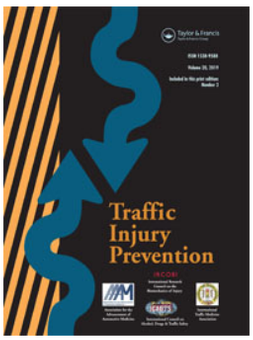

Traffic Injury Prevention

ISSN: 1538-9588 (Print) 1538-957X (Online) Journal homepage: https://www.tandfonline.com/loi/gcpi20

Pedestrian risky behavior and safety at zebra crossings in a Ghanaian metropolitan area

Thomas Ojo, Comfort Ogunleye Adetona, William Agyemang & Francis K. Afukaar

To cite this article: Thomas Ojo, Comfort Ogunleye Adetona, William Agyemang & Francis K. Afukaar (2019) Pedestrian risky behavior and safety at zebra crossings in a Ghanaian metropolitan area, Traffic Injury Prevention, 20:2, 216-219, DOI: 10.1080/15389588.2018.1555372

To link to this article: https://doi.org/10.1080/15389588.2018.1555372

TRAFFIC INJURY PREVENTION
2019, VOL. 20, NO. 2, 216–219
https://doi.org/10.1080/15389588.2018.1555372

Pedestrian risky behavior and safety at zebra crossings in a Ghanaian metropolitan area

Thomas Ojo[a], Comfort Ogunleye Adetona[a], William Agyemang[b], and Francis K. Afukaar[b]

[a]Department of Geography and Regional Planning, Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, Ghana; [b]Building and Road Research Institute, Kumasi, Ghana

ABSTRACT

Objective: This article assesses pedestrian behavior and safety at zebra crossings in the Cape Coast Metropolis.

Method: A mix of a naturalistic exploratory and descriptive study was conducted using both primary and secondary data. The primary data included an observational study of over 6,000 pedestrians using zebra crossings in the metropolis. The secondary data were obtained from the national road traffic crashes (RTCs) database at the Building and Road Research Institute covering information on pedestrian crashes between 2007 and 2016 in the metropolis. Analyses were conducted using frequencies and percentages with Pearson's chi-square correlation used to establish the relationship between independent and dependent variables.

Results: The findings showed that the majority of the 328 pedestrian crashes between 2007 and 2016 resulted in either fatalities or serious injuries and occurred at locations away from a junction. Most of the pedestrians observed used the zebra crossing were alone and engaged in talking or using mobile phone. Age group, pedestrian status, and the location of the zebra crossings influenced pedestrians' risky behaviors.

Conclusion: The majority of the pedestrian crashes in the metropolis resulted in injuries resulting in hospitalization or fatalities and occurred at a midblock. Pedestrians largely exhibited risky behaviors predisposing the occurrence of RTCs at zebra crossings despite the fact that they are a pedestrian right-of-way. There is therefore the need for the National Road Safety Commission to carry out campaigns to educate pedestrians on the safer use of zebra crossings.

ARTICLE HISTORY
Received 25 April 2018
Accepted 29 November 2018

KEYWORDS
Pedestrian crashes; zebra crossing; metropolis; risky behavior; Cape Coast

Introduction

Low vehicular ownership in low and medium-income countries (LMICs) results in pedestrian travel for geographical mobility and spatial interaction (Abane 1994, 2010; Ipingbemi 2010). The lack of pedestrian facilities increases vehicular–pedestrian conflicts, predisposing pedestrian crashes (Kwakye et al. 1997). Pedestrians account for the majority of road traffic injuries and deaths in LMICs such as Ghana, Kenya, Mexico, and Peru (Damsere-Derry et al. 2010; Donroe et al. 2008). Pedestrian crashes account for more than half of all urban road user deaths in these countries compared to 11% in high-income countries like the United States (Donroe et al. 2008). The lack of pedestrian facilities such as zebra crossings and pedestrian walkways account for the high incidence of pedestrian injuries in LMICs compared to high-income countries (Donroe et al. 2008; Ipingbemi 2010). A pedestrian is "someone who is walking, usually in public places, and particularly on or adjacent to public rights of way for vehicles" (Wigan 1995, p. 7).

Walking, compared with driving, is subject to fewer rules and is confined largely to crossing on the road with widespread noncompliance by pedestrians (King et al. 2009). Thus, pedestrians exhibit certain risky behaviors such as wearing headphones, talking on a cell phone, eating/drinking, smoking, or talking while crossing the roadway, predisposing them to road traffic injuries and deaths (Damsere-Derry et al. 2010). Most pedestrian fatalities and injuries at zebra crossings result from these risky behaviors (Mako and Szakonyi 2016).

