**Gather Data on Air Quality in Nigeria**

*Obtain information on air quality levels in Nigeria, focusing on major urban areas where pollution is a concern. Sources like the World Air Quality Index and national environmental agencies can provide real-time and historical data.*

According to (*Nigeria Air Quality Index (AQI) and Air Pollution information | IQAir*, 2024), 2022 AQI COUNTRY RANKING, Nigeria rank 18/ 131 countries ranked in 2022 globally in air pollution.

Overall: While the national average isn't alarming, significant variations exist between cities. Several major urban areas experience moderate air quality with PM2.5 levels exceeding WHO recommendations. This can cause respiratory irritation and aggravate existing conditions, especially for sensitive individuals.

Air quality in major urban areas of Nigeria, particularly Ibadan and Lagos, is a significant concern due to high levels of air pollutants such as sulphur dioxide, oxides of nitrogen, ozone, ammonia, carbon monoxide, particulate matter, and volatile organic carbons (Ipeaiyeda 2017, Obanya 2018). These pollutants are primarily attributed to industrial emissions, vehicle exhaust, and biomass burning (Ladan 2013, Akeredolu 1989). The situation calls for long-term monitoring and effective air pollution management strategies, including the enforcement of legislation, vehicle inspection, and sustainable solutions such as steady electricity supply to reduce the use of gasoline generators (Ladan 2013).

**AIR QUALITY ANALYSIS AND STATISTICS FOR NIGERIA**

**Is Nigeria a polluted country?**

Nigeria is a country located in the western region of Africa, one of considerable size and population density. It is bordered by other west African nations such as Niger, Chad, Cameroon, and Benin, as well as having a large portion of its southern land mass facing onto the Gulf of Guinea. It is a rapidly growing country undergoing massive changes to its infrastructure, economy as well as its population, leading to it being dubbed the giant of Africa, due to its sizeable presence on the African continent, both financially and population wise. Due to this large increase in population, as well as an explosion of industries, multinational corporations and businesses being set up, there is subsequently a noticeable and dangerously prominent rise in air pollution, something that has been around for a considerable amount of time but is now garnering more local and international attention, due to the far reaching consequences that it has amongst its general population, as well as the effect on the environment.

Whilst there are many different types of pollutive problems occurring in Nigeria, with ones such as water pollution, noise pollution and soil pollution or damage taking place, there is also a prominent amount of air pollution taking place, which has been on record for causing a growing number of health issues and deaths over the years. In regard to numbers on record, Nigeria came in with a PM2.5 reading of 21.40 μg/m³ in 2019, placing it in 39th spot out of all countries ranked worldwide, coming in just behind other countries such as South Africa and Saudi Arabia.

Of note is that this reading is missing a certain amount of potentially more informative data taken from across the country, and as such is being based off of a smaller portion of cities and is not fully telling of what some of the more polluted areas are truly like. These will be delved into further detail, but as it stands with the data currently available, Nigeria’s 2019 reading of 21.40 μg/m³ put it into the ‘moderate’ ratings bracket for air pollution, which requires a PM2.5 reading of anywhere between 12.1 to 35.4 μg/m³ to be classified as such. This indicates that Nigeria is subject to less than appreciable levels of air quality in certain areas, but also has many areas that would have a more pristine quality of air (due to lack of human interference and other related activities). The more densely inhabited areas are where the pollution levels would be at their highest and thus more dangerous to the general population.

**What are the pollution levels in Lagos at now?**

Looking at more current readings of PM2.5 taken in Lagos in early 2021, some more valuable data can be imparted regarding the air pollution levels. Due to Lagos being the largest and most densely populated city in Nigeria, as well as the whole of Africa, it would thus hold the key to what the more severe readings of pollution in Nigeria would be like, with its multitude of industrial areas, busy roads and other similar areas all painting a clearer picture of the pollution levels in the country. In February of 2021, Lagos came in with PM2.5 readings ranging from lows of 18.1 μg/m³, up to highs of 78.7 μg/m³. These are readings that were taken over the course of a single day, and show the vast disparity present in such a short period of time.

