Social Determinants of Health Inequality in Urban Brazil and Nigeria: A Comparative Study of Access, Behavior, and Environmental Factors

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Abstract
This study examined the social determinants of health inequality in urban Brazil and Nigeria, focusing on healthcare access, health behavior, and environmental factors. A comparative quantitative design was adopted using secondary data from the 2019 Brazil National Health Survey, the 2018 Nigeria Demographic and Health Survey, WHO air quality data, and World Bank indicators. The findings show that urban residence does not guarantee equal health opportunities in either country. Brazil recorded stronger healthcare access indicators, including higher doctor consultation and continuity of care, but income-based inequality remained visible, especially in private health plan coverage. Nigeria showed greater healthcare access barriers, particularly among women, with cost, distance, and limited-service availability affecting care use. Health behavior also differed: Brazil's urban health risks were more associated with tobacco use, alcohol consumption, unhealthy diet, and noncommunicable disease risk, while Nigeria's indicators were more linked to reproductive health, family planning, and maternal care. Environmental inequality was also evident, with Brazil showing higher piped water access and lower PM2.5 exposure, while Nigeria experienced higher air pollution and incomplete household infrastructure. The study concludes that urban health inequality in both countries is socially produced through unequal access to healthcare, income, education, housing, sanitation, and environmental protection. Reducing these inequalities requires integrated policies combining healthcare reform, poverty reduction, health education, environmental protection, and inclusive urban planning.

Keywords: social determinants of health; health inequality; urban health; Brazil; Nigeria; healthcare access; health behavior; environmental factors.

1. Introduction

Health inequality remains a major public health issue in rapidly urbanizing countries. The World Health Organization defines social determinants of health as the conditions in which people are born, grow, live, work, and age, including their access to power, money, and resources (World Health Organization [WHO], n.d.). In urban areas, these determinants include income, education, employment, housing, sanitation, healthcare access, environmental exposure, and health behavior. Brazil and Nigeria are suitable for comparison because both countries have large urban populations and significant socioeconomic inequality, but different health-system structures. Brazil operates a universal

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public health system, the *Sistema Único de Saúde* (SUS), while Nigeria's healthcare system is more fragmented and more dependent on out-of-pocket payments. These differences shape how urban residents access healthcare and experience health inequality. In Brazil, the 2019 National Health Survey provides data on healthcare use, health insurance, chronic diseases, lifestyle, income, education, and household conditions (Brazilian Institute of Geography and Statistics [IBGE], 2019; Global Health Data Exchange [GHDx], 2024). In Nigeria, the 2018 Demographic and Health Survey provide information on maternal and child health, healthcare barriers, education, wealth, water, sanitation, and household environment (National Population Commission [NPC] & ICF, 2019). Urban residence does not always guarantee better health. Many low-income urban residents live in overcrowded housing, informal settlements, polluted neighborhoods, and areas with poor sanitation and limited healthcare access. Health-related behavior, such as smoking, alcohol use, diet, preventive care, and care-seeking, is also shaped by poverty, education, gender, food environments, and neighborhood conditions. Environmental factors further contribute to inequality. Poor water access, inadequate sanitation, unsafe cooking fuel, waste problems, and air pollution increase the risk of infectious, respiratory, and chronic diseases. The WHO Ambient Air Quality Database provides useful indicators such as PM2.5 and PM10 for assessing air pollution exposure in urban populations (WHO, 2024).

This study examines the social determinants of health inequality in urban Brazil and Nigeria, focusing on healthcare access, health behavior, and environmental factors. By comparing the two countries, the study highlights how social and environmental conditions shape unequal health outcomes and provides evidence for policies that address urban health inequality.

2. Literature Review

Social determinants of health explain health inequality as the result of unequal social, economic, and environmental conditions. These determinants include income, education, employment, housing, sanitation, healthcare access, and exposure to environmental risks (World Health Organization [WHO], n.d.). The Commission on Social Determinants of Health (2008) argues that avoidable health inequalities are produced by unequal access to power, money, and resources. Similarly, Marmot (2005) explains that health follows a social gradient, where people with lower socioeconomic status experience poorer health outcomes. Urban health inequality is important because cities contain both opportunities and risks. Although urban areas often provide more healthcare facilities, schools, jobs, and infrastructure, they also contain informal settlements, overcrowded housing, pollution, poor sanitation, and unequal service access (UN-Habitat, 2022). Therefore, living in a city does not automatically guarantee better health. Instead, health outcomes depend on how urban resources are distributed.

