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Observing Driver Distraction Behaviors at Intersections in Calabar Metropolis, Nigeria

Anderson A. Etika & Hycienth Edubi

1. Department of Civil Engineering, University of Cross River State, Calabar, Nigeria

Abstract: Driver distraction is increasingly recognised as a critical contributor to road traffic crashes, particularly at urban intersections where drivers are required to process multiple streams of information simultaneously. This study investigates the prevalence and patterns of driver distraction behaviours at selected intersections within Calabar Metropolis, Nigeria. Using a structured observational approach, driver behaviours were recorded across major intersections during peak and off peak periods over multiple days. Distraction types were categorised into mobile phone use, passenger interaction, eating or drinking, adjustment of in vehicle controls, external environmental distractions, and cognitive inattention. Descriptive and inferential statistical analyses were employed to examine variations in distraction behaviours across locations, time periods, and driver characteristics. Results indicate that mobile phone use and passenger interaction were the most prevalent forms of distraction, with higher occurrence rates observed during peak traffic periods. The findings underscore the safety risks posed by distracted driving at intersections and highlight the need for targeted enforcement, public awareness campaigns, and context specific traffic management interventions in Calabar Metropolis. This study contributes empirical evidence from a developing country urban setting and provides a basis for policy and engineering countermeasures aimed at improving intersection safety.

Keywords: Driver distraction, Intersections, Road safety, Observational study, Calabar Metropolis.

INTRODUCTION

Road traffic crashes remain a major public health and development challenge globally, with driver behaviour identified as a dominant contributing factor. Among behavioural risks, driver distraction has gained increasing attention due to its strong association with delayed reaction times, reduced situational awareness, and poor decision-making. Distraction refers to any activity that diverts a driver's visual, manual, cognitive, or auditory attention away from the primary task of driving.

Intersections represent particularly critical locations within urban road networks. They involve complex interactions between vehicles, pedestrians, cyclists, traffic control devices, and roadside activities. As such, even brief lapses in driver attention at intersections can result in severe conflicts and crashes. International evidence indicates that a substantial proportion of urban crashes occur at or near intersections, often linked to inattention or distraction.

In Nigeria, rapid urbanisation, increasing vehicle ownership, and weak enforcement of traffic regulations have intensified road safety challenges. Cities such as Calabar Metropolis experience high traffic volumes, mixed traffic conditions, informal transport

operations, and inconsistent traffic control at intersections. These conditions create an environment where distracted driving behaviours—such as mobile phone use, interaction with passengers, and responses to roadside activities—are common and largely normalised.

Despite growing concern, empirical studies on driver distraction in Nigeria remain limited, particularly those focusing specifically on intersection environments. Most existing road safety studies emphasise general crash statistics or highway conditions, with little attention to behavioural observations at urban junctions. This gap constrains the development of evidence-based interventions tailored to local traffic realities.

This study therefore aims to observe and analyse driver distraction behaviours at selected intersections in Calabar Metropolis. By identifying the dominant forms of distraction and their temporal and spatial patterns, the research seeks to generate locally relevant evidence to support traffic safety policies, enforcement strategies, and intersection design improvements.

LITERATURE REVIEW

Concept of Driver Distraction

Driver distraction is commonly defined as the diversion of attention away from driving-related tasks toward competing activities that reduce driving performance. Regan, Lee, and Young (2011) describe driver distraction as any activity that diverts a driver's visual, manual, cognitive, or auditory attention from the primary task of driving. Similarly, Lee, Young, and Regan (2009) emphasise that distraction impairs situation awareness and increases crash risk, particularly in complex traffic environments. Empirical studies consistently demonstrate that distracted drivers exhibit delayed reaction times, reduced lane-keeping ability, and diminished hazard perception (Strayer & Drews, 2007; Caird et al., 2014).

Driver Distraction and Intersection Safety

Intersections are among the most hazardous components of urban road networks due to the convergence of multiple traffic streams and road users. According to the World Health Organization (WHO, 2018), a substantial proportion of urban traffic crashes occur at or near intersections. Regan et al. (2009) note that intersections impose high cognitive demand on drivers, requiring continuous monitoring of traffic signals, pedestrians, and conflicting vehicle movements. When drivers are distracted, their ability to detect signal changes or anticipate the actions of other road users is significantly reduced, increasing the likelihood of conflicts and collisions.

