

Abstract

Traffic congestion is a problem in many major cities around the world because of high population density relying on vehicles as the primary means of transportation. Lagos, Nigeria is one such densely populated city with high traffic congestion. This paper examines the public health implications of the effect of traffic congestion on air quality and possible interventions to address it. Lagos, a megacity of over 15 million people, is the most populous metropolis in Nigeria and accounts for over 12% of the country's total population. Traffic congestion has been a problem in Lagos for many years. Lagos has more than 5 million automobiles on its roads, averaging 200 vehicles per kilometer, more than double the national average of 11 vehicles. Commuters spend 30 hours a week on average stuck in traffic. Outdoor air pollution affects the health of the population and can lead to death. It is a major source of respiratory problems and the World Health Organization estimated in 2019 show 4.2 million premature deaths worldwide were attributable to outdoor air pollution. The influence of traffic congestion on air quality and how this lowered air quality may affect individuals have become key study concerns, especially when assessing from the public health perspective. Factors that lead to traffic congestion and its concomitant air pollution are examined from a public health perspective. Possible interventions at multiple levels - physical, social, economic, and policy – are discussed to advocate for permanent solutions to the problem of traffic congestion in Lagos. This will ultimately lead to improved air quality and reduce the associated health problems and death for the citizens of Lagos.

Introduction and Background

Introduction: Poor air quality has been related to traffic bottlenecks, which are a major issue in Lagos, Nigeria. Lagos's air quality is deteriorating as a result of the excessive number of vehicles on the road and the lack of adequate roads and transit facilities. The presence of one or more pollutants in such amounts and for such periods of time as to harm the health of humans, animals, or plant life is what is referred to as air pollution. Traffic congestion has been recognized as one of the primary drivers of this problem. This study examines the relationship between traffic congestion and Lagos's air quality from a public health perspective.

Background

Lagos has a high rate of air pollution due primarily to traffic congestion. It is the economic center of Nigeria and the megacity with the fastest population growth in the world with a population of 21 million people and account for 12% of Nigeria's total population. Air pollution caused 7 million deaths worldwide, or 10% of all deaths, in 2012. In 2016, almost 85% of the 2.9 million recorded fatalities occurred in low- and middle-income nations. In 2017, Nigeria had the second-worst mortality rate in all of Africa with more than 7% of deaths (114,100) attributed to air pollution. In Lagos, almost 11,200 premature fatalities were brought on by air pollution as a result of traffic congestion in 2018. In 2019, air pollution was responsible for over 23,900 premature deaths (or 12.4% of all fatalities). With 200 automobiles per kilometer on Lagos's roads, a person stuck in traffic for 30 hours a week, and other commuters, pedestrians, and drivers, fossil fuel emissions directly impact people's health. The high density of antique autos with high sulfur content is the primary source of PM 2.5. Because of the enormous number of obsolete automobiles in Lagos, as well as the city's limited transportation options, the sulfur content has increased. Carbon monoxide is another pollutant discovered at a high level and it is well-known for lowering oxygen levels in the body. Adults and children frequently experience this problem. Some of these toxins also harm the environment, plants, and animals. In 2018, due to illness and early mortality brought on by ambient air pollution losses of 2.1 billion, or 2.1% of Lagos State's GDP, occurred. Traffic congestions and the accompanying poor air quality have deleterious health implications for the citizens of Lagos and require robust interventions at multiple levels.

Methods

Database	PubMed, Google Scholar.
Year of study interval	2018 - 2022
Search Terms	Air quality in Lagos, Nigeria. Traffic Congestion in Lagos, Nigeria. Factors responsible for traffic congestion in Lagos. How does traffic congestion in Lagos impact air quality. Traffic jams. How to address traffic congestion in Lagos Nigeria. Health impact of air pollution due to traffic congestion. Pollution by vehicles, Air pollutants and the effects
Inclusion Criteria	Peer-reviewed, English publications, 2018-2022
Screening	Articles gathered and processed separately by two authors for appropriateness
Literature Matrix	Study description - year, article reference keywords

Figures showing traffic congestion in Lagos, the busiest city in Africa.



Figure 1. Femi A. Productivity drops as traffic congestion costs Lagosians N4 trillion yearly'. *The Guardian*. Published February 10, 2021. Assessed March 10, 2023. <https://guardian.ng/business-services/productivity-drops-as-traffic-congestion-costs-lagosians-n4-trillion-yearly>

Figure 2. Pius UE. Minibuses causing traffic gridlock at Idumota Lagos. *AFP/Getty Images. Arbitrizer*. Published May 10, 2017. Assessed March 10, 2023. <https://arbitrizer.com/lagos-loses-n4-trillion-to-traffic-congestion-annually>

Figure 3. Chinedu O. Africa's busiest city Lagos at risk of economic slowdown. *Business insider Africa*. Published October 31, 2022. Assessed March 15, 2023. <https://africa.businessinsider.com/local/markets/africas-busiest-city-lagos-may-be-at-risk-of-economic-slowdown/84cw37s>

Health Impact of Air Pollution

1. Respiratory problems (Emphysema, COPD, Asthma related changes, chronic bronchitis)
2. Oxidative stress and inflammation levels in human cells leading to cancer and other chronic illnesses.
3. Cardiovascular diseases
4. Reproductive and immune system disorders
5. Neurological disorders (ADHD, Neural tube defects, Dementias)
6. Cancers (e.g. breast cancer, lung cancer)
7. Asphyxiation, anemia, fibrosis, exacerbation of heart disease, and degeneration of blood vessel lining cells.
8. Irreparable damage to the central nervous system, coma, and seizures.