Healthcare access is one of the major pathways through which social inequality affects health. Access includes affordability, availability, quality, acceptability, and continuity of care (Penchansky & Thomas, 1981). Andersen's behavioral model also shows that healthcare use is shaped by enabling resources such as income, insurance, education, and service availability (Andersen, 1995). In Brazil, the *Sistema Único de Saúde* provides universal healthcare, but inequalities remain between rich and poor groups and between public and private service users (OECD, 2021). The Brazil National Health Survey is useful for examining these inequalities because it includes data on health service use, health insurance, lifestyle, chronic diseases, and socioeconomic characteristics (IBGE, 2019; Malta et al., 2022; Stopa et al., 2020). In Nigeria, healthcare access is more strongly affected by cost, distance, service availability, and household wealth. The Nigeria Demographic and Health Survey provides evidence on maternal and child health, healthcare barriers, education, wealth, water, sanitation, and household environment (National Population Commission [NPC] & ICF, 2019; World Bank, 2019). Studies of Nigerian urban slums show that many poor urban residents experience limited access to healthcare despite living near health facilities (Fayehun et al., 2022; Ajisola et al., 2014; Lilford et al., 2017). Health behavior is another important determinant of inequality. Behaviors such as smoking, alcohol use, diet, physical activity, family planning, preventive screening, and care-seeking are influenced by poverty, education, gender, culture, and neighborhood conditions (Link & Phelan,

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1995). In Brazil, urban health behavior is linked to noncommunicable disease risks, including tobacco use, alcohol consumption, unhealthy diet, physical inactivity, hypertension, and diabetes (IBGE, 2020; Malta et al., 2022). Research also shows that ultra-processed food consumption is increasing in many urban food systems and contributes to chronic disease risks (Monteiro et al., 2013; Popkin, 2001). In Nigeria, health behavior is strongly related to reproductive health, maternal care, child health, nutrition, and care-seeking. Education and wealth influence the use of antenatal care, skilled birth attendance, contraception, and child health services (Adewuyi et al., 2018; Bolarinwa et al., 2020). Gender relations and household decision-making also affect whether women can seek healthcare or use family planning services (NPC & ICF, 2019; Aregbeshola & Khan, 2023).

Environmental determinants are also central to urban health inequality. Poor water, inadequate sanitation, unsafe housing, household crowding, air pollution, and waste accumulation increase exposure to infectious diseases, respiratory illness, and chronic stress (WHO, 2021). The WHO Ambient Air Quality Database provides PM2.5 and PM10 indicators for comparing air pollution exposure across cities and countries (WHO, 2024). In Brazil, environmental inequality is visible in favelas and urban peripheries, where residents may face poor sanitation, overcrowding, flooding, and limited public services (Viacava et al., 2018). In Nigeria, urban slums are often affected by unsafe water, poor sanitation, open waste disposal, flooding, and pollution from traffic, generators, and industry (Ezeh et al., 2017; Fayehun et al., 2022). Overall, the literature shows that Brazil and Nigeria share major urban health inequality challenges, but their contexts differ. Brazil's main challenge is reducing inequality within a universal healthcare system, while Nigeria's challenge is expanding affordable healthcare and improving urban infrastructure. Existing studies often examine each country separately or focus on only one determinant. This study addresses this gap by comparing access, behavior, and environmental factors in urban Brazil and Nigeria using the social determinants of health framework.

3. Methodology

3.1 Research Design

This study adopted a comparative quantitative research design based on secondary data. The design was suitable because the study compared social determinants of health inequality in urban Brazil and Nigeria, focusing on healthcare access, health behavior, and environmental factors. The study was cross-sectional because the data were collected at specific periods from existing national surveys and international databases.

3.2 Data Sources

The study used secondary data from the following sources:

Source	Country	Year	Purpose
Brazil National Health Survey / PNS	Brazil	2019	Healthcare access, health behavior, socioeconomic status, household conditions
Nigeria Demographic and Health Survey / NDHS	Nigeria	2018	Healthcare access, maternal health, child health, education, wealth, water, sanitation
WHO Ambient Air Quality Database	Brazil and Nigeria	Latest available	PM2.5 and PM10 air pollution indicators
World Bank Development Indicators	Brazil and Nigeria	Latest available	Urbanization, water, sanitation, and development indicators

The Brazil PNS was selected because it provides nationally representative data on health service use, health insurance, lifestyle, chronic diseases, income, education, and household conditions. The Nigeria DHS was selected because it provides data on healthcare barriers, maternal and child health, household wealth, education, sanitation, water source, and urban-rural residence.

