ourselves for passengers. Therefore, the slightest opportunity a colleague driver gets, he wants to speed up to pick as many passengers as possible waiting upstream at the station”. Another reason why commercial drivers speed on the roadway is weak enforcement. Comments which reflect this perspective include: ‘some of us violate the speed limit laws because there is weak enforcement in the country’ one of the public transport drivers said. Finally, sensation seeking (egot gratification) is another motivation that explains speeding among drivers in Ghana. One of the drivers indicated that: ‘some of us believe that their vehicles are superior (powerful) and they want to show off to their fellow drivers and passengers that their vehicles are faster than their colleagues’.
Motorists’ perception on major causes of road traffic crashes in Ghana

In order to elicit motorists’ perception on the major causes of road traffic crashes in Ghana, an open-ended question ‘in your opinion, what is the main cause of road traffic crashes in Ghana’ was asked. Over 60% of motorists mentioned over-speeding as the major cause of road crashes in the country. Another 12% of participants indicated that wrongful overtaking was the major cause of road crashes in Ghana. Ten percent (10%) of motorists were of the opinions that drink/drug driving were responsible for road crashes while 7 and 4% attributed the main causes of road crashes to road factors and vehicle factors respectively.

Motorists’ perception on ways to prevent speeding

The drivers were asked the question ‘in your opinion, how can speeding be controlled?’ The responses were summarized under five broad themes and are presented below. Firstly, motorists were of the view that for speed control to be effective, enforcement is key. Some of the arguments put forth by drivers in support of this argument are: ‘I think speeding is prevalent because of weak enforcement. Therefore, the police have to use their speed guns to identify speeding motorists and fine those who are violating the rules’ one of the motorists stated. The motorists also cited road safety education as a potential strategy to prevent speeding. One of the drivers indicated that: ‘you know some of the drivers do not have any formal driver training or have forgotten what is expected of them. I will therefore suggest that periodic road safety education be organized to refresh our memories to enable us to obey the speed limit laws’. Motorists were also of the opinions that technological advancement has made vehicles too fast. One of the drivers said that: ‘in recent years, vehicles are being designed to move faster than before. Therefore, tackling, the speeding problem through designing of our vehicles will go a long way to control speeding behavior on our roads’. Fourthly, motorists were of the view that traffic calming measures such as speed humps, traffic lights and speed cameras could be used to reduce speeding on Ghanaian roadways to the barest minimum. Lastly, commercial drivers were of the opinion that empowering passengers to alert motorists when the latter are speeding will be a very good intervention.

Discussion

This research has provided a useful insight into trotro and taxi drivers’ attitudes towards speeding and using faulty speedometers to determine their travelling speeds in the Kumasi Metropolitan Area. In this study, 58% of commercial drivers in the Kumasi Metropolis drive with faulty speedometers. Majority of motorists who drive with faulty speedometers held the wrong perception that they could accurately tell their vehicle speeds when their speedometers go faulty. Our finding is in support that motorists will generally underestimate their travelling speeds when their speedometers are concealed or not functioning (Hurwitz et al., 2005; Hussain, Alhajyaseen, Brijs et al., 2019; Hussain, Alhajyaseen, Pirdavani et al., 2019). Fifty-three percent (53%) of motorists were of the opinion that the act of driving a vehicle with a faulty speedometer was safe or very safe. The idea that drivers’ perceptions of risks influence their decisions and choice,
particularly speeding is at the heart of road safety education and advocacy. When motorists drive with faulty speedometers, they mainly use unreliable techniques such as personal driving experience, wind from vehicle window, engine sound, or poking their hand outside to tell their travelling speeds. By these procedures, motorists are significantly underestimating their travelling speeds much to the peril of vulnerable road users and road safety advocates. Given the paramount role which vehicle speeds play in road traffic crash incidents, the mean speed differences of 10% between the perceived and actual speeds cannot be trivialized. As indicated earlier, there is an exponential relationship between vehicular speeds and road traffic crash fatalities (Elvik, 2013). This means that a small increase in vehicle speeds leads to a more than proportionate increase in road traffic fatalities. Specifically, a 10% reduction in vehicular speed say from 60 km/h to 54 km/h will result in 38% reduction in road traffic fatalities (Elvik et al., 2004). It is therefore recommended that functioning speedometers should be made a prerequisite for granting or renewing the road worthy certificate and enforced by the police.

