FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

PERCEIVED RISK OF AIR POLLUTION AND ITS HEALTH IMPLICATIONS AMONG COMMERCIAL CAB DRIVERS IN ILORIN TOWN, KWARA STATE, NIGERIA

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https://doi.org/10/33003/jees.2025.0201/011

ABSTRACT
The study assessed the risk of exposure to air pollution among commercial cab drivers in Ilorin town, Nigeria. The objectives focused on socio-economic characteristics of commercial drivers, types and condition of vehicles, and working duration. Seasonal variation in air pollution-related symptoms experienced by commercial drivers was examined as well. A structured questionnaire was used to collect, and 394 copies were administered. Descriptive statistics, ANOVA, and t-test were used to analyse the data. The results were presented in tables and charts. Findings revealed that the drivers were male (100%), with most being over 35 years old (31.5%). The Saloon Car is the most used vehicle. Commercial cab drivers typically resume work as early as 6 am and close late in the evening. Cough (36.8%), headache (39.6%), catarrh (37.1%), depression (36.5%), and eye redness, as well as itching (39.3%), were commonly experienced by commercial transporters. The extent to which health conditions are experienced varies significantly between the rainy and dry seasons, with a F-ratio of 61.36 and a p-value of less than 0.05 (P<0.05). The differences in health conditions associated with air pollution exposure among drivers during both dry and rainy seasons were not significant, as evidenced by a t-test value of 1.8, with a p-value greater than 0.05 (P>0.05). It was concluded that drivers experience air pollution-related health issues, including cough, headache, catarrh, depression, and eye redness and itching. The health issues, however, occurred both in dry and rainy seasons. This study recommends that the drivers adopt a work schedule that limits exposure to air pollution.

Keywords: Pollution, Season, Cab, Drivers, and Health

INTRODUCTION

Commercial transportation has become the backbone of accessibility systems, with the growth of economic and social networks over the past two centuries. Individuals, families, entrepreneurs, and firms exchange goods and services, interact with people regularly, not only for economic life but also for the quality of life (Omenikolo, Uduma, Chinekeokwu & Abara, 2017). However, the adverse effects of commercial transportation have a greater impact on the natural and human environment. The fossil fuel combustion associated with transportation results in emissions of pollutants that cause air pollution, which in turn causes damage to human health, agriculture, and sensitive ecosystems, and contributes to global climate change.

Incomplete carbon reactions, unburned hydrocarbons, or other elements present in the fuel or air during combustion cause vehicular air pollution. In the process of combustion, several gaseous materials and impurities are generated. These combustion by-products were emitted into the environment as exhaust gases.

The emissions from vehicles pose a serious health threat to humans (Abam, 2009). However, the risk associated with air pollution varies with individuals due to the concentration and duration of exposure to the air pollution. The concentration of a specific air pollutant is the amount of material per unit volume of air. Exposure refers to any contact between an airborne contaminant and a surface of the human body, either outer (for example, the skin) or inner (for example, the respiratory tract epithelium). Thus, exposure requires the simultaneous occurrence of two events: a pollutant concentration at a particular place and time, and the presence of a person at that place and time.

High exposure to air pollution has been attributed to be a leading factor that upsets human emotions and alters behavior (Reeve, 2014). Long-term exposure to polluted air results in a variety of psychological problems (such as stress, depression, anxiety, irritation, becoming short-tempered, and mood swings), which adversely affect behaviour such as eating, recreation, commuting, traveling, and socialization (Torres & Casey, 2017). Older people and females suffered more and were more anxious because of low air quality than younger people and males (Liu, Baumgartner, Zhang & Schaur, 2016).

According to Kessler & Bromet (2013), air pollution has been correlated with depression, a severe mental disorder affecting people globally, which is continuously increasing. Depression is characterized by a loss of pleasure and interests, guilt, sadness, inter alia, a decrease in libido, disruption to sleep, and a loss of concentration. A positive correlation between air pollution and depressive disorders that adversely affect human behaviour (Calderon *et al.,* 2015). Lundberg (2016) reported that psychological and toxic effects of air pollution could lead to psychiatric symptoms, including anxiety and changes in mood, cognition, and behavior. Depression, guilt, sadness, decrease in libido, insomnia, loss of concentration, and loss of pleasure and interests have also been associated with exposure to air pollution. Increased levels of some air pollutants are accompanied by an increase in psychiatric admissions and emergency calls and, in some studies, by changes in behaviour and a reduction in psychological well-being (Sass *et al.,* 2017).

Numerous toxic pollutants interfere with the development and adult functioning of the nervous system. Typical medical effects of air pollution, such as asthma, can indirectly affect psychological health. The sick building syndrome and multiple chemical sensitivity are conditions with toxicologic and psychiatric aspects. Manifestations are often insidious or delayed, but they can provide a more sensitive indicator of toxic effects than cancer rates or mortality data (Sass *et.al,* 2017). However, the risk associated with occupational exposure to air pollution has not been well assessed. However, studies have revealed that drivers are exposed to a series of pollutants such as carbon monoxide, nitrogen dioxide, toluene, and benzene during their daily activities. Accurate estimates of human exposure to inhaled air pollutants are necessary for a realistic appraisal of the risks these pollutants pose and to design and implement strategies to control and limit those risks.