Mobile Phone Use and In-Vehicle Distractions

Driver distraction is a multidimensional phenomenon encompassing several distinct but often overlapping forms of inattention. Consistent with established literature, this study focuses on visual, manual, cognitive, and external distractions commonly observed in urban traffic environments (Regan et al., 2011; Lee et al., 2009).

Mobile phone use represents one of the most critical distraction types, as it simultaneously involves visual, manual, and cognitive components. Naturalistic driving

studies have shown that activities such as texting, dialing, and browsing significantly increase crash and near-crash risk (Dingus et al., 2016). However, mobile phone use is not the only form of distraction affecting driver performance at intersections.

Passenger-related distraction, particularly conversations within the vehicle, has also been identified as a major source of cognitive load. Strayer and Drews (2007) demonstrated that engaging in emotionally or cognitively demanding conversations reduces situational awareness and reaction time, even when drivers maintain visual focus on the road. In urban Nigerian contexts, commercial drivers frequently interact with passengers during trips, negotiating fares or responding to questions while driving, thereby increasing distraction risk (Oluwole et al., 2021).

Manual distractions such as eating, drinking, smoking, and adjusting in-vehicle controls (radio, air conditioning, navigation systems) require drivers to remove at least one hand from the steering wheel. These behaviours reduce vehicle control and slow response to sudden hazards, particularly in stop-and-go traffic conditions typical of intersections (Caird et al., 2014).

External distractions originate from the roadside environment and include pedestrians, street vendors, roadside commercial activities, billboards, and unusual traffic events. Such distractions are particularly prominent in developing cities where informal economic activities occur close to the carriageway. Olawole and Adebayo (2017) note that roadside activities significantly increase driver workload and visual scanning demands, heightening the likelihood of attention diversion.

Finally, cognitive distractions such as daydreaming, stress, and mental preoccupation may occur even when no observable secondary task is present. According to Kahneman's limited-capacity theory of attention, drivers have finite cognitive resources, and internal distractions can impair hazard perception as severely as visible secondary tasks (Kahneman, 1973). These cognitive distractions are especially relevant for commercial drivers operating under time pressure and economic stress in urban Nigerian settings.

Driver Distraction in Developing Countries

In developing countries, driver distraction is often exacerbated by weak enforcement of traffic regulations, informal transport systems, and poor road infrastructure. Peden et al. (2020) report that in low- and middle-income countries, commercial drivers frequently engage in multitasking behaviours due to economic pressures and inadequate regulatory oversight. In Nigeria, studies have identified mobile phone use, passenger interaction, and roadside commercial activities as dominant sources of distraction among urban drivers (Afolabi & Gbadamosi, 2017; Oluwole et al., 2021). These behaviours are often normalised due to inconsistent law enforcement and limited public awareness of distraction-related risks. Urban traffic conditions in a developing country like Nigeria are characterised by mixed traffic, informal pedestrian crossings, roadside trading, and inconsistent traffic control. Olawole and Adebayo (2017) argue that these conditions significantly increase driver workload and susceptibility to distraction. In cities such as Calabar, poorly maintained road surfaces, unclear lane markings, and malfunctioning traffic signals further compound the problem by forcing drivers to divide attention between navigation and hazard avoidance.

These contextual factors suggest that driver distraction in Nigerian cities may differ in pattern and intensity from those observed in high-income countries.

Research Gap

Although international literature has extensively documented the relationship between driver distraction and crash risk, there remains a paucity of empirical, observation-based studies focusing on intersection environments in Nigerian cities. Most existing Nigerian studies rely on self-reported data or aggregate crash statistics, with limited attention to real-time driver behaviour at intersections. This study addresses this gap by providing systematic observational evidence of driver distraction behaviours at selected intersections in Calabar Metropolis, thereby contributing locally grounded insights to the broader road safety literature.

METHODOLOGY

Study Area

The study was carried out in Calabar Metropolis, the capital of Cross River State, located in the South South region of Nigeria. Calabar is a fast-growing urban city known for its administrative, commercial, and tourism activities. The metropolis has an estimated population of over 400,000 people and functions as an important transportation center within the region.