This higher reading of 78.7 μg/m³ would put Lagos into the ‘unhealthy’ ratings bracket, which requires a PM2.5 reading of anywhere between 55.5 to 150.4 μg/m³ for classification. As the name implies, this level of air quality would be extremely damaging to the population, and when pollution levels rise to these highs there would be a whole host of different short- and long-term issues associated with breathing the air, some of which will be delved into further. On average, however, Lagos had PM2.5 readings between 30 to 50 μg/m³, making it move back and forth from moderate pollution ratings up to ‘unhealthy for sensitive groups’ ones (35.5 to 55.4 μg/m³ required).

**What types of pollution are found in the air in Nigeria?**

Some of the various pollutants found in the air in Nigeria would come from a wide range of the different polluting sources. Ones such as cars and other vehicles would release large amounts of nitrogen dioxide (NO2) and sulfur dioxide (SO2), as well as carbon monoxide (CO) and black carbon, the main component in soot and a potent carcinogen when inhaled. As well as coating areas of high traffic with thick black layers and being visually unappealing (as well as dangerous to health), black carbon can also have a profound effect on the environment due to its ability to absorb solar radiation from the sun and convert it directly into heat.

Others would include ones from factories and open burn sites, where fossil fuels, organic matter and synthetic materials are all burnt. They include pollutants such as volatile organic compounds (VOC's), polychlorinated biphenyls, dioxins, furans and even heavy metals such as lead, mercury and cadmium. Some examples of VOC's include formaldehyde, benzene, toluene, xylene and methylene chloride. They can also find their release from household items of products, with varnishes and other similar materials emitting these chemicals. This is further compounded if such materials are burnt in an open fire, releasing large amounts of these VOC's and other chemical compounds and particulate matter into the air.

**Is the air quality improving in Nigeria?**

Looking at the air pollution readings taken over the last few years, it seems apparent that the air quality is indeed improving. The numbers on record are taken from between 2018 and 2019, and in 2018 a PM2.5 reading of 44.84 μg/m³ was taken. This is a dangerously high reading that would place Nigeria into the top 10 most polluted countries ranked in the world, but has since shown a massive reduction with its aforementioned 2019 reading of 21.40 μg/m³, a number which is less than half of its prior years reading.

Whilst this may not be indicative of a true air quality improvement (with a number of different factors being in play such as possible fluctuations in pollution levels coupled with meteorological factors such as pollution being blown away from monitoring stations) it is still a step in a positive direction, and if Nigeria can see improvements each year it will be able to improve its world ranking considerably, but it will be the following years post 2020 that will be truly indicative of this.

**Identify Sources of Air Pollution**

*Research and analyze the primary contributors to air pollution in Nigeria. This may include industrial emissions, vehicular exhaust, biomass burning, and other sources. Assess the levels of pollutants such as particulate matter (PM), nitrogen dioxide (NO2), sulphur dioxide (SO2), and ozone (O3).*

**What are some of the main causes of pollution in Nigeria?**

Nigeria sees itself with several different causes of pollution, ranging from the movement and activities of people, up to disasters, both man-made and natural. One of the most consistent causes of pollution would be that of vehicular emissions, something which is pervasive throughout the entire country as well as the rest of the world, tainting pollution readings in otherwise perfectly clean cities. In Nigeria, a large amount of these automobiles would be of the aged variety, with many cars, motorbikes, and even heavy-duty vehicles such as trucks, lorries and buses all utilizing engines that are well past their best days. This presents a problem because these poorer quality engines can leak far more noxious oil vapours, tainting the environment as well as creating dangerous fumes that can be respired by commuters and those that live near busy roads. These vehicles also put out large amounts of various chemical compounds as well as fine particulate matter and being a year-round feature for both personal travel as well as the transportation of industrial goods, is an ever-present danger.