Air pollutants are continuously released from numerous sources into the atmosphere. Several studies have been conducted in Ilorin on pollutants and analyzing their consequences on public health. For instance, Amo, Adekola, and Obioh (2005) assessed the ambient concentrations of sulphur (IV) oxide (SO2) in the city of Ilorin, Nigeria. Raimi (2018) assessed air quality indices and their health impacts in the Ilorin Metropolis. However, none of these studies looked at occupational exposure to air pollution and its associated risks. According to Salami (2007), vehicular emissions have become one of the most complex environmental challenges. In effect, cities that rely on a large number of automobiles for the

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

bulk of daily transportation and offer few efficient public mass transportation modes may suffer from the effects of automobile emissions. There is therefore a need to assess the risk associated with vehicular emissions. The commercial drivers in Ilorin utilize old and worn-out engines, improper fuel grades, lack of regular maintenance, physical ageing of engines, intensive use of vehicles, and misuse of lubricants (especially motorcycles), which combine to produce a constraint on perfect fuel combustion. This eventually leads to the emission of CO, Hydrocarbons (HCs), NO_2, and SO_2 from the exhaust system and engine parts of motor vehicles (Salami, 2007). It is therefore pertinent to assess the risk of air pollution exposure among commercial drivers in Ilorin, Nigeria. To achieve this aim, the specific objectives are to examine the socio-economic characteristics of commercial drivers in Ilorin, assess the types and conditions of vehicles used for commercial transportation, assess the working duration of commercial drivers, and assess the seasonal variation in air pollution-related symptoms experienced by commercial drivers.

Study Area

The study area is in the savannah region of Nigeria and lies between latitudes 80 24'N and 8036' N and between longitudes $4^0$10'E and $4^0$36'E with an area of about 100km 2 (Kwara State Diary, 1997). Ilorin Metropolis shares its southern and eastern boundary with Ifelodun LGA, while it shares its northern boundary with Moro LGA and the western boundary with Asa (Figure 1).

Ilorin is the present-day capital of Kwara State in the north central Region of the Federal Republic of Nigeria. Ilorin metropolis comprises three Local Government Areas: Ilorin West, Ilorin South, and Ilorin East. (Ahmed, 2009).

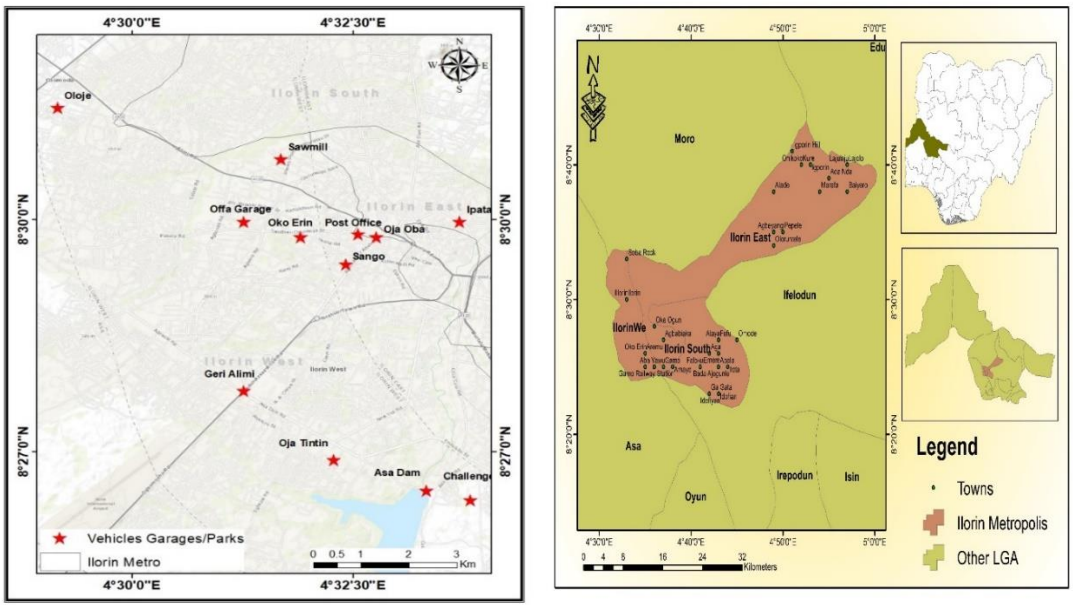

Figure 1: Ilorin Metropolis showing different Parks/ Garages
Source: Adapted from Office of the Surveyor General (2021)

The climate of Ilorin is a humid tropical type and is characterized by wet and dry seasons. The wet season of Ilorin begins towards the end of March when a tropical air mass is prevalent and ends in October. The dry season in the town begins with the onset of the tropical continental air mass. This type of dusty wind, which carries no moisture, is

commonly referred to as harmattan. This wind is usually predominant between November and February, with the mean annual total rainfall at 1,200 mm (Ajibade, 2008).

The geology of Ilorin is made up of Precambrian basement complex rock. The soils of Ilorin are predominantly loamy, with medium to low fertility, primarily due to the high seasonal rainfall and high temperatures. This combination leads to a tendency for lateritic soil to be the primary soil type in Ilorin, as minerals and nutrients are leached from the soil. The city of Ilorin is mainly drained by the consequent river Asa and has rivers Aluko, Alalubosa, Okun, Osere, Agba, and Atileke as tributaries (Jimoh & Iroye, 2009). Rivers Okun and Aluko are located on the western part of Asa, and Alalubosa can be found on the eastern part of the Asa River. Asa river flows in a North-South direction dividing the plain into two, Western and Eastern parts. The eastern part is generally steeper than the western part; elevation on the western side varies from 273m to 333m above sea level, while on the eastern side, it varies from 273m to 364m (Ajibade & Ojeola, 2004).

The city is covered mainly by ferruginous soil on crystalline acidic rock. Ilorin vegetation is characterized by scattered tall trees and shrubs, between 10 and 12 feet in height. Some of the notable trees include butter trees, Acacia, Locust beans, Baobab, and Akee-apple (Ajibade, 2008). The population of Ilorin is about 847,582 (NPC, 2007). Muslim Yoruba people mainly inhabit modern Ilorin, although its traditional ruler is a Yoruba-speaking Fulani emir.

The most prevalent land use classes are: Residential, Administrative, Institutions (Health and Educational), Commercial (Stores/Services & Markets), Transportation (Motor Park), Industrial (Manufacturing/Workshop), Sand mining activities, and Agriculture, among others.