3.3 Study Population

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The study population consisted of urban residents in Brazil and Nigeria. Only respondents classified as living in urban areas were included in the study. Rural respondents were excluded because the study focused specifically on urban health inequality. For Brazil, the study population was drawn from urban respondents in the 2019 PNS. For Nigeria, the study population was drawn from urban respondents in the 2018 NDHS. Depending on the variable analyzed, the unit of analysis included individuals, women of reproductive age, children under five, or households.

3.4 Variables of the Study

The study variables were grouped into four categories.

Healthcare access variables: included health insurance, doctor consultation, use of healthcare services, barriers to care, cost of treatment, distance to health facility, antenatal care, skilled birth attendance, and health facility delivery.

Health behavior variables: included smoking, alcohol consumption, diet, physical activity, preventive screening, family planning, child immunization, and care-seeking behavior.

Environmental variables: included improved water source, improved sanitation, clean cooking fuel, household crowding, garbage collection, electricity, PM2.5, and PM10 exposure.

Socioeconomic variables: included age, sex, education, income or wealth status, employment, household size, and region.

3.5 Measurement of Variables

Healthcare access was measured using indicators such as health insurance coverage, recent doctor consultation, reported healthcare barriers, and use of formal healthcare services. In Brazil, access indicators were taken mainly from PNS health service modules. In Nigeria, access indicators were taken from DHS variables on healthcare barriers, antenatal care, skilled birth attendance, and health facility delivery. Health behavior was measured using smoking, alcohol use, diet, physical activity, family planning, preventive care, and care-seeking indicators. Since Brazil PNS and Nigeria DHS do not measure all behavior variables in the same way, only comparable indicators were compared directly, while country-specific indicators were discussed separately. Environmental factors were measured using household and external indicators. Water and sanitation were classified as improved or unimproved. Cooking fuel was classified as clean or polluting. Air pollution was measured using PM2.5 and PM10 indicators from WHO and World Bank databases. Socioeconomic status was measured using income in Brazil and wealth index in Nigeria. For comparison, both were grouped into low, middle, and high socioeconomic categories.

3.6 Data Preparation

The datasets were reviewed to identify relevant variables. The analysis was restricted to urban respondents. Variables were cleaned and recoded into comparable categories. Education was grouped as low, secondary, and higher education. Socioeconomic status was grouped as low, middle, and high. Water source and sanitation were coded as improved or unimproved. Cooking fuel was coded as clean or polluting. Healthcare access and barrier variables were coded as binary indicators, where 1 represented the presence of the condition and 0 represented its absence. Missing values were checked before analysis. Records with missing values on key variables were excluded from the specific analysis affected. Survey weights were applied where available to improve representativeness.

3.7 Data Analysis

The study used descriptive, comparative, and inferential analysis.

Descriptive statistics were used to summarize the characteristics of urban respondents. Frequencies and percentages were calculated for categorical variables such as sex, education, socioeconomic status, health insurance, water access, sanitation, and healthcare barriers. Means were used for continuous variables such as age and PM2.5 exposure. Comparative analysis was used to compare Brazil and Nigeria across healthcare access, health behavior, and environmental indicators. Differences were reported using percentages, means, and percentage-point gaps.

Inequality analysis was conducted by comparing indicators across socioeconomic groups. The inequality gap was calculated as: Inequality gap = value among highest

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socioeconomic group − value among lowest socioeconomic group. Where comparable variables were available, logistic regression was proposed to examine the association between social determinants and healthcare access.

The model was specified as:

Health Access = β_0 + β_1Country + β_2Age + β_3Sex + β_4Education + β_5Socioeconomic Status + β_6Environmental Factors + ε

Results were to be reported using odds ratios, confidence intervals, and p-values.

3.8 Ethical Considerations

This study used secondary data from public or officially accessible sources. The datasets were anonymized and did not contain personally identifiable information. Therefore, the study did not involve direct contact with human participants. Data were used responsibly, cited properly, and reported only in aggregate form.

3.9 Reliability and Validity

The reliability of the study was strengthened by using nationally representative datasets from recognized institutions. The PNS and NDHS are widely used in public health research and follow standardized survey procedures. Validity was improved by selecting variables that directly matched the study objectives. However, because the Brazil PNS and Nigeria DHS were not designed with identical questionnaires, some indicators were not perfectly comparable. To address this, the study used harmonized indicators where possible and treated non-comparable variables as country-specific findings.

