

Health Effects of Automobile Engine Emissions Among Stakeholders

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ARTICLE INFO

keywords:

Automobile engine
Emissions
Health effects
Stakeholders
Cronbach's alpha

ABSTRACT

This study investigated the health effects of automobile engine emissions among stakeholders in Lagos State, Nigeria. Survey design was used in the study. A total sample of 120 stakeholders comprising drivers, passengers, and residents living around Somolu Local Government Area were randomly sampled and used for the study. Three research questions were stated to guide the study. A structured questionnaire titled Emissions Health Effects Questionnaire (EHEQ) was developed and used as the research instrument. The items in the questionnaires were rated on a four-point rating scale. Three experts validated the instrument, while Cronbach's alpha was used to obtain 0.830 as a reliability coefficient. The questionnaire was retrieved and used to collate and analyze responses. Mean and standard deviation were used to analyze responses based on the research questions. The results show that stakeholders are exposed to automobile engine emissions, which are linked with pronounced health effects, including wheezing, labored breathing, decreased lung function, and increased respiratory symptoms. The findings support the use of alternative fuels in vehicles and reducing traffic congestion.

1. Introduction

Automobile engine emissions contribute significantly to air pollution and pose major health concerns to stakeholders such as drivers, passengers, pedestrians, and surrounding residents. Exposure to this complex mixture of pollutants from automobile engine emissions poses a significant occupational health risk to stakeholders and has been linked to various health issues, which include respiratory symptoms,

cardiovascular disease, and lung cancer, particularly in urban areas such as Lagos State.

Automotive exhaust pipes emit carbon dioxide, carbon monoxide, and nitrates into the atmosphere as a byproduct of the petroleum combustion process. According to [2], vehicle exhaust emissions consist of remnants of ambient air, carbon dioxide (CO₂), water vapour, and various chemicals present in either

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Received 05 April 2025, Received in revised from 23 June 2025, Accepted 14 July 2025

Available Online 10-07- 2025

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particle or gaseous form, the majority of which result from incomplete combustion of fuel.

An emission is a result of an internal combustion engine that has been released or discharged into the environment. Automobile engine emissions have altered the environment and contributed to air pollution by reacting with the atmosphere. Air pollution. According to [1], it refers to any negative impacts from any source that contribute to atmospheric pollution and/or ecological deterioration. This pollution has had a significant negative impact on the health of its stakeholders. Health effects are changes in health caused by exposure to emissions; these are negative outcomes that have an adverse impact on health and may result in a decline in quality of life, disability, or premature death. Humans are now facing substantial health difficulties such as respiratory issues with symptoms such as coughing, wheezing, and shortness of breath, as well as vision impairments, as a result of this significant detrimental impact caused by car emissions.

Stakeholders are individuals or community members who are directly or indirectly affected by automotive engine emissions; these include mechanics and non-mechanics. Non-mechanics are people who live or work in a specific location but have no understanding of how to fix automobiles. They can be vehicle owners, drivers, or individuals in the environment.

A mechanic is someone who works on internal combustion engines, diagnosing and repairing any issues that develop. These car mechanic facilities are located on open plots of land near urban towns and cities. [10]. They are either mobile or stationed in a workshop, and some even carry out the activity from their homes.

Automobile engine emissions offer considerable threats to respiratory health, impacting people of all ages, but especially susceptible groups such as children, the elderly, and those with pre-existing respiratory diseases. Engine emissions pose health risks such as respiratory ailments, acute injuries, eye injuries, hearing loss, backache, and musculoskeletal disorders. Fine particles from engine exhaust can penetrate deeply into the lungs, leading to respiratory diseases such as asthma and chronic bronchitis. These particles have the potential to aggravate asthma, irritate the airways, and worsen chronic bronchitis symptoms. This causes short-term respiratory difficulties. Increasing the likelihood of developing long-term respiratory problems such as chronic obstructive pulmonary disease (COPD). Impeding lung growth in children and hastening the decline of lung function in adults.

Statement of the Problem

The latest issue with an automobile is the increased release of exhaust gases into the atmosphere, which is

brought on by the aging of the vehicle, improper maintenance, and worn-out engines. These gases are released straight into the atmosphere and contribute to air pollution by reacting with it. Through this process, the gases can contaminate the air by combining with the particles to create a complicated mixture of liquid droplets and minuscule particles suspended in the atmosphere. These rising emissions are seriously affecting the health of both youngsters and the elderly, who are exposed to vehicle engine emissions. These effects include respiratory complaints, cardiovascular disease, and lung cancer. According to [3], exposure to air pollution has been linked to some deaths. Even though there is a growing amount of evidence about the negative health effects of air pollution, more research is still needed to determine the precise health effects of vehicle engine emissions and to keep stakeholders informed. In order to find practical methods for lowering exposure and minimizing health impacts, this study aims to examine the health effects of automobile emissions among Lagos State stakeholders.