The dominant occupation of the people in Ilorin is Tertiary. Most government ministries are located within Ilorin; as a result, government agencies employ the services of civil servants in the area. Some people are also engaged in primary occupations such as sand mining, farming, fishing, and distributive trading, among others. Other people make their living through various economic activities, including riding motorcycles, driving taxis, and operating the recently arrived " Keke Napep'' on Ilorin Road, as well as fashion designing and other forms of activities.

Materials and Methods

This study used primary and secondary data. The primary data was sourced through a questionnaire. The secondary data source was the administrative map of the study area, which was obtained from the office of the surveyor general, Kawara State. The population of commercial drivers was sourced from the zonal chairman of the National Union of Road Transport Workers (NURTW), Kwara State. The map of Ilorin was obtained from the office of the Surveyor General of Kwara State.

The sample frame of the study was the estimated 24,799 commercial bus drivers in Ilorin (Table 1 and Figure 2). The sample size to be surveyed from the 24,799 commercial drivers is determined with Taro Yamane's (1973) sample size formula. The formula has been set as follows.

$$n = \frac{N}{1+N(e)^2}$$

Where n =sample size

N = population size
e = error of sampling

This study allows for an error of sampling of 0.05; hence, the sample size is 394. Therefore, 394 commercial bus operators were examined for the study. The sample size for each of the identified garages was determined based on their proportion to the Total sample frame and sample size as shown in Table 1.

Table 1: Sample Frame and Sample Size of the Study Area

S/N	Vehicle Garage/Park	Population	Sample Size
1. 1	Asa Dam	1,986	32
2. 2	Challenge	2,578	41
3. 3	Geri Alimi	1,672	27
4. 4	Ipata	2,892	46
5. 5	Offa Garage	3,512	56
6. 6	Oja Oba	1,976	31
7. 7	Oja Tuntun	1,855	29
8. 8	Oko Erin	1,457	23
9	Oloje	1,345	21
10	Post Office	1,091	17
11	Sango	2,123	34
12	Saw Mill	2,312	37
	Total	24,799	394

Source: Adapted from NURTW, Kwara State Branch, 2021

This study employed both inferential and descriptive methods of data analysis. The socioeconomic characteristics of the respondents were analysed with frequency and percentages (descriptive statistics). Cross tabulation was used to compare the type of commercial vehicle used, concerning the condition of the vehicle (descriptive statistics). Frequency and percentages were used to determine the duration spent in a vehicle. Also, cross-tabulation and ANOVA were used to determine the association between the type of vehicle and the working duration used inside the vehicle, as presented in the model:

$$F = \frac{MS_{Between}}{MS_{within}}$$

Where:

$$MS_{Between} = \frac{SS_{Between}}{df_{Between}}$$

$$MS_{within} = \frac{SS_{within}}{df_{within}}$$

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Print ISSN: 1595-9686
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Sum of Squares:

- $SS_{between} = \sum n_i(\bar{X}_i - \bar{X})^2$
- $SS_{within} = \sum\sum(X_{ij} - \bar{X}_i)^2$

Where:

- n_i = number of observations in group i
- $\bar{X}_i$ = mean of group i
- $\bar{X}$ = grand mean (mean of all observations)
- X_{ij} = individual observation in group i

Degrees of Failure
$df_{between} = k - 1$
$df_{within} = N - k$
Where: k = number of groups (types of vehicles)
N = total number of observations (working duration used inside the vehicle)

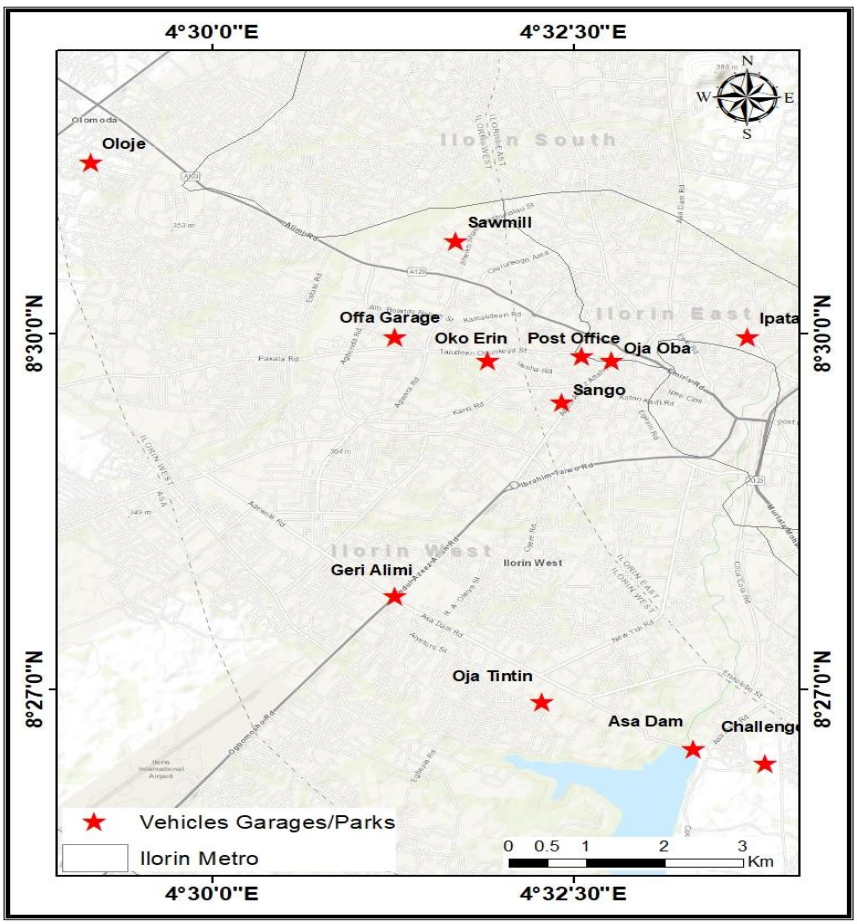

Figure 2: Spatial Distribution of Parks/Garages
Source: Authors' Fieldwork, 2021

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EISSN: 1595-9708

T-test analysis was used to test if there is a significant difference in the seasonal variation in air pollution-related symptoms experienced by commercial bus operators as presented in the model.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