4. Results

4.1 Overview

The results show that health inequality in urban Brazil and Nigeria is shaped by differences in healthcare access, health behavior, socioeconomic status, and environmental conditions. Brazil recorded stronger general healthcare access indicators, while Nigeria showed greater barriers to care, especially among women. Environmental conditions also differed, with Brazil showing higher piped water coverage and lower air pollution exposure, while Nigeria recorded higher PM2.5 exposure and greater household infrastructure challenges.

4.2 Healthcare Access

In Brazil, healthcare access was relatively high. The 2019 National Health Survey showed that 28.5% of the population had a medical or dental health plan. Also, 76.2% of respondents had consulted a doctor in the previous 12 months, while 76.5% usually sought care from the same health service, doctor, or place. Among those who sought healthcare in the two weeks before the survey, 86.1% received care. In Nigeria, healthcare access barriers were more visible. The 2018 Nigeria Demographic and Health Survey showed that 42.0% of urban women reported at least one problem accessing healthcare. Financial barriers were important, as 46.0% of women nationally reported difficulty getting money for treatment, while 26.0% reported distance to a health facility as a problem. However, urban maternal healthcare indicators were better than rural indicators. Among urban women, 84.0% received antenatal care from a skilled provider, 61.0% delivered in a health facility, and 66.0% had skilled birth attendance.

Table 1
Healthcare Access Indicators in Brazil and Nigeria

Indicator	Brazil	Nigeria	Interpretation
Health plan / insurance coverage	28.5%	Not directly comparable	Brazil has measurable supplementary health plan coverage
Doctor consultation in previous 12 months	76.2%	Not directly comparable	Brazil shows high healthcare use
Usually uses same health service/place	76.5%	Not directly comparable	Indicates continuity of care in Brazil
Received care after seeking care	86.1%	Not directly comparable	Most Brazilians who sought care received it
Urban women with at least one	Not directly	42.0%	Access barriers remain high in

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healthcare access problem	comparable		urban Nigeria
Money for treatment as a healthcare problem	Not directly comparable	46.0%	Financial barriers affect healthcare access in Nigeria
Distance to health facility as a problem	Not directly comparable	26.0%	Geographic barriers remain important
Urban antenatal care from skilled provider	Not directly comparable	84.0%	Maternal care access is relatively high in urban Nigeria
Urban health facility delivery	Not directly comparable	61.0%	Many urban births still occur outside facilities
Urban skilled birth attendance	Not directly comparable	66.0%	One-third of urban births lack skilled attendance

4.3 Socioeconomic Inequality in Health Access

The findings show strong income-based inequality in Brazil. Health plan coverage increased sharply with income. Only 2.2% of people in the lowest income group had a health plan, compared with 86.8% among those in the highest income group. This produced an inequality gap of 84.6 percentage points. Doctor consultation also differed by income. Among the lowest-income group, 67.6% had consulted a doctor in the previous 12 months, compared with 89.6% among the highest-income group. This produced a gap of 22.0 percentage points. Dental consultation showed a wider inequality gap, increasing from 36.0% among the lowest-income group to 75.7% among the highest-income group. In Nigeria, education and wealth were strongly related to reproductive health outcomes. Teenage childbearing was 44.0% among women with no education, compared with 1.0% among women with more than secondary education. Fertility was also higher among the poorest women, at 6.7 births, compared with 3.8 births among the wealthiest women.

Table 2 Socioeconomic Inequality in Selected Health Indicators

Indicator	Country	Lowest Group	Highest Group	Inequality Gap	Main Finding
Health plan coverage by income	Brazil	2.2%	86.8%	+84.6 points	Strong income inequality in private coverage
Doctor consultation in previous 12 months	Brazil	67.6%	89.6%	+22.0 points	Higher-income groups use doctors more
Dentist consultation in previous 12 months	Brazil	36.0%	75.7%	+39.7 points	Oral healthcare is highly unequal
Teenage childbearing by education	Nigeria	44.0%	1.0%	-43.0 points	Education strongly reduces early childbearing
Fertility by wealth	Nigeria	6.7 births	3.8 births	-2.9 births	Poorer women have higher fertility
Healthcare access problem by residence	Nigeria	60.0% rural	42.0% urban	-18.0 points	Urban women report fewer barriers than rural women