Figure 3.1 presents a map of Calabar Metropolis showing the road network across the two local government areas, Calabar South and Calabar Municipality. The city features a dense and interconnected road system with several major intersections that connect residential areas, commercial centers, and institutional locations.

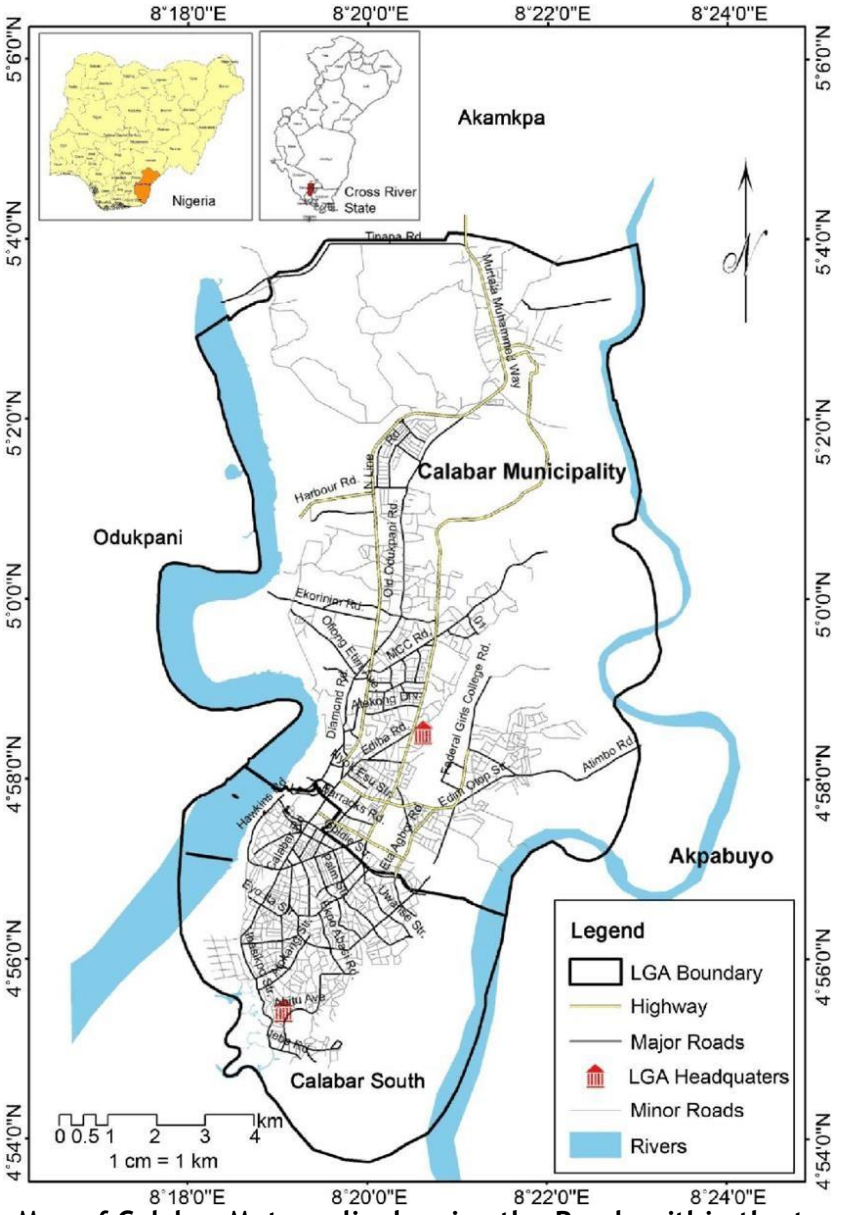


Figure 3.1: Map of Calabar Metropolis showing the Roads within the two (2) Local Governments in Calabar (Calabar South and Municipality LGAs)

Major arterial routes such as the Murtala Mohammed Highway, Marian Road, and Atekong Road play critical roles in intra-city mobility and inter-regional connectivity. These roads experience high traffic volumes and frequent congestion, particularly during peak periods. Many intersections along these corridors accommodate mixed traffic, including private cars, taxis, minibuses, motorcycles, and pedestrians.

