Ibadan Journal of the Social Sciences

Contents

VOLUME 10 / NUMBER 2 / SEPTEMBER 2012

FACULTY OF THE SOCIAL SCIENCES, UNIVERSITY OF IBADAN
ISSN 1597 5207

Ibadan Journal *of the*
Social Sciences
Volume 10/ Number 2/ September 2012

Subscriptions and Marketing

Two issues of IJSS are published per year, in March and September, by the Faculty of the Social Sciences, University of Ibadan, Nigeria. **Annual subscriptions** (2005): Nigeria and ECOWAS Member States x1,500 (individual), x3,000 (institution); Outside ECOWAS, rest of Africa, and the world US$30 (individual), US$75 (institution); **Single Issues** (2005): Nigeria and ECOWAS Member States x400 (individual), x650 (institution); Outside ECOWAS, rest of Africa, and the world US$40 (institution). Advertising and other marketing details are available from:

The Business Manager
Ibadan Journal of the Social Sciences (IJSS) Department of Economics
University of Ibadan, Ibadan, Nigeria
Email: journal.ijss@mail.ui.edu.ng

ISSN:1597-5207

Printed by Samlad Printers, Mokola, Ibadan 08028252503

Ibadan Journal *of the* Social Sciences

Volume 10/ Number 2/ September 2012

Contents

© Ibadan Journal of the Social Sciences
Volume 10, Number 2, March 2012

Effect of Land Use, Time of Day and Vehicle Type on Seat Belt Use in Lagos, Nigeria.

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The seat belt has been proven to be effective in the reduction of traffic injuries and deaths. Despite the efficacy and strict enforcement of legislation, it has been frequently underutilized in many countries including Nigeria.The aim of this study was to investigate the seat belt use rate, and determine the effect of land use types, vehicle types and time of day on observed rates in a local government area of Lagos state, Nigeria. A two-day cross-section observational survey was conducted in three observation points. The use rates by land use type, time of day and vehicle type were observed. A total of 40,753 vehicles were evaluated. In general, 43.1 percent of drivers observed used the seat belt. The highest seat belt compliance rate was observed in the residential sector (55.8%), among private cars (65.1%), and between 1.00pm and 4.00pm (44.8%). The chi-square analysis confirmed significant differences in seat belt use across three land use types (X^2=609.72, p = 0.001), vehicle types (X^2= 11780.31; p = 0.001) and time of day (X^2= 59.86; p= 0.001). More seat belt education and stricter enforcement of the seat belt regulation were suggested to raise the level of seat belt use in concerned areas, vehicle types and at the affected time intervals.

Keywords: seat belt use, traffic injuries, observational survey, road accidents, Nigeria.

Introduction

Road traffic accidents around the world are becoming more and more worrisome, given the heavy toll on human lives and financial resources. Road traffic injuries are among the three leading causes of death for people between ages of 5 and 44 years, killing more each year than malaria (WHO, 2010). It also affects millions of human lives costing billions of dollars in economic loss every year (Jacob et al. 2000).

In the attempt to minimise the loss of life and injuries often resulting from these road traffic accidents, consistent use of seat belt by motorists has been recommended as one of the most effective ways of reducing traffic fatalities and injuries (NHTSA, 1999; Wells et al. 2002; Cunill et al. 2004; Bendak, 2005). The National Highways Traffic Safety Administration (NHTSA, 1999) observed that the consistent use of seat belt can reduce risk of serious injuries between 50%-83%, while Petridou et al. (1998) noted that 27% of road fatalities can be avoided if car occupants use seat belt. Therefore, it is an effective safety device. However, poor compliance with seat belt legislation has been an issue of growing concern in many countries (Knishkowy and Gofin, 2002; Passmore and Ozanne-Smith, 2006). Seat belt use for drivers and front seat passengers in Nigeria has been legally mandatory since 2004 (Ipingbemi, 2012). Despite the enforcement, some studies have reported relatively low seat belt use rates in the country (Sangowawa et al. 2005, Sangowawa et al. 2010).

Previous research shows seat belt use is influenced by several factors which include gender (NHTSA, 2000; Wells, 2002; Zambon et al. 2008, Bilgic et al. 2011), socio economic status, educational and marital status (Strine et al. 2010), ethnicity (Wells et al, 2002), road type (Cunhill et al. 2004; Ipingbemi, 2012), time of day (Routley et al. 2008), vehicle type (Routley et al. 2008; NHTSA, 2005), driver and front seat

passengers (Routley et al. 2008) and day of week (Routley et al. 2008). In addition, the literature reveals regional, rural-urban, intra and inter-city variationsin seat belt use (Bendak, 2005; Strine et al. 2010). These past studies provide a good background with respect to seat belt use, but there is a paucity of research considering the possible influence of land use type, time of day, and vehicular type in developing countries. Thus, an observational survey was carried out in June, 2011 to determine the seat belt use among drivers,in three land use types at different time periods using different vehicle types in Lagos state, Nigeria.