This research also established that 20% apiece of the motorists were of the perceptions that the speed limits for urban and rural settings were higher than recommended. This means that 80% of motorists cited the exact speed limit for the various road environments or below. This perception compares better to motorists’ knowledge of the legal blood alcohol concentration limit of Ghana as in that research, only 4% of motorists knew the exact legal blood alcohol concentration limit in Ghana (Damsere-Derry et al., 2017). The road safety implications of this finding is that motorists with these wrong perceptions may indulge in speeding behavior but still think that they are not violating any traffic regulations. Given the fundamental importance of speed in road crash causation and the attendance fatalities, this road safety knowledge gap is significant and needs to be addressed through road safety education.

Our discussions with motorists proved enriching and evidently demonstrated that drivers have the requisite knowledge of the causes of road crashes in Ghana. The results indicate that motorists attributed over 70% of road crashes to either speeding or speeding-related maneuvers like wrongful overtaking. This finding supports earlier research in which motorists also reported excessive speeding as the major risk factor of road crashes in Ghana (Damsere-Derry et al., 2017). The emphasis which motorists placed on speeding as a major risk factor is in line with the relative importance of speeding as a risk factor for road crashes in the scientific literature (Elvik, 2013; Elvik et al., 2004). As drivers have enumerated germane speed control strategies such as enforcement, road safety education, speed calming and road safety advocacies, this fore knowledge could be explored as a proxy to improve speed control strategies such as advocacy and road safety education which are especially low in Ghana.

In view of the high prevalence of speeding in Ghana and as a way of empowering passengers, the National Road Safety Authority (NRSA) of Ghana has proposed the ‘passenger speak up’ programme. This programme seeks to encourage passengers to politely alert motorists when the vehicle in which they are travelling on exceed the speed limit for the road environment. This programme will make an incredible road safety impact when the speedometers in the vehicles they travel in are in good conditions and working properly. In order to promote the “passenger speak up” advocacy being championed by the NRSA, it is imperative to ensure that all vehicles with faulty speedometers are restored. Enforcement for this can be done at two levels; through the
licensing agencies and the police. The vehicle licensing agencies should include speedometer inspections in their checklists for roadworthy certificate renewal which happens periodically for public transport vehicles. The police should also ensure that driving with faulty speedometers is made a punishable offense by randomly stopping and riding with trotro and taxi drivers.

Conclusions
A substantial proportion of trotro and taxi drivers in the Kumasi Metropolis drive their vehicles with faulty speedometers. In this process, they rely on subjective procedures such as driving experience, intruding wind, sound of engine, and poking their hands outside cars to determine their travelling speeds. Consequently, these drivers significantly underestimate their travelling speeds to the peril of road users including themselves. In order to avert the practice of driving with faulty speedometers and promote the passengers speak up advocacy being proposed by road safety policymakers should include inspection of the state of speedometers in the vehicles as a prerequisite for issuing or renewing of roadworthy certificates which occur periodically for public transport vehicles. Additionally, driving with properly functioning speedometers will guide motorists who violate speed limits unintentionally to conform to speed regulations. The police should also enforce driving with faulty speedometers by randomly boarding trotros and taxis periodically to ensure that motorists are adhering to this regulation. The wrong perceptions which motorists hold that they can accurately tell the travelling speeds by using faulty speedometers need to be corrected.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Funding
The research was funded, in part, by the Fogarty International Center, U.S. National Institutes of Health (D-43TW007267); National Institute of Health National Institute of Health [D-43TW007267];

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