Infrastructural challenges such as inadequate traffic signage, limited traffic control devices, potholes, uneven road surfaces, and occasional traffic signal failures are common, especially during the rainy season. These conditions increase the cognitive and visual demands placed on drivers and may encourage distraction as drivers attempt to respond to environmental hazards. The combination of high traffic density, infrastructural limitations, and diverse road users makes Calabar Metropolis an appropriate and representative setting for examining driver distraction behaviors at urban intersections in Nigeria.

Research Design

The study adopted a descriptive cross-sectional research design. The descriptive approach is suitable for identifying and characterizing the types and prevalence of driver distraction behaviors as they naturally occur at intersections. This design allows for systematic documentation of observable behaviors without influencing or altering the driving environment.

The cross-sectional nature of the study involves data collection at specific periods over the study duration, providing a snapshot of prevailing distraction behaviors among drivers in Calabar Metropolis. This approach facilitates the examination of associations between distraction behaviors and variables such as vehicle type, driver gender, time of day, and traffic conditions. The combined descriptive and cross-sectional framework provides a robust basis for understanding current distraction patterns and supports future comparative or longitudinal investigations

Data Collection, Variables and Analysis

Data for this study were collected mainly through direct roadside observation, supported by structured interviews and self-administered questionnaires. The study focused on drivers operating vehicles at selected intersections within Calabar Metropolis. These included private car owners, commercial drivers such as taxi and bus operators, as well as government vehicle drivers.

A stratified random sampling method was used to ensure that different categories of vehicles were fairly represented. The strata were based on vehicle type, and drivers were randomly selected within each group. The sample size was calculated using Cochran's formula, which produced an estimated sample of about 400 drivers in order to achieve reliable precision and confidence levels.

Direct observation served as the primary method of data collection. Trained research assistants were positioned at selected high traffic intersections where they recorded visible distraction behaviors using a structured observation checklist. Observations were carried out during peak and off-peak periods, across all days of the week, over a one-month period. Data were recorded in hourly time blocks, with distraction behaviors noted separately for male and female drivers.

The observation tool captured key forms of driver distraction such as mobile phone use, conversations with passengers, eating, drinking and smoking while driving, external distractions including billboards, pedestrians and roadside activities, adjustment of vehicle controls and entertainment systems, as well as signs of daydreaming or mental overload. The same daily observation framework was applied consistently from Monday to Sunday to ensure uniform data collection.

Qualitative data obtained from structured interviews and open-ended questionnaire responses were analyzed using thematic analysis. Interview transcripts were carefully coded and grouped into themes reflecting drivers' views on distraction, attitudes toward road safety, and contextual factors influencing their behavior. SPSS statistical package for social sciences software was used to support systematic coding and analysis. Findings from the qualitative analysis were integrated with observational data to improve the interpretation

RESULTS AND DISCUSSION

Overview of Observed Driver Distraction

Both descriptive and inferential statistical methods were used to examine the prevalence, distribution, and factors influencing driver distraction. The analysis tested the null hypothesis that there was no significant difference in distraction levels across locations, days of the week, and gender, against the alternative hypothesis that significant differences existed. The descriptive statistics for observed distraction behaviors are presented in Table 4.1.

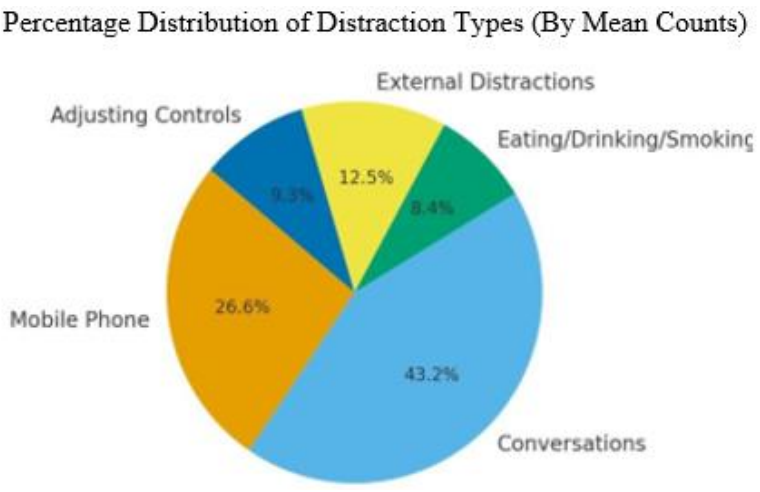
Table 4.1: Overall Descriptive Statistics (N, Minimum, Maximum, Mean, Std. Dev.)