Purpose of the Study

The primary aim of this study was to assess the health impacts of automobile engine emissions on stakeholders in Lagos State, Nigeria. Specifically, the study focused on:

1. Investigate the health effects of automobile engine emissions among stakeholders in Lagos State.
2. Investigate the factors contributing to automobile emissions in Lagos State.
3. Find the effective strategies for reducing automobile engine emissions and mitigating health effects in Lagos State.

Research Questions

1. What are the health effects of automobile engine emissions among stakeholders in Lagos State?
2. What are the factors contributing to automobile engine emissions in Lagos State?
3. What are the effective strategies for reducing automobile engine emissions and mitigating health effects in Lagos State?

Research Hypotheses

Ho1: There is no significant difference between the health effects of automobile engine emissions among stakeholders in Lagos State.

Review of Related Literature

The health effects of automobile engine emissions among stakeholders in Lagos State

Health effects are alterations in health brought on by exposure to emissions; they may be short-term or long-term effects and are detrimental consequences that have an adverse influence on health and may result in a reduction in quality of life, disability, or early death. The major health effects of automobile

engine emissions among stakeholders in Lagos State are

i. Respiratory Health Problem: Globally, high rates of cardiovascular disease (CVD) are linked to CO exposure [6]. Automobile emissions can contribute to poor air quality, which can lead to premature death, because they contain harmful compounds like carbon monoxide and nitrogen dioxide, which have been linked to a range of ailments, including asthma. According to [3], exposure to air pollution has been linked to some deaths. Emissions can worsen pre-existing asthma symptoms, increase the risk of lung cancer, induce dementia and heart disease, stunt children's lung growth, and trigger asthma attacks. may impair lung function and respiratory health, particularly in susceptible groups like youngsters and the elderly. Lung cancer, heart attacks, pneumonia, and bronchitis are some of the harmful illnesses [8]. Air pollution can cause symptoms such as coughing, wheezing, and shortness of breath by irritating and inflaming the lungs, eyes, nose, and throat. They can cause upper respiratory infections, which can lead to heart disease, lung cancer, and chronic respiratory heart illnesses, in addition to headaches, nausea, and allergic reactions.

ii. Eye Impairment: When someone loses all or a portion of their eyesight, it is referred to as a vision impairment. Even with the use of contact lenses,

glasses, medicine, or surgery, the impairment must not go away. Visual impairment refers to the functional limitation of one or more eyes or the vision system. People with this disability will have trouble seeing details, reading, or remembering persons or unfamiliar objects, according to [12]. Nigerians who wear contact lenses and those who do not are experiencing a variety of ocular ailments due to air pollution. Exposure to chemicals found in vehicle emissions can cause short-term eye irritations, dry eyes, and discomfort; these symptoms usually go away as pollution levels drop. Nitrogen oxides, particulate matter, and other contaminants found in car emissions can irritate, redden, and discomfort the eyes. Automobile emissions can increase the risk of cataract development, conjunctival irritation that can result in conjunctivitis, or pink eye, and age-related macular degeneration.

The factors contributing to automobile emissions in Lagos State

The elements that cause or contribute to the occurrence of automobile emissions issues or circumstances in Lagos State include, but are not limited to, the following:

i. Vehicle Age and Condition: Vehicles that exceed the manufacturer's recommended mileage or distance are in poorer condition and may produce additional

emissions from their engines. Most of the imported vehicles used for personal and business purposes are old and exceed the manufacturer's recommended mileage with faulty engines. [11] report suggests that the government reduce the age of imported cars from eight to three years from the date of manufacturing.

ii. The Combustion Process: When the air-fuel mixture is not properly monitored and regulated for the combustion process to complete due to technical issues in the vehicles or missing emissions control equipment, such as catalytic converters, it may emit additional pollutants.

iii. Poorly maintained engines, such as those with malfunctioning fuel injectors or spark plugs, or a failure to undertake routine maintenance and repairs, lower fuel economy and hence increase emissions of pollutants. According to [5], incomplete combustion occurs when a heat sink, such as a solid surface or flame trap, interrupts the combustion process. This can also happen when there is inadequate oxygen for the hydrocarbon to react completely with the oxygen, resulting in the formation of carbon dioxide and water. Some of the air and fuel mixture from the injectors or carburetor bypass the piston rings and escape into the crankcase to the atmosphere through the exhaust pipe. [4] assert that a fuel's chemical composition determines the condition and engine performance.

iv. Traffic Congestion: The rate of emission increase is caused by traffic congestion as a result of the increase in vehicles and their usage, bad roads, and careless drivers in urban areas like Lagos. In the opinion of [7], regular maintenance of roads and bridges will help increase vehicle speed and lessen traffic on important highways to reduce the levels of traffic congestion. Extra factors include good driving and aggressive driving habits.