Study Context and Methodology

Study context

Lagos State is one of the states with the highest injuries and deaths resulting from motor accident. In 2007, there were 4,299 road accidents in Lagos state, and it involved 5826 vehicles. In all, these accidents resulted in 2,411 injuries and claimed the lives of 909 people in the state (Lagos State Government, 2010). Lagos State has the highest population density in Nigeria, with a figure of 2,455 persons per square kilometre. It also had a total of 548km of roads in 2000 and a breakdown of these roads show that the Federal government owned 287.1km, state 217.6km while the remaining 43.3km belong to the local government areas (LSG, 2010). Lagos has one of the highest motorisation rates in the country. The number of registered vehicles in 1999 was 210,798 in the State and out of this figure, 153,781 were private; 32,490 commercial; 22,467 were corporate vehicles while the remaining 1,170 were government owned (Lagos State Government, 2010).

The study context, Ojo local government is one of the twenty local government areas (LGAs) in Lagos state, Nigeria. It is located between $6^0$28' N 3^0 11'E and 6^0 46'N 3^0.18'E, and occupies an area of about 182 square kilometres of which 10.44 percent is riverine. With a population of 941,523 as at 2006 and population density of 5,173 persons per square kilometre, it is surrounded by Amuwo Odofin, and Badagry LGAs in the east, north, west and Lagos lagoon in the south. Though cosmopolitan in nature, it was first inhabited by the Aworis. Presently, it enjoys a mix of many Nigerian ethnic groups such as the Igbos, Hausas,Urhobos, Itsherikis etc. The study area has a varied land use pattern comprising mainly residential, commercial and institutional land use areas. Prominent features in these areas include the Lagos State University, Ojo campus; Adeniran Ogunsanya College of Education, Ijanikin; Federal Government College, Ijanikin;Iyana Iba market and the Alaba International market.

Methods

Data for the study were gathered from the two-day cross section observational survey carried out in Ojo local government area of Lagos state, Nigeria. The main outcome of interest was the observed use of seat belts of drivers according to land use, vehicle type and time of day.

A preliminary survey was conducted in order to identify the various land uses that characterised the area of study. Three land use types namely residential, institutional and commercial land use were identified. The choice of location where vehicle counts took place was informed by the predominant land use in the vicinity. Three observation points were purposively selected. Mile 2 area was chosen for the commercial land use because of the strong presence of commercial activities there. It also provided a convenient point for observations of commercial and private drivers. The Lagos State University was selected to represent institutional land use type while Baale community was chosen to represent the residential land use.

Drivers' use of seat belt was observed simultaneously in these three locations in June 2011 by 300 level undergraduate students of the Department of Geography, University of Ibadan, Nigeria, who served as field assistants. They were trained by the authors on how to conduct the observational study. Field assistants were assigned to the three observation sites to count and document driver's seat belt compliance,the total number of vehicles that passed (irrespective of whether they used seatbelt or not). The number of drivers/vehicles that used seat belt was recorded on tally sheets and classified by vehicle type. One observer group at every location swapped with another every hour so as to avoid fatigue during observation. These observations were conducted for two days from 8.00 am to 6.00 pm at the designated locations.

The data obtained from this survey were subsequently classified by use of seat belt into two: use of seat belt, vehicle type (private cars, public cars, private buses and public buses), land use type

(commercial, residential, and institutional) and time of day (morning low, morning high, afternoon high and afternoon low). The data set was eventually analysed using Statistical Package for the Social Scientists (SPSS) version 15 . Chi square analysis was used to determine the variations in seat belt use between the different groups observed in this study.

RESULTS

Seat belt use

In all, a total of 40,753 vehicles were observed for seat belt compliance over a period of ten hours for a period of two days. Generally, the results of the observational survey showed that 43.1% of the drivers used seat belts. In other words, more than half of the drivers failed to comply with safety regulation.

Variations in Seat belt use by Land use type

Out of the total of 40,573 drivers, 18,983 vehicles were seen in the commercial sector; 5,301in the residential area while 16,469 vehicles were seen in the institutional area. Use rates of 55.8% (2,956 vehicles), 44.8% (8,504 vehicles) and 37.1% (6,111 vehicles) were recorded in the residential, commercial and institutional land use areas respectively.This clearly show seat belt compliance was at its highest level in the residential land use area (Figure 1). The result of chi square analysis showed there was a significant variation in the level of seat belt use across the three land use types (X^2=609.72, p = 0.001).