Variable	N	Minimum	Maximum	Mean (M)	Std. Dev.
Mobile Phone	432	0	55	9.44	8.50
Conversations	432	0	80	15.31	15.47
Eating/Drinking/Smoking	432	0	43	2.98	4.18
External Distractions	432	0	39	4.43	5.42
Adjusting Controls	432	0	48	3.31	5.41

Across all intersections and observation periods, a large proportion of drivers displayed at least one form of distraction. Conversations with passengers recorded the highest mean frequency with a value of 15.31, followed by mobile phone use with a mean of 9.44. This indicates that these two behaviors are the most common sources of distraction among drivers in the study area. Eating, drinking, and smoking while driving recorded the lowest mean value of 2.98, suggesting that these behaviors were less common. These results provide a clear baseline for further spatial, temporal, and demographic analysis.

Distribution of Distraction Types

The distribution of distraction types observed at the intersections is illustrated in Figure 4.1.



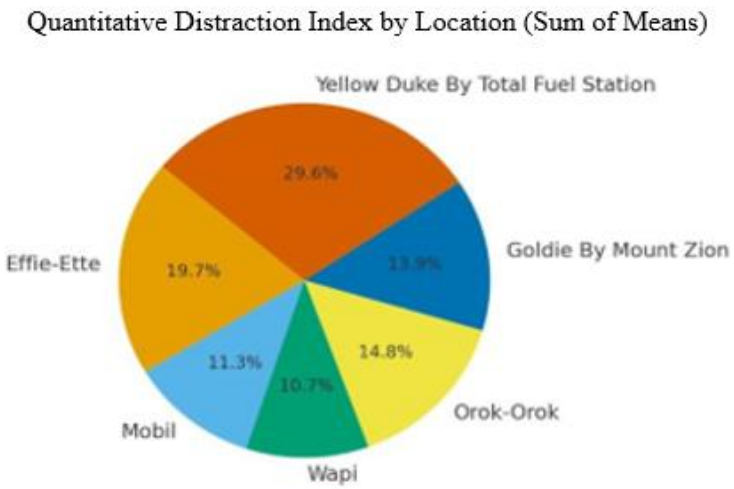


Figure 4.1: Pie Charts Demonstrating Distraction Types And Location Distraction Index

The results show that cognitive and interaction related distractions, especially conversations with passengers and mobile phone use, make up the largest share of distraction events. External distractions such as roadside activities and pedestrians also contribute notably to overall distraction levels, reflecting the busy and visually demanding nature of urban intersections in Calabar.

Figure 4.1 clearly shows the relative contribution of each distraction category to the total number of observed events.

Conversations and mobile phone use together account for the majority, highlighting the need to address both interpersonal and technology related distractions in road safety efforts.

Spatial Variation Across Intersections

Clear spatial differences in driver distraction were observed across the study locations. Mean distraction scores by location are presented in Table 4.2.

Table 4.2: Mean Distraction Scores by Observation Location

Location	Mobile Phone Mean	Conversation Mean	Eating Mean	External Mean	Adjust Mean
Effie-Ette	9.40	24.99	3.49	1.18	2.94
Mobil	7.94	8.24	2.01	4.82	1.04
Wapi	7.64	7.68	1.81	4.94	0.65
Orok-Orok	7.89	16.96	1.47	2.64	2.61
Goldie By Mount Zion	7.58	16.21	1.35	2.18	2.24
Yellow Duke by Total Fuel Station	16.19	17.82	7.74	10.83	10.35

Yellow Duke by Total Fuel Station consistently recorded the highest mean values across several distraction categories, including mobile phone use, eating, external distractions, and adjustment of vehicle controls. This suggests that drivers at this location experience significantly higher distraction pressure compared to other intersections.