Effective strategies for reducing automobile engine emissions and mitigating health effects Lagos State

A healthy environment is one that offers the resources and chances to attain both physical and mental well-being. One of the biggest problems affecting people's health and emotional well-being is automobile emissions. In order to have a healthy environment, there is a need to combat this threat posed by emission through mitigation of this pollutant. One of the ways by which emission is increasing is through vehicle population in the street; therefore, it must be addressed.

[11] recommend that the government should lower the age of the imported vehicles from eight to three years old from the date of manufacture. Vehicles with high usage, such as vehicles more than twenty years old, should be prohibited from plying

roads, and grossly polluting vehicles should be scrapped. This will reduce technical issues resulting from the combustion process during air-fuel combination.

Vehicle maintenance should be performed on a regular basis to avoid unnecessary emissions discharge. Fuel-efficient driving behaviours should be encouraged in order to prevent the adverse health effects caused by automotive engine emissions. According to [7], regular maintenance and renovation of roads and bridges will improve vehicle speed and minimize congestion on important highways, hence lowering pollution levels.

Technological solutions, such as electric or hybrid vehicles and emission-reducing equipment like catalytic converters, can transform emissions into any valuable product. Therefore, it is necessary to improve air quality. Reduce the use of vehicles by using public transit or alternative modes of mobility. Walking or bicycling should be encouraged instead of driving to limit exposure to automotive engine emissions.

Wearing a mask would also help reduce exposure to automobile engine emissions. Encourage measures that reduce car emissions, such as congestion pricing and low-emission zones. Above all, people should monitor their health, particularly if they are experiencing respiratory or other problems. Pre-

existing medical issues should be treated according to prescription recommendations. Individuals experiencing new or worsening symptoms, seek medical attention. Emission control is crucial since reducing exposure to it is necessary for a good and healthy existence.

Methodology

A descriptive survey research design was adopted for this study. The area of this study was Lagos Mainland, Kosofe, and Somolu Local Government Areas. This local government area was selected based on the peculiarity of automobiles and for the availability and accessibility of data collection to carry out this study. The population of the study consisted of mechanics, personnel who are currently working in registered automobile companies, and non-mechanic personnel who are located within Lagos State. One hundred and twenty (120) people, comprising 60 mechanic personnel from registered automobile workshops and 60 non-mechanic personnel, were randomly sampled for the study in Lagos Mainland, Kosofe, and Somolu Local Government Areas, respectively. A structured questionnaire was used to elicit information from the respondents. This is the type of questionnaire that restricted respondents to the response options provided. The instrument has contained two sections, namely, A and B. Section A elicits demographic data

of respondents, which include gender, designation, and years of experience, while Section B covers the entire variables of the study. The instrument adopted a 4-point rating scale of strongly agree, agree, disagree, and strongly disagree, rated 4, 3, 2, and 1, respectively. The instrument was validated by three experts from the Federal College of Education (Technical), Akoka. A pilot test was carried out in order to obtain the reliability of the instrument on eleven (11) mechanic personnel and non-mechanic personnel consisting of drivers, passengers, and residents living around Mushin Local Government Area of Lagos State. The responses were analyzed using Cronbach's alpha to obtain a reliability coefficient of 0.830. The researchers personally visited the selected automobile unit and administered the instrument to the participants during the official working hours (8am-6pm). Data were analyzed using simple percentage, mean, and standard deviation. The

mean of 2.5 and above was regarded as much as required, while the mean below 2.5 was taken as not required.

Analysis of the research Questions

Strongly agreed (SA)	3.5- 4.00
Disagree (D)	1.50- 2.49
Agreed (A)	2.50 -3.49
Strongly disagree (D)	0.50 - 1.49

Note: The cut-off point of 2.50 Strongly agreed (SA) 4, Agreed (A) 4, Disagree (D) 2, Strongly disagree (D) $4+3+2+1 / 4 = 2.5$ Any mean score equal to 2.50 or greater than 2.50 was regarded as agree and less than 2.50 was disagreed.