These pedestrian risky behaviors have received little attention in Ghana, especially at zebra crossings. Existing studies including Afukaar et al. (2008), Damsere-Derry et al. (2010), and Obeng-Atuah et al. (2017) focused mostly on pedestrian crashes in Ghana. Specifically, Damsere-Derry et al. (2010) assessed pedestrians' injury patterns in Ghana and Aidoo et al. (2013) investigated the effects of road and environmental characteristics on pedestrian hit-and-run road traffic crashes (RTCs) in Ghana. Obeng-Atuah et al. (2017) investigated pedestrian crossings in urban Ghana. Although these studies provide ample information on pedestrian safety in Ghana, they fail to address pedestrian risky behavior when using the zebra crossings. Zebra crossings are pedestrians' right-of-way and are expected to record very low incidence of pedestrian crashes (if any) because drivers will stop for them to cross.

CONTACT Thomas Ojo thomas.ojo@ucc.edu.gh Department of Geography and Regional Planning, Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, Cape Coast, Ghana.
Associate Editor Richard Frampton oversaw the review of this article.
Supplemental data for this article is available online at on the publisher's website.
Supplemental Material

There are a number of pedestrian crashes in the Cape Coast Metropolis and few zebra crossings. Having more zebra crossings in the metropolis would help address this pedestrian problem but we do not know whether they are really safer, so research is being conducted at existing zebra crossings to look at the safety of their usage. There are 23 zebra crossings in the metropolis and few have road signs. Some are on 2-lane carriageways, especially on the University of Cape Coast (UCC) campus very close to a bus stop.

The study is guided by the following questions:

1. What is the level of pedestrian crashes in the metropolis from 2007 to 2016?
2. How do pedestrians utilize the zebra crossings?
3. Do gender, age group, pedestrian status, and the areas where the zebra crossings are located influence crossing behavior?

Answering these questions will help in understanding the magnitude of pedestrian crashes in the metropolis and also reveal how pedestrians use the pedestrian facilities. The findings of the study will inform the National Road Safety Commission on the need to intensify road safety education on pedestrian right-of-ways and the officials of the Motor Transport and Traffic Department of the Ghana Police Service to arrest and prosecute pedestrians who engage in risky crossing behaviors. The current study will provide further insights into behavioral studies on road safety in the metropolis as in Ogunleye-Adetona et al. (2018) and Ojo (2018) with low seat belt and child restraint use irrespective of the type of residential area.

Methods

Study area

Cape Coast Metropolis is bordered by the Gulf of Guinea to the south, Komenda-Edina Eguafo Abirem Municipality to the west, Abura Asebu Kwanmankese to the east, and Twifo Lower Denkyira to the north. According to the 2010 Population and Housing Census, the population of the Cape Coast Metropolis is 169,894 which is 7.7% of the total population of the central region. The metropolis, with about 25 residential areas, is home to prominent secondary schools such as Wesley Girls High School, Mfantsipim School, St. Augustine's College and Holy Child School, and 2 universities (UCC and Cape Coast Technical University). There are 23 zebra crossings in the metropolis, with 6 in the Cape Coast Township (low-income), 12 in medium-income residential areas (3 at Adisadel, 4 at Ola, and 5 at Pedu), and 5 on the UCC campus (high-income).

Research design

The study is a mix of naturalistic exploratory and descriptive research designs that seeks to provide information on a phenomenon that may call for an extensive future study.

Sources of data

Primary (observational checklist) and secondary (crash data from the Building and Road Research Institute) sources of data were used in the study. The secondary data provide information on the incidence of pedestrian crashes in the metropolis. The secondary data do not indicate whether pedestrian crashes occurred at zebra crossings or elsewhere.

Target population/sample size

All pedestrians using zebra crossings in the metropolis were eligible for the study. However, the study focused on pedestrians utilizing zebra crossings at the UCC (high-income), Pedu (medium-income), and Cape Coast Township (low-income). Based on the experiences of the pilot study, an average of 75 observations was targeted daily for 28 working days between February and March 2018 at each of the three purposively selected residential areas. Therefore, the researchers targeted 2,000 pedestrians each from 6, 5, and 5 observation sites at Cape Coast Township, Pedu, and UCC campus.

Sampling procedure

The study adopts a purposive sampling technique. Therefore, only pedestrians using the zebra crossing when a car had stopped for them were observed.

Data collection procedure

Fourteen research assistants trained in a classroom environment conducted the study. Two research assistants were stationed at each of the zebra crossings for interobserver reliability. These assistants were stationed at about 50 m from the zebra crossings to avoid being noticed by the pedestrians, which may distort the natural setting needed for the observation.