Figure 4.2 presents a chart showing mobile phone usage by location, clearly demonstrating the dominance of Yellow Duke in observed distraction counts.

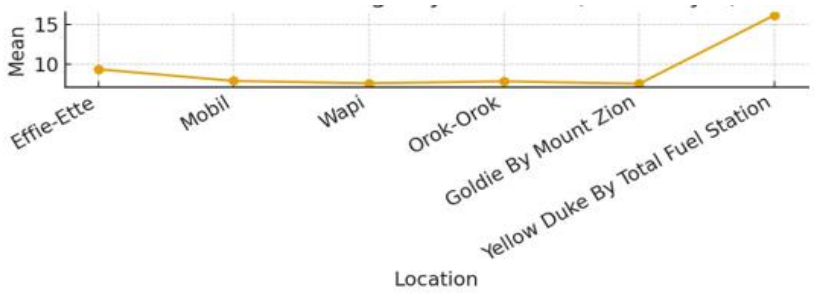


Figure 4.2: Line Chart For Mobile Phone Usage By Location.

The spatial concentration of distraction at this location is further summarized using a composite distraction index, shown in Table 4.3. With a distraction index of 62.93, Yellow Duke ranks significantly above other intersections, which recorded a mean value below 45.

Table 4.3: Distraction Index (sum of mean counts) by Location and commentary

Location	Distraction Index (Sum of Means)	Commentary
Effie-Ette	42.00	Lower activity/less stimuli
Mobil	24.05	Lower activity/less stimuli
Wapi	22.72	Lower activity/less stimuli
Orok-Orok	31.57	Lower activity/less stimuli
Goldie By Mount Zion	29.56	Lower activity/less stimuli
Yellow Duke by Total Fuel Station	62.93	High vehicle/commercial activity

The elevated distraction levels at Yellow Duke may be attributed to high traffic volumes, fuel station activities, roadside commercial operations, and frequent vehicle queueing, all of which create opportunities for drivers to engage in secondary activities. In contrast, locations such as Mobil, Wapi, and Effie-Ette recorded lower distraction indices, reflecting comparatively lower environmental stimuli and traffic complexity.

Temporal Variation by Time of Day

Temporal analysis revealed variations in distraction behavior across different times of the day. Average mobile phone use by day of the week is illustrated in Figure 4.3.

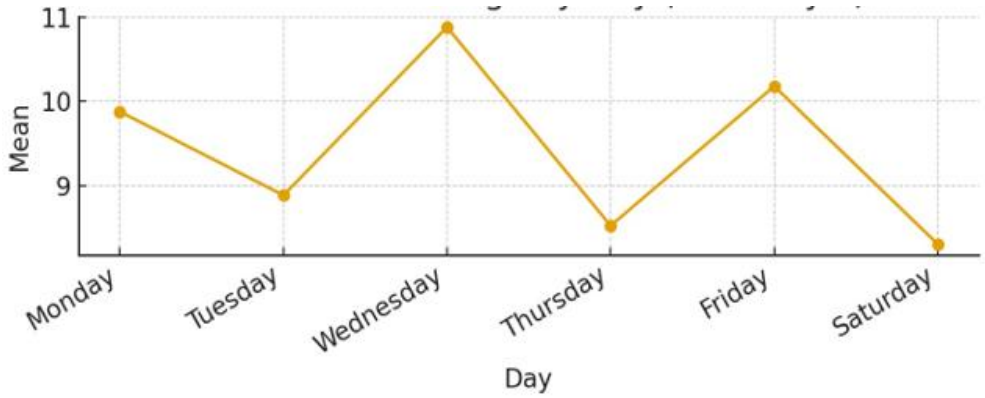


Figure 4.3: Mobile Phone Usage By Day

While Wednesday recorded the highest average level of mobile phone use with a mean value of 10.88, the one-way ANOVA results showed that differences between days of the week were not statistically significant. As a result, the null hypothesis for variation by day of the week was retained. In contrast, time-of-day analysis revealed clearer patterns. Figure 4.4 indicate that mobile phone use was highest between ten and eleven in the morning, with a mean value of 10.49.