Results and Discussion

Demographic Data of Respondents

The result on demographic data of respondents is presented in Table 1.

Table 1: Demographic Data of Respondents

Demographic	Character	Frequency	Percentage	Valid Percent	Cumulative Percent
Gender	Male	83	69.2	69.2	69.2
	Female	13	10.8	10.8	80.0
	Total	96	100.0	100.0	
	No formal qualifications	2	1.7	1.7	1.7
Level of Education	Primary School	14	11.7	11.7	13.3
	Craft / Voc. Certificate	19	15.8	15.8	29.2
	Secondary School Cert.	27	25.0	20.8	50.0
	OND Certificate	7	5.8	5.8	55.8
	HND Certificate	None	None	None	None
	NCE Certificate	6	5.0	5.0	60.8
	B.Sc/ B.Ed Certificate	1	0.8	0.8	61.7
	PhD Certificate	None	None	None	None
	M.Sc/ M.Ed Certificate	46	38.3	38.3	100.0
	Other	None	None	None	None
	Total	120	100.0	100.0	

Data from demographic section yielded information about respondent's demographic characteristics (table 1) above. Majority of the respondent were 25 years and below (83.3%) and 26 years (16.7%). This means majority of the respondent were young male who were observant of their environmental condition and impact on their wellbeing.

Those with no formal education constitutes 2 (1.7%), 14 (11.7%) had primary education, 19 (15.8%) had craft: while 25 (20.8%), 7 (5.8%), 5 (5.0%), 1 (0.8%),

4 (38.3%) had Secondary, OND, NCE, BSc, and MSc, respectively PhD and HND had (0%). Based on the year of experience of the mechanics' personnel 1-5 year were 10 (8.3%), 6-10 were 9 (7.5%), 11-15 were 2 (1.7) and 16-20 were 8 (6.7%), 21-25 were 11 (9.2%) and 26 above were 20 (16.7%)

Research Question 1

What are health effects of automobile engine emissions among stakeholders in Lagos State?

Table 2: Mean responses on the health effects of automobile emissions among stakeholders in Lagos State.

S/N	Item	Mean	Std. Dev.		
1	Automobile engine emission can affect the health of the automobile mechanics more than any other persons	2.44	1.091	7	The effects of Automobile engine emission are likely to be catastrophic in the future if not checked
2	Automobile engine emissions affect overall health and well-being.	3.15	.958	8	Experts agreed that auto emission is really a problems
3	I do not believe that automobile engine emissions have affected your quality of life.	2.09	1.012	9	Exhaust gases react with atmosphere to produce negative health and environmental impact
4	There is too much conflicting evidence about the prevalence of Automobile engine emission	3.13	.766	10	Information about Automobile engine emission can be counted as irrelevant
5	There are no concrete evidence about Automobile engine emission to know whether it is actually having impact on the human health	1.75	.791	11	Automobile engine emission causes environmental pollution
6	Exposure to automobile engine emissions increases risk of cardiovascular	2.38	.996	12	Automobile engine emission is inevitable because of the way modern society works especially in the use of road transportation
				13	Some of these health problems are as a result of Automobile engine

	emission that react with the atmosphere			18	Automobile engine emission have a way to causes eyes irritation in the society	2.82	1.034
14	Automobile engine emission is part of our daily lifestyle	2.55	.743	19	Automobile engine emission has led to health issues such as asthma and health diseases.	3.02	.961
15	Automobile engine emission have no significant impact on human health	1.83	.863	20	Automobile engine emission can lead to chronic respiratory diseases	3.00	.961
16	Automobile engine emission is something that threatens the health of human being as time goes on	2.82	1.113				
17	Automobile engine emission have a way to promote causes of cancer in the society	2.69	1.002				

Table 2 above shows the health effects of automobile engine emissions among stakeholders in Lagos State.

looking at the result of the survey, it is seen that majority of the items were above the cutoff point.

The respondents opined that Automobile emission causes environmental pollution and that the exhaust gases react with atmosphere to produce negative health and environmental impact, item 7 which is the highest mean of 3.54 shows that the effects of Automobile Emission are likely to be catastrophic in the future if not checked.

S/N	Item	Mean	Std. Dev.
1	Automobile emissions are caused by traffic congestions	2.54	1.159
2	Increase in vehicle population promote causes of emission.	2.47	.859
3	The release of gases that are not burnt completely are the major cause of air pollutions	2.93	.618
4	Faulty combustion	3.32	608

Research Question 2

What are the factors contributing to automobile engine emissions in Lagos State?