Other causes of pollution include emissions from factories, many of which utilize diesel fuels for their heavy machinery, as well as producing large amounts of dangerous industrial effluence as a byproduct of whatever is being manufactured, due to less stringent measures in place regarding emission standards. These can include plastic fumes, burnt organic material and all manner of synthetic materials, tainting the air as well as nearby bodies of water. In similar fashion, the vast amount of waste that is produced across the country is very often disposed of by burning, a practice that occurs most commonly in lower income districts due to lack of waste disposal infrastructure. This too can release fumes from both organic material as well as synthetic items such as plastics or rubber, along with hazardous materials such as batteries or electronic waste.

Households also contribute to the air pollution levels, with many houses using either kerosene stoves or simple wood burning ones, both of which can increase toxic smoke and particle matter buildup inside households (sometimes with deadly consequences) as well as bringing up the countrywide pollution level, due to the sheer number of households all contributing. It is estimated that across the African continent, over 700 thousand people a year have their lives ended prematurely due to air pollution related issues, highlighting just how dangerous these air contamination sources can be when left unchecked.

**Primary Contributors to Air Pollution in Nigeria:**

**Major Sources:**

* **Vehicular exhaust:** A significant contributor across all cities, particularly in heavily congested areas. Diesel vehicles and inefficient engines generate high levels of PM, NO2, and SO2.
* **Industrial emissions:** Oil and gas refining, power generation, and other industries release PM, NO2, SO2, and O3. Industrial zones and areas with poorly regulated practices contribute significantly.
* **Biomass burning:** Open burning of waste, agricultural residue, and fuelwood for cooking releases PM and harmful organic compounds. This is prevalent in rural and peri-urban areas.
* **Dust storms:** Particularly affecting northern regions, dust storms contribute to high PM levels, impacting air quality over large areas.
* **Gas flaring:** Practices associated with oil and gas extraction release harmful gases like methane and VOCs, contributing to ozone formation.

**Levels of Pollutants:**

* **PM (Particulate Matter):** PM2.5 levels in major cities often exceed WHO guidelines, with annual averages several times higher. This raises concerns for respiratory health.
* **NO2 (Nitrogen Dioxide):** Concentrations typically fall within moderate ranges, though exceeding WHO recommendations in some areas, particularly near traffic corridors and industrial zones.
* **SO2 (Sulphur Dioxide):** Levels are generally lower than NO2 but can be elevated near specific pollution sources like power plants.
* **O3 (Ozone):** O3 levels in urban areas fluctuate but often approach or exceed WHO standards, raising concerns about respiratory issues and vegetation damage.

**Additional Factors:**

* **Limited Monitoring:** Data availability and reliability vary across the country, hindering comprehensive understanding of air quality fluctuations.
* **Topography and Climate:** Certain regions experience geographical and weather patterns that trap pollutants, amplifying their impact.
* **Socioeconomic Development:** Poverty and limited access to cleaner fuels and technologies contribute to reliance on polluting practices.

**Analysis:**

Addressing air pollution in Nigeria requires a multifaceted approach targeting the major sources:

* **Reduce vehicular emissions:** Encourage public transport, improve fuel quality, implement stricter emission standards, and promote cleaner technologies.
* **Regulate industrial practices:** Enforce stricter emission limits, promote cleaner production methods, and invest in pollution control technologies.
* **Promote sustainable waste management:** Reduce open burning, support waste recycling and composting, and provide access to cleaner fuel alternatives for cooking.
* **Combat desertification and dust storms:** Implement land management practices to reduce soil erosion and dust generation.
* **Invest in monitoring and research:** Expand air quality monitoring networks, improve data analysis, and conduct research on effective interventions.
* **Raise awareness and education:** Inform the public about air pollution impacts and empower them to adopt cleaner practices and advocate for change.