- $\bar{X}_1, \bar{X}_2$ = sample means of group 1 and 2
- s_1^2, s_2^2 = sample variances
- n_1, n_2 = sample sizes

$\overline{x_1}, \overline{x}_2$ = average value for dry and wet season (asthma, cough, eye redness, catarrh, and depression)
s_1^2, s_2^2 = variance value for dry and wet seasons
n_1, n_2 = number of items in the dry and wet seasons

Results and Discussion

Socio-Economic Characteristics of the Respondents

The demographic characteristics of vehicle drivers who participated in the study are presented in Table 3. All the drivers that participated in the study were male. This is because males were the dominant force in the transport business in Ilorin. Most drivers (89.6%) were above the age of 35 years. This may be because most people under 35 were much more interested in white-collar jobs. Over 90% of the respondents had formal education. However, most had secondary education (58.1%) and were married (70.1%). This could be attributed to the majority of the respondents being above 35 years of age. Most people tend to marry at the age of 25 and above in Nigeria. Over 50% of the respondents have more than one wife. This could be attributed to Islam and Yoruba culture, which encourages polygamy. About 42% of the respondents have a child, while about 58% have more than one child. This implies that the majority of the drivers have a large family to cater for. Over 50% of the drivers have been driving for more than 5 years. However, only 12.9% of the drivers have been driving for more than 10 years. This implies that the driving business has witnessed new entries in the last 10 years. This could be attributed to the occupation providing a source of income as long as an individual has a vehicle to use.

Table 3: Demographic Characteristics of Respondents

Variables	Frequency	Percentage
Gender (1)		
Male	394	100
Age (4)		
18-25 years	41	10.4
36-45 years	124	31.5
46-50 years	104	26.4
Above 50 years	125	31.7
Level of Education Completed (4)		
Primary Education	87	22.1

Secondary Education		229	58.1
Tertiary Education		54	13.7
None		24	6.1
Marital Status (5)			
Single		109	27.7
Married		276	70.1
Divorced		2	0.5
Separated		6	1.5
Widowed/Widower		1	0.3
Number of Wife/Wives (3)			
1		189	48.0
2-3		149	37.8
4 and above		56	14.2
Number of Children (3)			
1		167	42.4
2-3		188	47.7
4 and above		39	9.9
Number of Years Used in Driving Business (4)			
Below 1 year		76	19.3
1-5 years		121	30.7
6-10 years		146	37.1
Above 10 Years		51	12.9
Axis Driving is Limited to (4)			
Within the Capital LGA		111	28.2
Throughout the Metropolis		59	15.0
Outside Ilorin, Within Kwara		143	36.3
Outside Kwara State		81	20.6
Average Monthly Income (4)			
Below ₦ 20,000		95	24.1
₦ 20,001-₦ 40,000		159	40.4
₦ 40,001- ₦ 80,000		105	26.6
Above ₦ 80,000		35	8.9
Total	**32**	**394**	**100**

Source: Author's Fieldwork, 2021

Note: The total number of variables in the table is 32

Less than 50% of the respondents limited their transport business within the metropolis. However, only 20% of the drivers extend their transport services beyond Kwara State. This was attributed to the need to register before operating in other areas. About 76% of the drivers are earning above 20,000 naira monthly. Nevertheless, more than 30% are earning above 40,000 naira. This indicates that drivers have the potential to earn above the minimum wage. This could also be the reason for the high number of drivers who started driving in the last 10 years.

Types and Conditions of Vehicles Used for Commercial Transportation

Type of Vehicle Used for Transportation

The vehicles used for commercial transportation in Ilorin are cars, buses, and minivans. However, cars happen to be the most used (3.3%). This was because it serves the purpose of commuting in Ilorin the best. As it carries 4 to 5 passengers, it takes less time to fill up and

does not result in delaying passengers by trying to load more, unlike vans and buses, as shown in Figure 3.

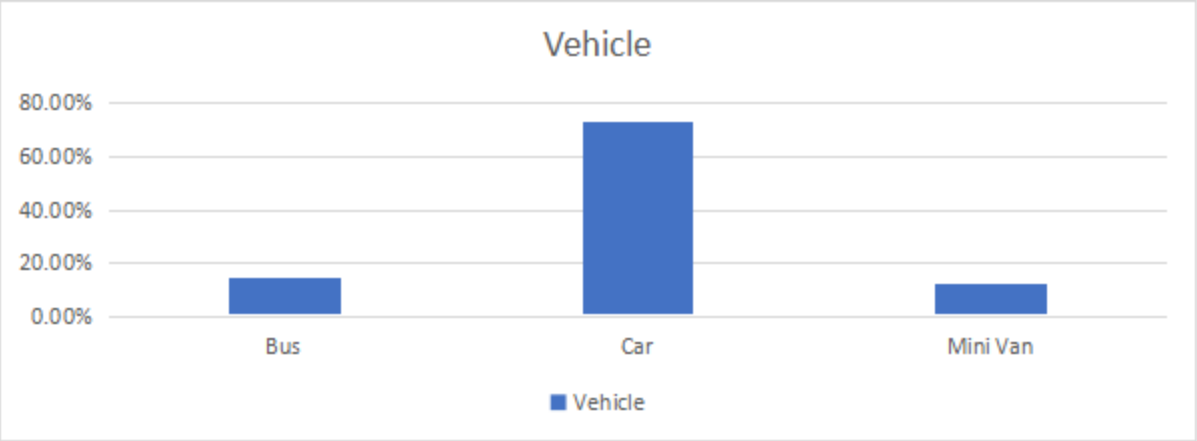

Figure 3: Type of Vehicle Used for Transportation
Source: Author's Fieldwork, 2021

The findings of this study correspond with those of Okeafor (2020), who also noted that cars are mainly used for commercial transportation within the city, while minivans and buses are often used for long-distance, interstate commercial transportation.