Any pedestrian crossing the road without using the zebra crossing was excluded. The research team suspended the observation whenever a driver stopped for a pedestrian to cross and resumed when the vehicle passed over the zebra crossing. The sociodemographic characteristics (gender [male and female] and approximate age group [<18, 18–25, 26–50 and >50] of the pedestrians in addition to crossing behavior (alone or in the company of others, talking on the phone, wearing headphones or an earpiece/hands-free, or eating/drinking). Similar behavioral studies have used guesswork to determine the age group of the observed in the metropolis (Ogunleye-Adetona et al. 2018; Ojo 2018).

On average, 75 observations were made between 11:00 a.m. and 1:00 p.m. and between 3:00 p.m. and 5:00 p.m. for 28 working days in February–March 2018. The study focused on risky behaviors of pedestrians on weekdays. The team focused on pedestrians exhibiting risky behavior if found in a group using the zebra crossings. Hence, one of the pedestrians was observed.

The metropolis was divided into low (Cape Coast Township), medium (Pedu), and high (UCC campus) residential areas as in Ojo (2018) and Ogunleye-Adetona et al. (2018). The observation sites were the zebra crossings in Cape Coast Township (6), Pedu (5), and UCC (5). Two of the zebra crossings on UCC campus are on dual-carriage lane with the one adjacent the main library having a designated bus stop. Two of the zebra crossings at Pedu junction are on

Table 1. Pedestrian crossing behaviors in the Cape Coast metropolis

Characteristics	*N* (%)	Risky behavior Yes, *n* (%)	Talking Yes, *n* (%)	Eating/drinking Yes, *n* (%)	Using phones Yes, *n* (%)	Earpiece/headphones Yes, *n* (%)
Pedestrians	6,010	3,880 (64.6)	2,008 (33.4)	310 (5.2)	975 (16.2)	587 (9.8)
Residential area						
High	2,042 (34.0)	1,556 (76.2)***	671 (38.9)***	107 (5.2)***	430 (21.1)***	348 (17.0)***
Medium	1,988 (33.1)	609 (30.6)***	382 (19.2)***	46 (2.3)***	101 (5.1)***	80 (4.0)***
Low	1,980 (32.9)	1,715 (86.1)***	955 (48.2)***	157 (7.9)***	444 (22.4)***	159 (8.0)***
Gender						
Male	3,363 (56.0)	2,077 (61.8)***	1,013 (30.1)***	139 (4.1)***	537 (16.0)**	388 (11.5)***
Female	2,647 (44.0)	1,803 (68.1)***	995 (37.6)***	171 (6.4)***	438 (16.5)**	199 (7.5)***
Age group						
<18	1,128 (18.8)	764 (67.7)***	399 (35.4)***	113 (10.0)***	168 (14.9)***	84 (7.4)***
18–26	3,377 (56.2)	2,509 (74.3)***	1,253 (37.1)***	164 (4.9)***	662 (19.6)***	430 (12.7)***
26–50	1,320 (22.2)	554 (42.0)***	312 (23.6)***	32 (2.4)***	139 (10.5)***	71 (5.4)***
>50	185 (3.1)	53 (28.6)***	44 (23.8)***	1 (0.5)***	6 (3.2)***	2 (1.1)***
Pedestrian status						
Alone	3,870 (64.4)	1,975 (51.0)***	661 (17.1)***	240 (6.1)***	670 (17.3)**	404 (10.4)**
Two	995 (16.5)	774 (77.8)***	568 (57.1)***	41 (3.8)***	84 (8.4)**	81 (8.1)**
More than 2	1,145 (19.1)	1,131 (98.8)***	779 (66.9)***	30 (2.4)***	221 (19.3)**	102 (8.9)**

*P value significant at <.05; **$P < 0.01$; ***$P < 0.000$.

a dual-carriage lane very close to a bus terminal on one side. All of the zebra crossings in the Cape Coast Township are on one-lane roads very close to schools or office complexes. Drivers operating in the metropolis are supposed to observe a speed limit of 30 km/h as stipulated in the Road Traffic Act (2004) and Road Traffic Regulation (2012). There are road signs indicating this speed limit in the metropolis.

Data analysis

The primary and secondary data were analyzed using descriptive statistics such as frequencies and percentages with Pearson's chi-square correlation used to establish the relationship between dependent (risky behavior) and independent (sociodemographic characteristics such as gender, age group, residential type) variables at a P value $< .05$.