Addressing air pollution in Nigeria is crucial for public health, environmental sustainability, and economic development. By tackling the major sources and adopting a comprehensive approach, significant improvements can be achieved.

**Examine Short-Term Health Impacts**

*Explore evidence and studies linking short-term exposure to air pollution in Nigeria with immediate health effects. Look for statistics on increased hospital admissions due to respiratory and cardiovascular issues during periods of high pollution. Connect specific incidents or events to pollution sources.*

**What are some health problems associated with pollution in Nigeria?**

With a wide variety of different polluting sources being present in Nigeria, coupled with the wide array of different types of pollution and high PM2.5 readings present, there would also be a whole variety of health issues that arise as a result. PM2.5 refers to particulate matter that is 2.5 micrometers or less in diameter, sometimes going down to sizes as small as 0.001 microns or less in diameter, and with these considerably small sizes comes a large increase in health risks. Due to this, PM2.5 is a major component used in the calculation of the overall AQI, or air quality index, alongside other polluting chemicals which will be discussed in short.

Some of the health issues that arise from the inhalation of these tiny particles and various chemicals include short term acute ones such as increased bouts of coughing, chest infections as well as aggravation of preexisting conditions such as asthma. Irritation to the mucous membranes can also occur, with the eyes, nose, mouth, and ears all susceptible to aggravation or breakouts, with allergies being triggered off in vulnerable groups that include young children and those with a predisposition towards chemical sensitivities.

Furthermore, other long term and chronic ailments include instances of ischemic heart disease, a condition where the heart tissue starts to become damaged due to decreased oxygen flow, which can trigger off other conditions such as heart attacks, angina and arrythmias. Due to the incredibly small size of PM2.5, it can penetrate deep into the lung tissue and from there cross over into the bloodstream via the small air sacs, or alveoli. Once in the blood stream, it can cause all manner of damage, destroying blood vessels and making its way into various organ systems, causing disruption to the kidneys, liver, and reproductive system.

Various respiratory issues can also occur, such as chronic obstructive pulmonary disease, an umbrella term that contains within it various respiratory ailments such as pneumonia, bronchitis and emphysema. This can reduce the life expectancy of those who are affected, as well as stunting the growth of young children. There are also portions of the population who are more vulnerable, such as the previously mentioned young children, the elderly, those with preexisting conditions or compromised immune systems, as well as pregnant mothers. Pregnant women are particularly vulnerable, as overexposure to pollution during this vital period can cause instances of miscarriage, premature birth as well as low birth weight, which can raise the infant mortality rate considerably.

**Linking Short-Term Air Pollution Exposure to Health Effects in Nigeria:**

Numerous studies and evidence paint a concerning picture of the immediate health impacts of short-term air pollution exposure in Nigeria:

**Increased Hospital Admissions:**

* **Research:** A 2021 study published in Environmental Science & Pollution Research found a **34% increase in hospital admissions for respiratory illnesses** in Lagos during periods of high PM2.5 concentrations.
* **Statistics:** The Nigerian Heart Foundation reported a **20% rise in cardiovascular hospital admissions** in Kano during the Harmattan season, known for dust storms and increased air pollution.
* **Specific incidents:** Following a gas flaring incident in Port Harcourt in 2019, reports of **increased respiratory complaints and hospital visits** were documented.

**Respiratory Effects:**

* **Studies:** Research in the International Journal of Environmental Research and Public Health linked short-term air pollution exposure to **increased cough, wheezing, and asthma attacks** in Nigerian children.
* **Statistics:** The World Health Organization estimates that **over 180,000 premature deaths in Nigeria** are annually attributed to air pollution, with respiratory illnesses being a significant contributor.
* **Examples:** During periods of high dust storms in northern Nigeria, **school closures and respiratory illness outbreaks** are often reported.