Makers of Vehicles

Mazda, Opel, and Toyota were the dominant vehicles commonly used for commercial transportation in Ilorin. However, Mazda is the most used (62.1%). The durability and affordability of Mazda were attributed to its dominant use among commercial drivers in Ilorin.

The primary type of vehicle used for commercial transportation in Ilorin is dominated by the Mazda product, as shown in Plate 1. The observation corroborates that of Okeafor (2020), who identified Mazda as the third most used car for commercial transportation in Nigeria. Volkswagen Vento, Volkswagen Golf 3, Volkswagen Jetta, and Toyota Sienna were also among the most used vehicles for commercial transportation in Nigeria (Okeafor, 2020).

Vehicle Ownership

Vehicle ownership among commercial transporters was found to be dominated by joint ownership (31.7%) and followed by organisation ownership (31.5%), self-ownership (26.4%), and other individual ownership. This implies that commercial transportation is a flourishing business in Ilorin, as people are involved in it directly (self-ownership and joint ownership) and indirectly through car hire (individual and organisational). The potential of commercial transportation and the opportunities of different ownership options could also contribute to high vehicle ownership, as the National Bureau of Statistics (2018) reported that in Nigeria, vehicle ownership has witnessed a tremendous increase in the past decades. Statistics show that it grew by 693% from 1970 to 2010. A breakdown of the statistics for some states, such as Lagos, Abuja, Enugu, Kaduna, Akwa Ibom, and Bauchi, shows that vehicle ownership grew phenomenally by an average of 134% (Francis *et al,* 2020).

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
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Duration of Vehicle Usage

Less than 15% of the vehicles have been in use for commercial transportation for a year. About 50% of the vehicles have been in use for 2-3 years, while 37.5% have been in use for 4 years or more. This implies that most of the vehicles in operation have been in use for over a year. This raises the question of when the vehicle was purchased, as this will determine the vehicular emissions generated by the vehicle. The period of using the vehicle seems low compared to Price water house Cooper (PwC) (2016) study on 'Africa's Next Automotive Hub' that reported that age distribution of cars in Nigeria as follows: 0–5 years/11%, 6–11 years/26%, 12–18 years/50%, 19+ years/13%.

Plate 1: Type of Vehicles in Post Office, Ilorin
Source: Author's Fieldwork, 2021

Condition of Vehicle During Purchase

The majority of the vehicles purchased were in second new-condition (64.9%), locally known as Tokunbo. Followed by those purchased from hand to hand (21.1%), while a few drivers do buy new vehicles (14%). The reason for purchasing the second new item was attributed to its durability and reliability. The respondent reported that buying from hand to hand could be associated with significant trouble, as it might consume more money due to repairs compared to new or second-hand ones. Okuhu (2011) also noted that about 80% of

the automobiles used in the country today are fairly used cars, popularly known as Tokunbo. This was even higher compared to the 64.9% that was observed among the vehicles used by drivers in the study.

Type of Vehicle and Condition of Vehicle during Purchase

The results in Table 4 indicate that the majority of cars (74.0%) and minivans (62.5%) used for commercial transportation are purchased in second-hand condition, whereas buses are purchased in new condition. This could be the reason why there were more car users than bus users. Additionally, this poses a risk that the cars will age more quickly and release more pollution, thereby exposing drivers to the associated health risks.

Table 4: Type of Vehicle and Condition of Vehicle During Purchase

			Condition During Purchase			Total
			New	Second New	Hand to Hand	
Type of vehicle	Bus	Frequency	34	12	11	57
		Percentage	59.6	21.1	19.3	100.0
	Car	Frequency	8	213	67	288
		Percentage	2.8	74.0	23.3	100.0
	Mini Van	Frequency	13	30	5	48
		Percentage	27.1	62.5	10.4	100.0
Total		Frequency	55	255	83	393
		Percentage	14.0	64.9	21.1	100.0

Source: Author's Fieldwork, 2021

The reason for the high second new use is best explained by Ohwojero and Ede (2013) who reported that since in the year 2000, it has been recorded that there is a decline in the production of Automobile, some of the Automobile industries that were established between 70s and 80s are no longer in operation, as a result of challenges that has befall them.

Condition of Vehicle Parts

As presented in Table 5, the majority of the drivers claimed that their vehicle seats (30.7%), glass (34.3%), paint (36.3%), sound (33.5%), exhaust (35.8%) and side mirror (35.5%) are in good condition to a low extent. Concerning the vehicle fuel gauge, the majority of the drivers were undecided. Indicating they did not trust the readings of their fuel gauge. However, about 37% and 34% of the respondents claimed their brakes and gears were working fine to a moderate extent, respectively. This implies that the primary functions of the cars were relatively in good condition, while other attributes that make a car beautiful and comfortable were not in good condition. In addition, Plate 2 shows a car with a relatively moderate seat but a poor dashboard. Plate 3 shows a car with good glass, and Plate 4 shows a car without a side mirror in Challenge, Ilorin. Onokala and Olajide (2020) also observed that poor vehicles are used for commercial transportation in Nigeria

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Print ISSN: 1595-9686
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Table 5: Condition of Vehicle Parts

Vehicle condition	High Extent (%)	Moderate Extent (%)	Low Extent (%)	Undecided (%)	No Extent (%)
Seat	11.4	16.0	30.7	22.3	19.5
Glass	18.5	22.8	34.3	14.2	10.2
Paint	16.5	23.1	36.3	17.0	7.1
Sound	17.5	22.1	33.5	16.5	10.4
Fuel Guage	23.4	25.1	17.0	31.2	3.3
Exhaust	22.3	30.7	35.8	5.8	5.3
Break	19.3	36.8	22.6	11.2	10.2
Window controller	14.2	22.1	24.9	13.5	25.4
Side mirror	25.1	31.2	35.8	5.3	2.5
Gear	22.6	34.0	24.9	14.7	3.8

Source: Author's Fieldwork, 2021

.