Results

Trend analysis of pedestrian crashes from 2007 to 2016

Table A1 (see online supplement) < shows that 328 pedestrian crashes occurred between 2007 and 2016, with the majority resulting in either fatalities or serious injuries. More than 70% of the pedestrian crashes were either midblock or at a T-junction. Most (52.4%) of the pedestrian crashes occurred between 2010 and 2013, with no fatalities in 2014.

Pedestrian behaviors at zebra crossings

A total of 6,010 pedestrians were successfully observed using a zebra crossing; 56.0% were males, 75.0% were aged <26 years old, and 64.4% used the zebra crossing alone. Overall, 64.6% of pedestrians observed exhibited risky crossing behavior, and talking (33.4%) was the most observed risky behavior, followed by using a mobile phone (16.2%) and earpiece/headphones (9.8%) at zebra crossings (see Table 1). Generally, more females (68.1%) than males (61.8%) used the zebra crossings in a distracted manner. In comparison, more females than males engaged in talking (37.6 vs. 30.1%) and eating/drinking (6.4 vs. 4.1%) when crossing the road but used earpieces/headphones less (7.5 vs. 11.5%). Most of the observed pedestrians who were 18–26 years old engaged in talking (37.1%), using phones (19.6%), and had earpieces/headphones (12.7%) compared to their cohorts. Pedestrians walking in groups are more likely to engage in talking (66.9%) at zebra crossings and using a mobile phone (19.3%). Singleton pedestrians crossing a road are more likely to be observed eating/drinking (6.1%) and using earpieces/headphones (10.4%).

Relationship between sociodemographic characteristics and pedestrian risky behaviors

As shown in Table 1, variables such as location, age group and pedestrian status are related to risky crossing behaviors such as talking, eating/drinking, using phones, and using earpieces/headphones at $P < .005$. Only gender does not have a relationship with using a phone at $P > .005$.

Discussion

The study revealed that the majority of the 328 pedestrian knockdowns occurred midblock irrespective of the degree of injuries sustained and that talking was the dominant pedestrian behavior when using a zebra crossing. The study further revealed that pedestrian risky behaviors are influenced by gender, age group, the residential area where the zebra crossings were located, in addition to whether the pedestrian was crossing alone or in the company of other pedestrians.

There are 6 known designated locations of pedestrian crashes in urban Ghana: Midblock, crossroad, T-junction, staggered junction, Y-junction, and roundabout. In the current study, most pedestrian crashes occurred midblock, similar to international comparisons in Europe (Gitelman et al. 2012). The current study further revealed that T- and Y-junctions were the second and third locations with the majority of pedestrian crashes in the metropolis. The lack of understanding between the pedestrian and vehicle driver accounts for this phenomenon. Available pedestrian crash data from

Building and Road Research Institute (BRRI) provide no information on the incidence of pedestrians at zebra crossings. However, it is expected that low numbers of pedestrian crashes will be recorded at zebra crossings because drivers may be aware of the pedestrian right-of-way.

In the study, talking was the dominant pedestrian risky behavior at zebra crossings. This contradicts most studies where the use of a mobile phone dominates (Hyman et al. 2010; Schwebel et al. 2012). Talking with fellow pedestrians, like using a mobile phone, makes the user cross the zebra crossing slowly and is also associated with a cognitive distraction that may undermine pedestrian safety (Schwebel et al. 2012). This causes blindness even during a simple activity that should require few resources (Hyman et al. 2010).

The prevalence of risky behaviors such as the use of mobile phones and eating/drinking by pedestrians in zebra crossings in the high-income area is inconsonant with the assertion that higher class predicts unethical behavior (Piff et al. 2012). On the contrary, pedestrians in high-income residential areas are not expected to exhibit these risky behaviors because of their level of education and income (Ojo 2018). In addition, they should be aware of the consequences of such behaviors and thus have a higher value for life. Female and older pedestrians (>50 years old) are risk averse and as such will not exhibit behaviors that may predispose them to RTCs, as is evident in the current study. This is not inconsonant with findings in Ghana (Abane 1993, 2010; Obeng-Atuah et al. 2017). Females are noted to socialize and thus engage in talking and using mobile phones more than males. Pedestrians using the zebra crossings alone are more likely to engage in risky behaviors, as shown in the current study. Walking with other pedestrians keeps singletons occupied.

In order to improve pedestrian safety in the metropolis, the National Road Safety Commission should carry out periodic road safety education, especially at the basic schools and in residential areas where there are zebra crossings. Officials of the Motor Transport and Traffic Department of the Ghana Police Service should enforce the law mandating that drivers respect the pedestrian right-of-way to encourage their use by residents. Furthermore, the National Road Safety Commission should intensity road safety campaigns with regards to the dangers associated with risky pedestrian crossing behaviors such as making/receiving a call, talking, or eating/drinking while using the zebra crossings.