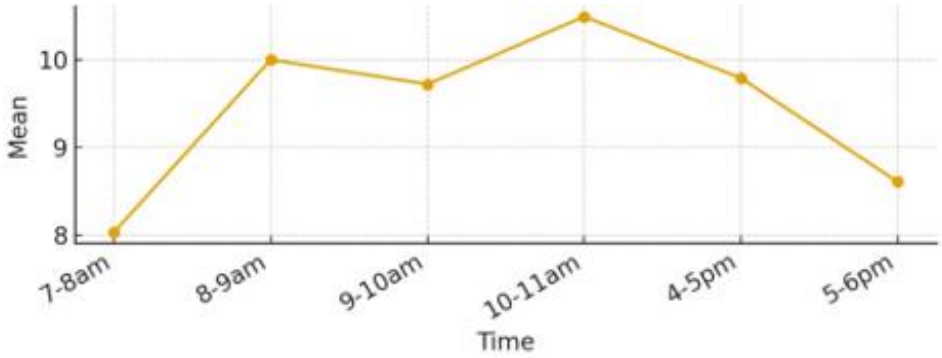


Figure 4.4: Mobile Phone Usage By Time

The period between 10am and 11am corresponds with increased commercial activities and commuter movement. Distraction levels were also relatively high during the morning and late afternoon periods when compared with early morning and evening hours. These results suggest that certain time periods carry a higher risk of distracted driving and would benefit from focused enforcement and public awareness efforts.

Discussion of Findings

The inferential statistical analysis provides strong evidence that location plays a significant role in shaping driver distraction behavior. Results from Levene's test presented in Table 4.4 show that the assumption of equal variances was violated for several variables grouped in locations, which justified the use of Welch robust tests.

Table 4.4: Levene's Test for Equality of Variances

Variable	Levene	df1	df2	p
Mobile Phone (by location)	17.21	5, 426	0.00	
Eating/Drinking/Smoking (by location)	28.10	5, 426	0.00	
External Distractions (by location)	41.50	5, 426	0.00	
Adjusting Controls (by location)	45.42	5, 426	0.00	
Mobile Phone (by day)	1.92	5, 426	0.09	
Eating/Drinking/Smoking (by day)	3.52	5, 426	0.00	

One way ANOVA results shown in Table 4.5 indicate statistically significant differences between locations for mobile phone use, eating drinking smoking, external distractions, and adjustment of vehicle controls, with all probability values equal to 0.00. The Welch test results in Table 4.6 further confirm the strength and reliability of these findings.

Table 4.8: One-way ANOVA by Location

Variable	Between SS	df between	Within SS	df within	F
Mobile Phone	4100.96	5	27057.60	426	12.91 (p = 0.001)
Eating/Drinking/Smoking	2169.27	5	5366.50	426	34.44 (p = 0.002)
External Distractions	4337.71	5	8328.35	426	44.38 (p = 0.002)
Adjusting Controls	4572.28	5	8051.39	426	48.38 (p = 0.002)

Table 4.6: Welch Robust Tests

Variable	W	df1	df2	p
Mobile Phone	5.95	5	195.76	0.001
Eating/Drinking/Smoking	14.44	5	195.57	0.002
External Distractions	33.50	5	195.53	0.002
Adjusting Controls	34.73	5	186.19	0.002

Also, the Post hoc Tukey HSD comparisons presented in Table 4.7 show that Yellow Duke by Total Fuel Station differs significantly from all other locations in terms of mobile phone use.

Table 4.7: Tukey HSD post-hoc highlights (Mobile Phone comparisons vs Yellow Duke)

Comparison	Mean Diff	p
Yellow Duke - Effie-Ette	6.79	0.0015
Yellow Duke - Mobil	8.25	0.0012
Yellow Duke - Wapi	8.55	0.0013

Yellow Duke - Orok-Orok	8.30	0.0012
Yellow Duke - Goldie By Mount Zion	8.61	0.0013

Furthermore, gender-based analysis presented in Figure 4.5 reveals that male drivers recorded noticeably higher average distraction levels across all categories, particularly for mobile phone use and conversations with passengers.