Plate 2: Car with fairly good Seat but poor Dashboard

Plate 3: Car with good Glass in Challenge, Ilorin

Source: Author's Fieldwork, 2021

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Plate 4: Car without Side Mirror in Post Office, Ilorin
Source: Author's Fieldwork, 2021

Working Duration of Commercial Drivers daily

This section presents the working durations of commercial vehicle owners, and the association between car types and the significance of the working durations is presented in this section.

Working Days Per Week

As presented in Figure 4, about 10% of the respondents work only between 3-4 days a week, 47.7% work between 5-6 days a week, and 42.4% work every day. The result implies that the majority of the drivers work for most of the week. That indicates that the drivers could be prone to prolonged exposure to air pollution. May be prone to prolonged exposure to air pollution.

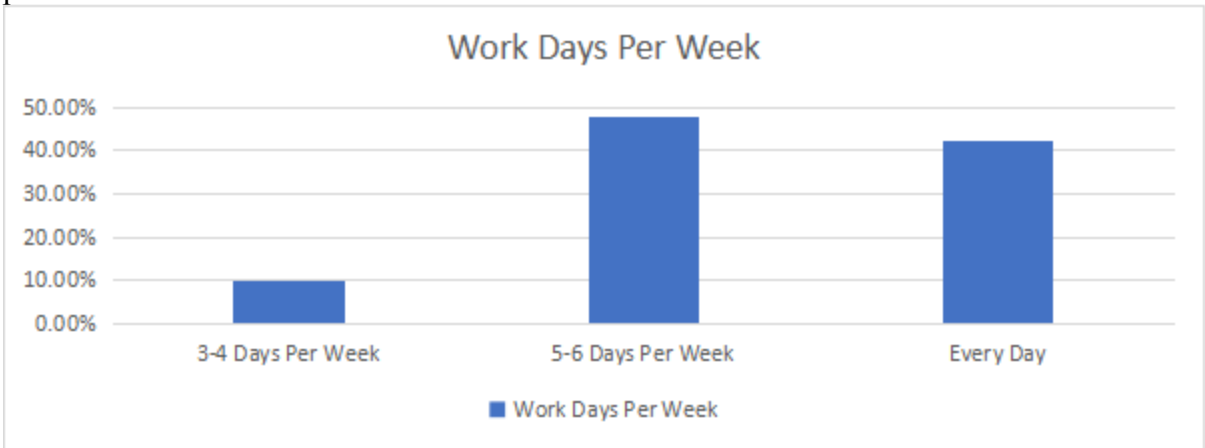

Figure 4: Work Days Per Week
Source: Author's Fieldwork, 2021

People move every day; this could be why transporters work almost every day of the week. Ojekunle (2016) also reported that commercial vehicle owners work nearly every day of the week due to the daily demand for transportation services.

Resumption Time, Break Time, and Closing Time of Drivers

About 70% of the driver resume as early as 6 am, while as high as 70% also go for their break between 12 pm and 3 pm. The majority of the drivers close between 3-6 pm and 9-12 pm (See Figure 5). It was reported that the early resumption is to accommodate large numbers of passengers who are in a hurry to get to their place of work and school. It was reported that the mid-noon break is a result of fewer passengers since most people will be at their workplace by then. The resumption of work or a break in the evening was also attributed to the increase in passengers who will be going back to their various residences.

Ojekunle (2016) also observed that the work schedule of transporters varies, and it influences their activities.

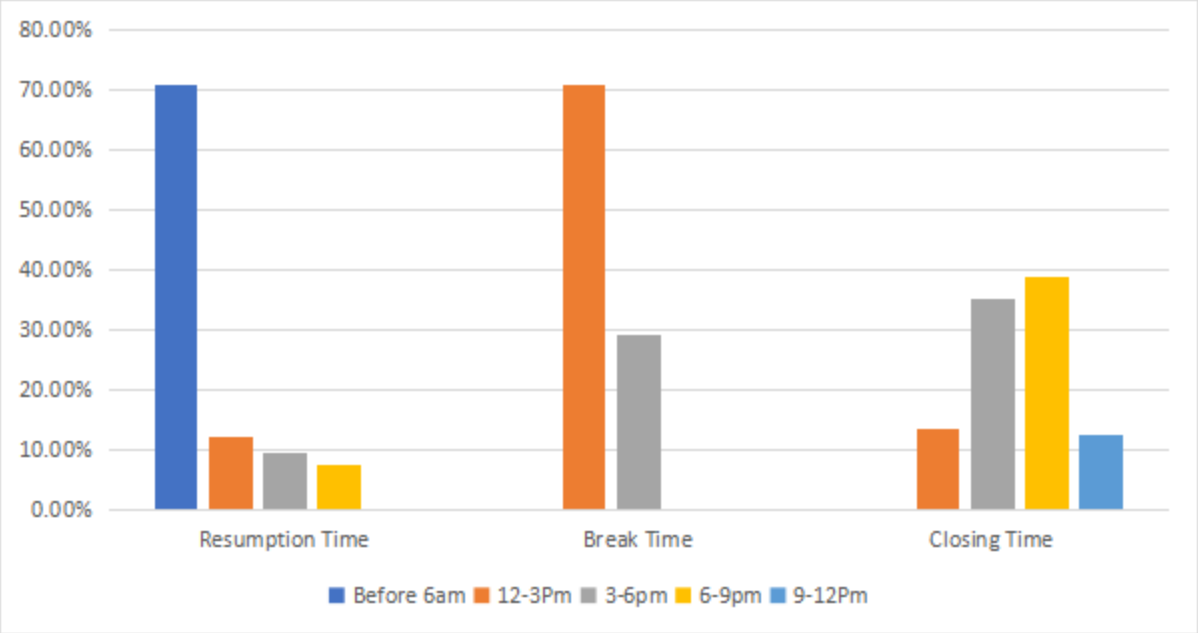

Figure 5: Resumption Time, Break Time, and Closing Time of Drivers
Source: Author's Fieldwork, 2021

Among the observed influences of schedule on the activities of commercial drivers, according to Ojekunle (2016), is that public transport operators exceed their bus carrying capacity under different traffic situations and days of the week. The most prevalent period was during peak periods (rush hours) of weekdays (Monday-Friday) when offices and business centres open and there are enough passengers above the supply capacity of the existing public transport vehicles.