Socio-economic Factors

1. Social events not within walking distances.
2. Mass social gatherings
3. Inattentive driving and disregard for road laws.
4. Urbanization and rapid motorization expansion without a commensurate increase in road network
5. No time segregation rule applies to trucks and other heavy-duty vehicles,
6. Increased economic trends and activities that require people to travel long distances
7. Vehicle breakdown and poorly maintained vehicles
8. Increased automobile ownership
9. Employment pattern and income levels
10. Inadequate investment in adequate infrastructure

Physical Factors

1. Poor infrastructure
2. Poor road conditions
3. Inadequately integrated transportation system
4. Inadequate planning and control of traffic
5. Frequent traffic collisions
6. Poorly maintained road pavement
7. Poor parking spaces
8. No parking restrictions.
9. Narrow roads
10. Disorganized land use distribution or pattern
11. Dominance of low-capacity minibuses

Policy Factors

1. Lack of clear policies at local, regional, and federal levels to address air pollution
2. A lack of maintenance and sound policies
3. Laws governing vehicle upkeep are not properly enforced by owners and drivers of public transportation.
4. Poorly implemented regulations to reduce automobile emissions.
5. Inadequate laws or regulations that prohibit or limit the use of old automobiles.
6. Policies to enforce driving and traffic education

Results, Discussion and Conclusion

Results

The different studies reviewed state that one major method employed in analyzing Lagos's air quality is the use of calibrated handheld devices to measure the air quality around transportation hubs. Lagos's transport sector areas had a PM 2.5 level in 2019 that was almost 14 times higher than the WHO-recommended range. Nitrogen oxides, sulfur oxides, ozone, fine particulate matter (PM 2.5), P.M. 10, carbon monoxide, and carbon dioxide are some of the pollutants that have been found in the air in Lagos bus stops, transportation, and residential areas. Recent studies on the quality of the air in Lagos have revealed that pollutants including particulate matter (PM 10, PM2.5), carbon monoxide, and sulfur dioxide were continuously over the WHO-set threshold. Traffic congestion is the major contributor to air pollution, especially in Lagos. The sustained emissions from vehicles due to traffic congestion increases the level of hazardous toxins and harmful by-products in the air. These are dangerous to human, plants, local vegetation's, and animal life. Some of the effects are formation of acid rain, greenhouse effects, ozone formation, toxicity to fish and other creatures in lakes, ocean and rivers. Respiratory, cardiovascular, reproductive, neurological and immune related disorders have all been implicated in air pollution due to traffic congestion.

Discussion

There are numerous micro and macro level factors responsible for traffic congestion in Lagos. These factors have been classified into physical factors (poor infrastructure, poorly maintained road pavements, inadequate land use patterns, poor parking spaces), social factors (mass social gatherings, urbanization, community and social events not within walking distance), economic factors (poor investment in adequate infrastructure, employment pattern, various economic activities requiring people to travel long distances) and policy factors (lack of clear policies at local, regional or federal levels to address traffic congestion as well as air pollution). Traffic congestion in Lagos has had environmental, health, societal and economical impact on its dwellers. It is therefore important to address the major contributing factors identified. The Government of Lagos should invest in improving the transportation infrastructures and road conditions, more means of transportation should be developed, creation of alternate routes and bye-passes, traffic rules and signals should be enforced with penalty for those who disobey them, There should be time segregation rules applying to heavy duty vehicles, driving school and traffic education should be enforced to teach drivers the ethics of driving, mass social gatherings should be prevented from causing road blocks, adequate terminal facilities should be developed, there should be proper land use, flexible working hours, adequate investment in transportation system, clear policies to address air pollution should be put in place and there should be adequate and timely implementation.

Conclusion

Traffic congestion in Lagos leads to poor air quality and affects the population's health. Government, Policymakers, and other key people in Lagos State must pay close attention to reducing it and upgrading the city's transportation infrastructure. The detrimental impacts of traffic congestion on human health and wildlife must likewise be made more widely known. Addressing traffic congestion at multiple levels in Lagos will improve air quality and improve the health and well-being of its citizens.

Future Work

1. Use social marketing to raise more awareness about the effect of traffic congestion.
2. Monitor the air quality of Lagos using modern equipment
3. Identify efficient technologies to address vehicular air pollution in Lagos.
4. Assess the effects of traffic congestion-related air pollution at bus stops, roadways, and residential areas inside or near transit zones.
5. Collaborate with Lagos City managers to pass relevant policies to address air pollution from vehicles.
6. Work with Lagos City managers to formulate, execute, and enforce health and environmental laws to regulate air quality.

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