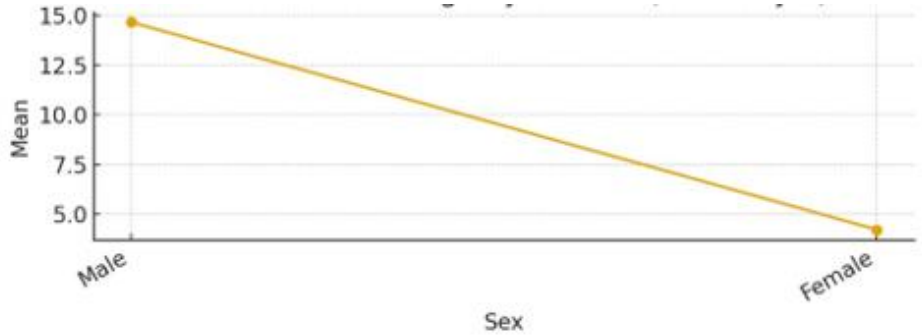


Figure 4.5: Mobile Phone Usage By Gender

These findings are consistent with previous studies that link higher distraction levels to commercial driving roles, work related pressure, and gender related driving patterns in urban environments.

Comparison with other studies conducted in other urban contexts revealed that the dominance of mobile phone use and passenger conversations observed in Calabar aligns with global trends (Strayer & Drews, 2007). However, the strong spatial variation identified in this study highlights the importance of local environmental conditions in influencing driver behavior. The results show how intersection design, roadside activities, and traffic management practices interact with human behavior to shape distraction levels.

Implications for Road Safety and Traffic Management

The findings of this study have important implications for road safety policy and traffic management in Calabar Metropolis and similar urban areas. The identification of locations with particularly high distraction levels, especially Yellow Duke by Total Fuel Station, points to the need for location-specific interventions such as enhanced enforcement, improved traffic control, and regulation of roadside commercial activities.

The observed temporal patterns suggest that mid-morning periods, especially between 10–11 am, should be given priority in enforcement and public awareness campaigns. Gender related differences further indicate that male drivers and commercial vehicle operators should be key targets for educational and behavioral interventions.

From a policy perspective, a multi-modal approach is recommended. This should include enforcement of mobile phone use regulations, sustained public education on the dangers of distracted driving, and infrastructural improvements at high-risk intersections. Effective collaboration among traffic authorities, transport unions, fuel station operators,

and urban planners will be essential for translating these findings into practical and sustainable road safety interventions.

A summary of the major risk factors and priority areas for intervention is presented in Table 4.8.

Table 4.8: Summary - Highest Distractions

Category	Highest
Location	Yellow Duke by Total Fuel Station
Time	10–11am (Mobile Phone M=10.49)
Gender	Male drivers (Mobile Phone M=14.67; Conversation M=26.57)
Day	Wednesday (Mobile Phone M=10.88) - not statistically significant
Most common distraction	Conversations (M=15.31)
Least common distraction	Eating/Drinking/Smoking (M=2.98)

These results give clear and reliable evidence that can be used to design practical, location based solutions to reduce driver distraction and make intersections safer in Calabar Metropolis.

CONCLUSIONS AND RECOMMENDATIONS

This study investigated driver distraction behaviors at selected intersections in Calabar Metropolis and provides clear evidence on the nature, distribution, and key factors influencing distracted driving in an urban Nigerian setting. Based on the analysis and hypothesis testing, the following are key findings from this study:

1. Distracted driving is a significant road safety concern in Calabar Metropolis: A large proportion of drivers were observed engaging in at least one form of distraction while approaching or passing through intersections, showing that distraction is a common and persistent behavior.
2. Driver distraction follows clear spatial patterns rather than occurring at random: Statistically significant differences were observed across locations. Intersections with intense commercial activity and frequent traffic queuing, especially Yellow Duke by Total Fuel Station, recorded the highest levels of distraction.
3. Mobile phone use and passenger conversations are the dominant forms of distraction: These behaviors consistently recorded the highest average values and together accounted for the largest share of observed distractions. This shows that both technology related and interpersonal distractions causes serious risks at intersections.
4. Gender has a significant influence on distraction behavior: Male drivers recorded higher levels of distraction than female drivers across several categories. This suggests that demographic and occupational driving characteristics play an important role in the distraction behavior.

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