Seasonal Variation in Air Pollution-Related Symptoms Experienced by Commercial Drivers

The Variation in Air pollution-related symptoms experienced by commercial drivers during both rainy and dry seasons was presented and discussed in this session.

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
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EISSN: 1595-9708

Air Pollution Related Symptoms Experienced by Commercial Drivers During Rainy Season

During the rainy season, the majority of the drivers experience asthma (36.8%) to a low extent, cough (30.7%), headache (35.0%), catarrh (39.6%), and depression (39.6%) to a moderate extent. Eye redness and itching are experienced to a high extent among the majority of the drivers (33.2%), Table 6. This implies the extent to which the drivers experience the health conditions differs. This is understandable as health conditions are a function of exposure and the biological make-up of the drivers.

Table 6: Air Pollution Related Symptoms Experienced by Commercial Drivers During Rainy Season

S/N	Health Conditions	High Extent (%)	Moderate Extent (%)	Low Extent (%)	Undecided (%)	No Extent (%)
	Asthma	5.8	10.4	36.8	22.3	24.6
	Cough	22.6	30.7	10.9	22.3	13.5
	Eye redness and itching	33.2	30.7	25.1	8.9	2.0
	Headache	30.7	35.0	17.0	8.6	8.6
	Catarrh	22.8	39.6	14.0	14.0	9.6
	Depression	11.7	39.6	10.9	19.8	18.0

Source: Author's Fieldwork, 2021

The cool weather during the rainy season can exacerbate the symptoms of air pollution for commercial drivers, as catarrh and cough are prevalent during this time. Additionally, this can lead drivers to misinterpret their symptoms as stemming from rainfall rather than air pollution.

Significance of the Variation in Air Pollution-Related Symptoms Experienced by Commercial Drivers during Rainy Season

Table 7 presents a calculated F-ratio of 61.36 with a calculated p-value less than 0.05, the alpha level of significance. Since the calculated p-value is less than the alpha level, there is significant variation in the type of health conditions (Headache, Cough, Asthma, Eye Irritation, etc) commercial drivers experience in Ilorin.

Table 7: Significance of the Variation in Air Pollution-Related Symptoms Experienced by Commercial Drivers during Rainy Season

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	469.202	5	93.840	61.364	0.000
Within Groups	3605.947	2358	1.529		
Total	4075.148	2363			

Source: Author's Fieldwork, 2021

In order to be able to establish both the magnitude and direction of the differences in this variable, a post-hoc test, the Duncan Multiple Range Test (DMRT), was conducted. Table 8 shows the Duncan Multiple Range Test (DMRT) results used to determine the groups' mean (s) that led to the significant difference noted in the Analysis of Variance (ANOVA) results in Table 8. Aside from headaches, eye redness, and itching, which are in the same group, all

other health conditions are grouped differently. Hence, the significant difference noted in the Analysis of Variance (ANOVA) results in Table 8 was a result of the fact that each of the groups, Groups 1 to 5, differs from the other groups.

Table 9: Duncan Multiple Range Test (DMRT) of the Rainy Season ANOVA

Diseases	N	Subset for alpha = 0.05				
		1	2	3	4	5
Asthma	394	2.5051				
Depression	394		3.0711			
Cough	394			3.2665		
Catarrh	394				3.5203	
Head Ache	394					3.7056
Eye Redness and Itching	394					3.8426
Sig.		1.000	1.000	1.000	1.000	.120

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 394.000.

Source: Author's Fieldwork, 2021

Air Pollution Related Symptoms Experienced by Commercial Drivers During Dry Season

During the dry season, the majority of the drivers experience asthma (over 50%) to a low extent (Table 9). Also, cough (36.8%), headache (39.6%), catarrh (37.1%), and depression (36.5%) are experienced to a moderate extent by drivers. Eye redness and itching are also experienced to a high extent among the majority of drivers (39.3%) during the dry season. This implies that eye redness and itching are a common major challenge for both the dry and wet seasons. This could be attributed to prolonged exposure to exhaust smoke from vehicles.

Table 9: Air Pollution Related Symptoms Experienced by Commercial Drivers during Dry Season

S/N	Health Conditions	High Extent (%)	Moderate Extent (%)	Low Extent (%)	Undecided (%)	No Extent (%)
	Asthma	14.0	17.0	24.9	19.0	25.1
	Cough	23.9	36.8	8.6	16.5	14.2
	Eye redness and itching	39.3	34.8	17.3	6.9	1.8
	Headache	28.7	39.6	14.5	9.6	7.6
	Catarrh	22.3	37.1	11.4	15.5	13.7
	Depression	11.9	36.5	13.5	20.1	18.0

Source: Author's Fieldwork, 2021

Torres and Casey (2017) also reported that long-term exposure to polluted air results in a variety of psychological problems such as stress, depression, anxiety, irritation, becoming short-tempered, and mood swings, which adversely affect behaviour (such as eating, recreation, commuting, travelling, and socialising.

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

Variation in Air Pollution-Related Symptoms Experienced by Commercial Drivers during Rainy Season

Table 10 shows a calculated F-ratio of 50.296 with a calculated p-value less than the 0.05 alpha level of significance. Since the calculated p-value is less than the alpha level, there is significant variation in the type of health conditions commercial drivers experience in Ilorin during the dry season as a result of air pollution.