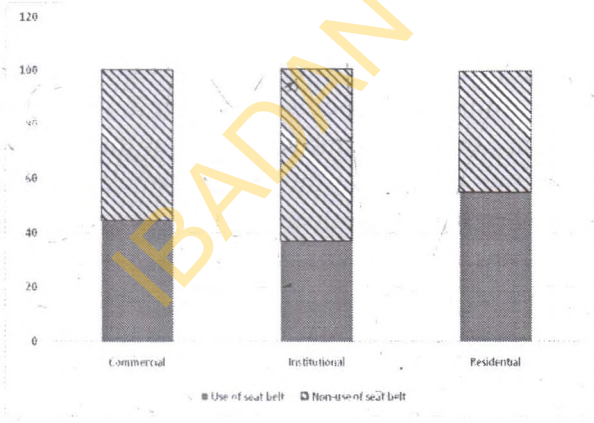

Figure 1: Variations in seat belt use by land use type.

Variations in Seat belt use by Vehicle Type

There were 21,586 private cars; 1,101 public cars; 2,892 private buses and 15,174 public buses during the traffic survey. Out of the 21,586 private cars,14,056 (65.1 %) used seat belts while 591 drivers (53.7%) out of the 1,101 public cars were sighted with seat belts. Only 1,608 out of the 2, 892 private bus drivers (55.6%) used seat belt whereas 1,316 (8.7%) out of the 15, 174 public buses complied (Figure 2).Of the four vehicle types observed, private cars had the highest seat belt compliance rate. The chi-square result confirmed this considerable difference in seat belt use rates among the vehicle types (X^2=11780.31; p = 0.001).

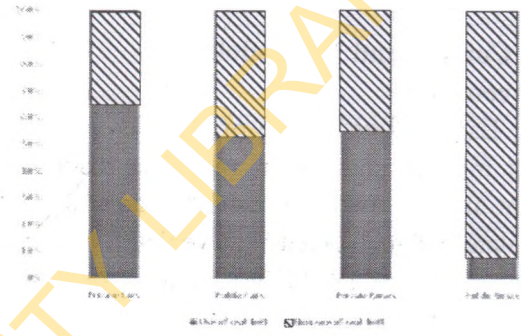

Figure 2: Vehicular Variations in Seat Belt Use

Variations in Seat belt use by Time of Day

The traffic survey period was categorised into four namely morning high, morning low, afternoon low and afternoon high. This classification was based on the observed traffic trends in the study area.The first low traffic period was between 8.00 am and 10.00 am (morning low), and this is usually followed by a heavy traffic period between 10.00 am and 1:00pm (morning high). This period was followed by another heavy traffic period between 1:00pm and 4:00pm (afternoon high), while the second low traffic regime peak was between 4:00pm and 6:00pm (afternoon low).

The results of the survey shows there were 9,529 vehicles during morning low; 11,416 during morning high while 13,649 were counted during afternoon high and 6,429 during afternoon low. It was observed that 4,104 drivers (44.3%) used the seat belt during the morning low; 4,976 drivers (43.6%) during the morning high; 5,546 (40.6%) during afternoon highand 2,945 (48.8%) during the afternoon low. Figure 3 shows that the highest seat belt compliance occurred between 1.00 pm and 4:00pm. The chi-square result indicates that there was a significant difference in seat belt use by time of day (X^2= 59.86; p= 0.001).

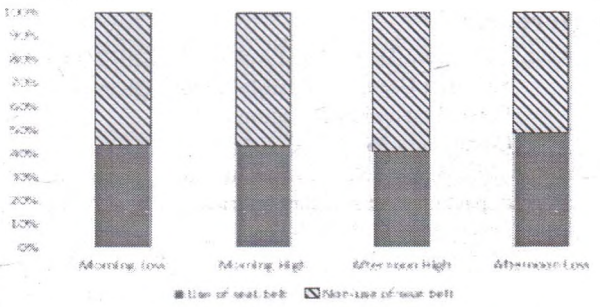

Figure 3: Variations in seat belt use by time of day

Discussion

The study shows that the study area has a seat belt use rate of 43.1 percent. In relative terms, it is higher than 18.7 percent in Ibadan metropolis (Sangowawa et al. 2010) but lower than that of Osogbo, Nigeria with 47 percent (Olukoga et al. 2010). Furthermore, it ranks below some other locationslike New York, USA where seat belt compliance reached 91% in 2011 compared to 88% and 90% usage rates in 2009 and 2010, respectively. (http://www.wbng.com/news/state/State-Seatbelt-Compliance-at-All-Time High125569488.html), the US national seat belt use rate of 85 percent (Strine et al. 2010) and Fife, Scotland with 97 percent, (Campbell et al. 2007). Then the key question emerges: why is the level of seat belt compliance persistently low in the country? Three factors may be said to be responsible. First, some Nigerian vehicles may not possess safety belts. Second, many drivers may not believe in the effectiveness of the safety device. Third, there might be a low level of seat belt awareness among Nigerian drivers.