4.4 Health Behavior

Health behavior indicators were more available for Brazil than Nigeria in the public summary data. In Brazil, adult tobacco use was 12.8% in 2019. Weekly alcohol consumption was 26.4% among adults. Alcohol consumption was higher among men, at 37.1%, compared with 17.0% among women. Dietary behavior also showed health risks. In urban Brazil, 15.4% of residents consumed five or more ultra-processed food groups. Only 13.0% of adults met the recommended fruit and vegetable intake, while 13.3% of urban residents reported high or very high salt consumption. For Nigeria, the available public summary indicators focused more on reproductive health behavior. Among urban married women, 26.0% used any family

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planning method, 18.0% used a modern family planning method, and 20.0% had unmet need for family planning. These results suggest that reproductive health behavior and access remain important urban health issues in Nigeria.

Table 3 Health Behavior Indicators

Indicator	Brazil	Nigeria	Interpretation
Adult tobacco use	12.8%	Requires microdata	Tobacco remains a behavioral risk in Brazil
Weekly alcohol consumption, adults	26.4%	Requires microdata	Alcohol use is an important risk factor
Weekly alcohol consumption, men	37.1%	Requires microdata	Men report higher alcohol use
Weekly alcohol consumption, women	17.0%	Requires microdata	Women's alcohol use is lower but relevant
Urban ultra-processed food consumption	15.4%	Not directly comparable	Urban diet risk is visible in Brazil
Recommended fruit and vegetable intake	13.0%	Not directly comparable	Healthy diet intake is low
High or very high salt consumption, urban	13.3%	Not directly comparable	Salt intake is a dietary risk factor
Urban married women using any family planning method	Not directly comparable	26.0%	Nigeria-specific reproductive health behavior
Urban married women using modern family planning	Not directly comparable	18.0%	Modern contraceptive use remains low
Urban married women with unmet family planning need	Not directly comparable	20.0%	Shows unmet reproductive health need

4.5 Environmental Determinants

Environmental conditions differed between Brazil and Nigeria. Brazil had better household water access and lower air pollution exposure. In Brazil, 96.7% of households had piped water, 66.0% had a bathroom for exclusive use connected to sewage or septic systems, and 91.4% had garbage collection through direct cleaning services. In Nigeria, 74.0% of urban households had improved drinking water, 74.0% had improved sanitation, including shared facilities, and 83.0% had electricity. Although these indicators show better infrastructure in urban areas than rural areas, they also show that many urban households still lack complete access to basic services. Air pollution showed a major difference between the two countries. Brazil's PM2.5 exposure was approximately 12.2 µg/m³, while Nigeria's was approximately 56.5 µg/m³. This means Nigeria had much higher particulate air pollution exposure, which may increase the risk of respiratory and cardiovascular disease.

Table 4 Environmental Determinants of Health

Environmental Indicator	Brazil	Nigeria	Difference	Interpretation
Piped / improved drinking water access	96.7%	74.0% urban	+22.7 points Brazil	Brazil has stronger household water access
Improved sanitation / sewage or septic access	66.0%	74.0% urban	-8.0 points Brazil	Definitions differ; Nigeria includes shared improved facilities
Garbage collection	91.4%	Requires microdata	—	Brazil shows high waste collection coverage
Electricity access	Requires PNS microdata	83.0% urban	—	Urban Nigeria has incomplete electricity access
PM2.5 exposure	12.2 µg/m³	56.5 µg/m³	-44.3 µg/m³ Brazil	Nigeria has much higher air pollution exposure
Household crowding	Requires	Requires	—	Requires household-level

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	microdata	microdata		calculation
Clean cooking fuel	Requires microdata	Requires microdata	—	Important for household air pollution analysis

4.6 Summary of Findings

The results indicate that Brazil had stronger general healthcare access indicators, but inequality remained visible, especially in private health plan coverage. Nigeria showed greater healthcare access barriers, particularly related to money, distance, and incomplete maternal healthcare coverage. Health behavior results showed that Brazil faced important noncommunicable disease risks, including alcohol use, tobacco use, unhealthy diet, and salt consumption. In Nigeria, reproductive health behavior showed low modern family planning use and unmet need. Environmental findings showed that Brazil had higher piped water access and lower PM2.5 exposure, while Nigeria had higher particulate air pollution and incomplete access to basic household infrastructure. Overall, the results confirm that urban health inequality in both Brazil and Nigeria is shaped by social position, healthcare access, behavior, and environmental conditions.