Table 10: Significance of the Variation in Air Pollution Related Symptoms Experienced by Commercial Drivers during Dry Season

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	410.343	5	82.069	50.296	0.000
Within Groups	3847.619	2358	1.632		
Total	4257.963	2363			

Source: Author's Fieldwork, 2021

A post-hoc test, the Duncan Multiple Range Test (DMRT), was conducted to establish both the magnitude and direction of the differences in this variable. Table 11 shows the Duncan Multiple Range Test (DMRT) results used to determine the groups' mean (s) that led to the significant difference noted in the Analysis of Variance (ANOVA) results in Table 10. Aside from Headache and catarrh, which are in the same group, all other health conditions are grouped differently. Hence, the significant difference noted in the Analysis of Variance (ANOVA) results in Table 10 was a result of the fact that each of the groups, Groups 1 to 5, differs from the other groups.

The DMRT Test confirmed the significant variation in the ANOVA, as it implies that drivers experience variation in symptoms from air pollution.

Table 11: Duncan Multiple Range Test (DMRT) of the Dry Season ANOVA

Diseases	**N**	**Subset for alpha = 0.05**				
		1	2	3	4	5
Asthma	394	2.7563				
Depression	394		3.0431			
Catarrh	394			3.3883		
Cough	394			3.3959		
Head Ache	394				3.7208	
Eye Redness and Itching	394					4.0305
Sig.		1.000	1.000	.933	1.000	1.000

Means for groups in homogeneous subsets are displayed.
a. Uses Harmonic Mean Sample Size = 394.000.

Source: Author's Fieldwork, 2021

Comparison of Symptoms between Rainy and Dry Season Air Pollution Related Symptoms. Commercial drivers in Ilorin primarily use cars for transportation, with Mazda being the most common vehicle brand (Table 12). The responses to symptoms like cough, eye redness and itching, headache, catarrh, and depression are relatively similar, with over 40% of responses being high or moderate in extent.

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

Table 12: Air Pollution Related Symptoms Experienced by Commercial Drivers During Rainy Season

S/N	Health Conditions	Season	High Extent (%)	Moderate Extent (%)	Low Extent (%)	Undecided (%)	No Extent (%)
i	Asthma	Dry	14.0	17.0	24.9	19.0	25.1
		Rainy	5.8	10.4	36.8	22.3	24.6
ii	Cough	Dry	23.9	36.8	8.6	16.5	14.2
		Rainy	22.6	30.7	10.9	22.3	13.5
iii	Eye redness and itching	Dry	39.3	34.8	17.3	6.9	1.8
		Rainy	33.2	30.7	25.1	8.9	2.0
iv	Headache	Dry	28.7	39.6	14.5	9.6	7.6
		Rainy	30.7	35.0	17.0	8.6	8.6
v	Catarrh	Dry	22.3	37.1	11.4	15.5	13.7
		Rainy	22.8	39.6	14.0	14.0	9.6
vi	Depression	Dry	11.9	36.5	13.5	20.1	18.0
		Rainy	11.7	39.6	10.9	19.8	18.0

Source: Author's Fieldwork, 2021

The similarity implies that drivers experience similar symptoms in both the dry and rainy seasons. The reason for the difference in asthma occurrence could be attributed to drier and dustier air conditions during the dry season, which can inhibit drivers 'convenient breathing. When such a scenario is combined with prolonged exposure to air pollution, it could be severe for a driver.

Variation in Pollution-Related Symptoms in Rainy and Dry Seasons Experienced by Commercial Drivers

It was observed that there was no significant difference in the rainy and dry season-related symptoms encountered by commercial drivers in Ilorin, as the t-test value of 1.8 has a p-value that is greater than 0.05. This could be attributed to most drivers working for 3 days or more, regardless of the season. Hence, exposure and symptoms could be similar for both seasons (See Table 13).

FUDMA Journal of Earth and Environmental Sciences (FUDJEES), Vol. 2, No. 1, 2025
Print ISSN: 1595-9686
EISSN: 1595-9708

Table 15: Variation in the Rainy and Dry Season Air Pollution Related Symptoms Experienced by Commercial Drivers

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Seasons	Equal variances assumed	2.3	.13	-1.8	4726	.067	-.07	.03862	-.14636	.00508
	Equal variances not assumed.			-1.8	4723.7	.067	-.07	.03862	-.14636	.00508

Source: Author's Fieldwork, 2021

It is pretty alarming that no difference exists in seasonal symptoms of air pollution experienced by commercial drivers. However, Park et al. (2015) claimed that seasonal variation in air pollution symptoms is an important issue.

Conclusion

The study's findings led to the conclusion that commercial transportation provides drivers with an opportunity to support their households, as they have the potential to earn above the minimum wage. Also, commercial drivers in Ilorin make use of cars for transportation, and Mazda is the major vehicle brand used. Most of the cars are purchased in second-hand condition (Tokunbo). The drivers mostly start their work in the early hours of the day (6 am) and take a break around 12 pm-3 pm. Also, they work on most days of the week. Furthermore, vehicles are often in poor condition, and drivers frequently experience health issues related to air pollution, including cough, headache, catarrh, depression, and eye redness and itching. The health issues, however, occur both in the dry and rainy seasons. However, it is experienced differently among drivers.

Recommendations

Based on the study's findings, it is recommended that commercial drivers in Ilorin learn from those earning high wages to adopt their system, thereby improving their earnings above the minimum wage. The state government can partner with the Mazda company to establish a branch in Ilorin, as commercial drivers in the city highly patronise the brand. Work schedules that limit exposure to air pollution should be assessed in Ilorin among drivers to help them schedule their resumption, closing, and break schedules. A comprehensive assessment of the factors that influence the variations in health conditions experienced by drivers in Ilorin during both the dry and rainy seasons is necessary. This evaluation should consider factors such as environmental conditions, pollutant exposure, dietary habits, working hours, lifestyle and access to healthcare. All these are necessary to understand and improve the health outcomes of drivers in Ilorin, Nigeria.

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