One major limitation of this study was the exclusion of pedestrians' perceptions on the use of zebra crossings in general and pedestrian risky crossing behaviors. Future research can consider the 2 phenomena in order to influence policy. Another limitation is the possibility of a pedestrian being observed several times in the course of the study. However, this does not affect the result of the current study phenomenon.

Dedication

This study is dedicated to the primary 1 pupil killed very close to a zebra crossing adjacent to Catholic Jubilee Boys School, Cape Coast, on his way to school during the data collection stage of the study on February 27, 2018.

Author contributions

T.K.O. and C.O.A. designed the study. W.A. and F.A. collected the data. T.K.O. and C.O.A. analyzed the data and drafted the article. F.A. and W.A. revised the article.

ORCID

Thomas Ojo http://orcid.org/0000-0001-9737-9827

References

Abane AM. Driver behaviour and city traffic: empirical observations from Accra, Ghana. *Research Review of the Institute of African Studies*. 1994;15(1–2):1–13.

Abane AM. Background characteristics and accidents risk of commercial vehicle drivers in the Cape Coast–Elmina area of the Central Region. *Oguaa Journal of Social Sciences*. 2010;5:64–86.

Afukaar FK, Agyemang W, Most I. *Accident Statistics 2007*. Kumasi: Building and Road Research Institution Council for Scientific and Industrial Research; 2008.

Aidoo EN, Amoh-Gyimah, R, Ackaah, W. The effect of road and environmental characteristics on pedestrian hit-and-run accidents in Ghana. *Accid Anal Prev*. 2013;53:23–27.

Damsere-Derry J, Ebel BE, Mock CN, Afukaar F, Donkor P. Pedestrians' injury patterns in Ghana. *Accid Anal Prev*. 2010;42:1080–1088.

Donroe J, Tincopa M, Gilman RH, Brugge D, Moore DA. Pedestrian road traffic injuries in urban Peruvian children and adolescents: case control analysis of personal and environmental risk factors. *Plos ONE*. 2008;3:e3166.

Ghana Educational Service Report. Cape Coast Metropolitan Area. Accra: Assembly Press; 2014.

Gitelman V, Balasha D, Carmel R, Hendel L, Pesahov F. Characterization of pedestrian accidents and an examination of infrastructure measures to improve pedestrian safety in Israel. *Accid Anal Prev*. 2012;44:63–73.

Hyman IE, Boss SM, Wise BM, McKenzie KE, Caggiano JM. Did you see the unicycling clown? Inattentional blindness while walking and talking on a cell phone. *Appl Cogn Psychol*. 2010;24:597–607.

Ipingbemi O. Travel characteristics and mobility constraints of the elderly in Ibadan, Nigeria. *J Transp Geogr*. 2010;18:285–291.

King MJ, Soole D, Ghafourian A. Illegal pedestrian crossing at signalized intersections: incidence and relative risk. *Accid Anal Prev*. 2009;41:485–490.

Kwakye EA, Fouracre PR, Ofosu-Dorte D. Developing strategies to meet the transport need of the urban poor in Ghana. *World Transport Policy & Practice*. 1997;3:8–14.

Mako E, Szakonyi P. Evaluation of human behaviour at pedestrian crossings. *Transp Res Proc*. 2016;14:2121–2128.

Obeng-Atuah D, Poku-Boansi M, Cobbinah PB. Pedestrian crossing in urban Ghana: safety implications. *J Transp Health*. 2017;5:55–69.

Ogunleye-Adetona C, Ojo T, Afukaar F. Assessment of seat belt use in University of Cape Coast campus, Ghana. *Urban Plan Transp Res*. 2018;6:22–34.

Ojo TK. Seat belt and child restraint use in a developing country metropolitan city. *Accid Anal Prev*. 2018;113:325–329.

Piff PK, Stancato DM, Côté S, Mendoza-Denton R, Keltner D. Higher social class predicts increased unethical behavior. *Proc Natl Acad Sci*. 2012;109:4086–4091.

Road Traffic Act. *Republic of Ghana*. Accra: Assembly Press; 2004.

Schwebel DC, Stavrinos D, Byington KW, Davis T, O'Neal EE, De Jong D. Distraction and pedestrian safety: how talking on the phone, texting, and listening to music impact crossing the street. *Accid Anal Prev*. 2012;45:266–271.

Wigan M. Treatment of walking as a mode of transportation. *Transp Res Rec*. 1995;7–13.