Table 3: Mean responses on the factors contributing to automobile emissions in Lagos State.

The table below summarizes the calculated mean and standard deviation of the items of questionnaires which deals with the research question 2, which states: what are the factors contributing to automobile emissions in Lagos State?

5	process can increase automobile emission			5	The gasoline used to power vehicle is the main cause of automobile emission	2.86	1.031
6				6	Automobile emissions are due to the technical issues with the gasoline engines.	2.63	.734
7				7	Reaction of air and fuel is the main cause of Automobile emission	2.32	.842

8	The causes of emissions is not limited to automobile	3.03	.783
9	Traffic congestions is the main cause of emission impact.	2.29	.991
10	Improper tune-up of	2.55	.743

air and fuel mixture by Automobile mechanics are the main cause of automobile emissions

The result of the data analysis on table 3 above showed that most of the items are with mean rating above 2.50 which reveal that majority uphold the fact that those items are the factors contributing to automobile emissions while only item 2, 7 and 9 with mean rating below 2.50 were rejected this implies that the respondents does not believed those items as the main causes of automobile emission.

Research Question 3

S/N	Item	Mean	Std. Dev.
1	Use of innovative technology for air cleaning of automobile engine emission will lead to reduction of chronic respiratory disease	3.17	.947
2	Use of alternative fuels in vehicles to control automobile engine emission can lead to a reduction of health issues such as asthma and health diseases.	2.85	.774
3	control of air and fuel mixture is one the main ways of mitigating automobile engine emission.	2.83	.540
4	Environmental pollution can be averted when automobile engine emission is properly controlled reducing	2.83	1.032

What are the effective strategies for reducing automobile engine emissions and mitigating health effects in Lagos state?

Table 4: Mean responses on the effective strategies for reducing automobile engine emissions and mitigating health effects in Lagos state.

The table 4 below present questionnaires items to address research question 3 showing opinion of respondents on effective strategies for reducing automobile engine emissions and mitigating health effects in Lagos state among 120 respondents in Lagos state.

5	traffic congestions People should be made to reduce vehicle usage as it will reduce automobile engine emission.	2.38	.927
6	use public transportation or alternative modes of transportation to reduce exposure to automobile engine emissions	2.62	.486
7	Possible effective reduction measures for automobile engine emission is via conversion to any useful substances.	2.92	.740
8	Automobile engine emission could be converted to any useful substances for future purpose	2.55	.620
9	Automobile emission is normal and cannot be controlled	1.85	1.113

The result of the data analysis on table 3 reveals the possible ways to mitigate automobile emission for healthy environment. Items 2, 3 and 4 with mean rating of 2.85, 2.83, and 2.83 respectively were above the cutoff point which shows that the respondents agree on the use of alternative fuels in vehicles, control of air and fuel mixture and proper control by reducing traffic congestions. However, the respondent's rejects item 5 and 9 which is lesser than the cutoff mark.

Discussion of Findings

The study's established that automobile engine emissions contribute to a large extent contribute to air pollution and pose unforgettable health concerns to stakeholders such as drivers, passengers, pedestrians, and residents living around, as evidenced by the following result [6], who asserted that high rates of cardiovascular disease (CVD) are linked to CO exposure globally. The study clearly establishes that automobile emissions contribute to poor air quality, which are likely to be catastrophic in the future if not checked and can lead to premature death, because they contain harmful compounds like carbon monoxide and nitrogen dioxide, which have been linked to a range of ailments. This is consistent with the findings of [3] and [8], who found that exposure to air pollution was associated with certain deaths. Emissions can exacerbate pre-existing asthma

symptoms, raise the risk of lung cancer, cause dementia and heart disease, hinder children's lung growth, and provoke asthma episodes. May damage lung function and respiratory health, especially in vulnerable populations such as children and the elderly. Lung cancer, heart attacks, pneumonia, and bronchitis are among the hazardous ailments.

Conclusion

The results of the study shed light on the factors influencing vehicle emissions in Lagos State and provide a better knowledge of the health effects of vehicle engine emissions. This study also aids in determining the best ways to lower emissions from automobile engines and lessen their negative health impacts.

Recommendation

The following recommendations were made in the in light of the investigation's findings:

1. The implementation of public education and awareness campaigns that aimed at informing people about the negative health effects of automobile emissions. In addition to interacting with stakeholders to raise awareness and encourage action on fuel-efficient driving practices and emissions reduction.
2. Techniques for enforcing laws on stringent vehicle emissions requirements and policies to cut emissions

should be introduced. These all have the potential to lessen the health effects of vehicle emissions.

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