The study has shown that seat belt use varied by land use type. Residential land use zone had the highest compliance rate. Interestingly, this goes contrary to the anticipated high compliance rate in the institutional area where a high level of safety belt awareness should prevail. Hence, the explanation for the high seat belt use rate in the residential areas may well be accounted by the presence of road safety officials in those parts. This result is similar to the differences observed in seat belt use between the working class and middle class suburbs of Riyadh, Saudi Arabia (Bendak,2005) and also conforms to what was observed in Kumasi, Ghana where seat belt use was lower within the central business district than outside the central business district (Afukaar et al.2010).

Though the use rates were generally low throughout the time periods, there was a significant difference in seatbelt compliance at the different time segments of the day. It was noticed that drivers complied most between 4:00 pm and 6:00 pm andbetween 10:00 am and 1:00 pm. This finding is similar to Routley et al. (2008) where 7.00 am -8.00 am had a higher likelihood of wearing than 6.00 am - 7.00 am, and at the same time contradicts Stevenson et al. (2007) who noted less use at late hours especially at night. The implication of this is that seat belt compliance appeared to be time dependent. The high level of seat belt compliance between the hours of 10:00 am and 1:00 pm, and 4.00 pm and 6.00 pm could be due to the activities of road safety officers, whose duty is to ensure seat belt compliance, at that point in time. This explanation is further strengthened by Strine et al. (2010) who are of the opinion that the fear of law enforcement officers could be one major reason why most people comply.

Private car drivers used the seat belt most while the public bus drivers had the lowest use rate. This echoes Sangowawa et al. (2010)'s finding that "drivers of private vehicles used more than company, government and commercial vehicles". In addition, it goes with the observation in Burns et al. (2003)'s compliance study in Scotland where it was noticed that light vans and taxi occupiers use seat belts less frequently than car occupants, and again similar to higher use rates among private car drivers in Kingston, Jamaica (Crandon et al. 2006), higher rates among passenger cars than pickup cars (NHTSA, 2000) and Routley et al. (2008)'s study in Nanjing, China where "car and van drivers are more likely to wear than taxi and pickups". This result can be partly explained in the following ways. It could be some public vehicles donot have safety belts. Another explanation is they often need to pick passengers, load or unload passenger items at bus stops. These frequent activities could eventually discourage the use of seat belt among public vehicle drivers. These factors thus could possibly affect seat belt use.

It is pertinent to emphasize that a study of this kind has its limitations. Firstly, the overestimations in vehicle count are likely to occur. In recognition of this flaw, it was ensured that a vehicle was not counted more than once. Secondly, the study was conducted in

one local government area of Lagos state, the results of which cannot be generalised to the whole state.

Conclusion

In summary, seat belt use among drivers in the study area had a rate of 43.12 percent. Despite the awareness of the seat belt regulation and strict enforcement by Nigeria's Federal Road Safety Commission (F.R.S.C), more than 50 percent did not use seat belt. This confirms that seat belt use is still below average in Nigeria. Comparatively, it is lower than those observed in developed countries. The study also shows seat belt use is significantly influenced by land use type, time of day and vehicle type. These results not only agreed with findings of previous research, but also provided a means of identifying and targeting land use zones, vehicles and time periods with lower compliance rates.

In view of the above, a number of ways to increase seat belt use rates in Lagos state have been suggested. Firstly, more seat belt education campaigns should emphasise the effectiveness of the safety device in the prevention of injuries and deaths with a view to increasing its level of use. In the course of public enlightenment, drivers particularly public drivers would be dissuaded from viewing seat belt wearing as an official obligation or a pretext for evasion from road safety officers. Secondly, the F.R.S.C. should ensure stricter enforcement of the seat belt regulation. Thirdly, this study could be replicated in other parts of the country so as to determine the level of use and possible effect of land use, time of day and vehicle type.Lastly, research efforts should be directed towards identifying beliefs, perceptions and attitudes that might affect the use or non-use of seat belts. It is believed that outcomes from such endeavours would form the basis of evidence based action plans for road safety.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the financial support of the Department of Geography, University of Ibadan, Nigeria for the field work on which this study is based. They are thankful to the 300 level undergraduate students (2011/2012 academic session) for their active involvement in the observational survey. The useful comments of the anonymous reviewers are highly appreciated.

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