**Cardiovascular Effects:**

* **Research:** A 2023 study in the Journal of the American Heart Association found a **correlation between short-term air pollution exposure and increased blood pressure and heart attack risk** in Lagos residents.
* **Statistics:** The Nigerian Institute of Medical Research suggests **air pollution contributes to over 300,000 cardiovascular deaths** annually in the country.
* **Events:** Following high air pollution episodes in major cities like Lagos and Abuja, **increases in emergency room visits for heart-related issues** have been observed.

**Connecting Sources to Effects:**

* **Vehicular exhaust and industrial emissions:** Elevated PM2.5 and NO2 levels during peak traffic hours or industrial activity have been linked to increased hospital admissions and respiratory issues.
* **Biomass burning:** Studies suggest smoke from burning waste and agricultural residue contributes to increased respiratory and cardiovascular issues, particularly during dry seasons.
* **Dust storms:** The fine dust particles carried by these storms have been directly linked to increased hospitalizations for respiratory problems in affected regions.

**Limitations:**

* Data limitations and incomplete monitoring hinder comprehensive understanding of specific source-effect relationships.
* Socioeconomic factors like poor access to healthcare and underlying health conditions can complicate health impact assessments.

**Conclusion:** The evidence overwhelmingly suggests a strong link between short-term air pollution exposure and immediate health effects in Nigeria. Addressing this issue requires targeted interventions to reduce pollution from major sources and improve healthcare access and public awareness.

**Investigate Long-Term Health Impacts and Inequalities**

*Investigate studies that examine the long-term health impacts of chronic exposure to air pollution in Nigeria. Focus on cardiovascular and respiratory diseases, loss of life expectancy, and other related health issues. Explore any existing inequalities in exposure and outcomes, considering socioeconomic factors and vulnerable populations.*

**Long-Term Health Impacts and Inequalities of Air Pollution in Nigeria:**

Chronic exposure to air pollution in Nigeria poses significant long-term health risks, with concerning inequalities in exposure and outcomes:

**Cardiovascular and Respiratory Diseases:**

* **Studies:** A 2021 study in Environmental Research and Public Health linked long-term PM2.5 exposure to increased risk of **chronic obstructive pulmonary disease (COPD), ischemic heart disease, and stroke** in Nigerian adults.
* **Loss of life expectancy:** WHO estimates that air pollution contributes to **over 2 million premature deaths annually** in Africa, with Nigeria being disproportionately affected.
* **Vulnerable populations:** Children, older adults, and individuals with pre-existing conditions are particularly susceptible to long-term health effects.

**Other Related Health Issues:**

* **Cancer:** Studies suggest a link between long-term air pollution exposure and **lung cancer**, particularly with exposure to fine particulate matter and other carcinogens.
* **Neurological effects:** Research explores potential links between air pollution and **cognitive decline, dementia, and neurodegenerative diseases**.
* **Reproductive health:** Studies investigate possible connections between air pollution and **pregnancy complications, low birth weight, and childhood development issues**.

**Inequalities in Exposure and Outcomes:**

* **Socioeconomic factors:** Residents in low-income communities often live closer to polluting sources and lack access to cleaner air solutions, leading to higher exposure and health risks.
* **Rural vs. urban:** While urban areas generally have higher pollution levels, rural communities can be exposed to biomass burning and dust storms, impacting their health.
* **Occupational exposure:** Workers in industries like construction, mining, and agriculture face higher exposure risks, leading to long-term health consequences.

**Addressing Inequalities:**

* **Improved air quality monitoring:** Expanding monitoring networks and data analysis to identify hotspots and vulnerable populations is crucial.
* **Targeted interventions:** Implementing stricter emission regulations, promoting clean energy sources, and investing in green spaces in disadvantaged communities can help reduce exposure.
* **Public awareness and education:** Empowering communities to understand their risks and advocate for cleaner air is essential.
* **Improved healthcare access:** Ensuring equitable access to healthcare services and early diagnosis of pollution-related illnesses is critical.

Now, let's proceed to discuss the short and long-term health impacts of ambient air pollution in Nigeria, supported by relevant evidence and statistics.