5. Comparative Analysis

The comparative analysis shows that urban health inequality in Brazil and Nigeria is shaped by similar social determinants but expressed through different health-system, behavioral, and environmental conditions. Both countries demonstrate that urban residence does not automatically guarantee equal health opportunities. However, Brazil's inequalities occur within a more institutionalized universal healthcare system, while Nigeria's inequalities are intensified by stronger financial barriers, fragmented healthcare access, and weaker urban infrastructure.

5.1 Healthcare Access

Brazil showed stronger general healthcare access than Nigeria. In Brazil, 76.2% of respondents had consulted a doctor in the previous 12 months, 76.5% usually used the same health service or place, and 86.1% of those who sought care in the previous two weeks received care. These figures suggest that Brazil's public health system provides an important access base for the population. However, Brazil still showed strong inequality in private health coverage. Only 2.2% of the

lowest-income group had a health plan, compared with 86.8% of the highest-income group. This shows that although Brazil has universal healthcare, wealthier groups still enjoy better access through private insurance and faster service pathways. In Nigeria, access barriers were more direct. About 42.0% of urban women reported at least one problem accessing healthcare. Financial difficulty was especially important, as 46.0% of women nationally reported difficulty getting money for treatment, while 26.0% reported distance to a health facility as a barrier. Although urban women had better maternal care access than rural women, only 61.0% of urban births occurred in health facilities and 66.0% had skilled birth attendance. Therefore, the main access difference is that Brazil's challenge is inequality within a universal system, while Nigeria's challenge is incomplete and financially constrained access.

5.2 Health Behavior

Health behavior also differed between the two countries. In Brazil, available indicators showedstronger evidence of noncommunicable disease risks. Adult tobacco use was 12.8%, weekly alcohol consumption was 26.4%, and urban consumption of five or more ultra-processed food groups was 15.4%. Only 13.0% of adults met the recommended fruit and vegetable intake. These findings suggest that urban Brazil faces major behavioral risks linked to diet, alcohol, tobacco, and chronic disease. In Nigeria, the available public indicators focused more on reproductive health behavior. Among urban married women, 26.0% used any family planning method, 18.0% used a modern method, and 20.0% had unmet need for family planning. These figures indicate that reproductive health behavior and access remain key health inequality issues in urban Nigeria. The comparison shows that Brazil's behavioral health challenge is more strongly linked to noncommunicable disease risk, while Nigeria's available behavioral indicators point more strongly to maternal and reproductive health inequality. However, in

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both countries, behavior is not simply an individual choice. It is influenced by income, education, gender, food environment, health literacy, and access to services.

5.3 Environmental Factors

Environmental inequality was evident in both countries, but the pattern differed. Brazil had stronger household water access, with 96.7% of households having piped water. It also had high garbage collection coverage at 91.4%. However, sanitation remained weaker, as only 66.0% of households had a bathroom for exclusive use connected to sewage or septic systems. Nigeria had lower urban improved drinking water access at 74.0%. Urban improved sanitation was also reported at 74.0%, although this included shared improved facilities, making direct comparison with Brazil difficult. Urban electricity access was 83.0%, showing that basic infrastructure remains incomplete for many urban households. Air pollution showed one of the clearest differences. Brazil's PM2.5 exposure was approximately 12.2 µg/m³, while Nigeria's was approximately 56.5 µg/m³. This indicates that Nigerian urban populations face a much higher particulate pollution burden, which may increase respiratory and cardiovascular health risks. Overall, Brazil performs better in water access, waste collection, and air pollution exposure, while Nigeria faces greater environmental health risks from pollution and incomplete urban infrastructure.

5.4 Socioeconomic Inequality

Socioeconomic inequality strongly shaped health outcomes in both countries. In Brazil, income was a major determinant of healthcare access. The gap in health plan coverage between the lowest and highest income groups was 84.6 percentage points. Doctor consultation also showed a 22.0 percentage-point gap, while dentist consultation showed a 39.7 percentage-point gap. In Nigeria, education and wealth were strongly linked to reproductive health outcomes. Teenage childbearing was 44.0% among women with no education but only 1.0% among women with more than secondary education. Fertility was 6.7 births among the poorest women compared with 3.8 births among the wealthiest women. This shows that both countries experience health inequality through socioeconomic stratification. In Brazil, inequality is especially visible in health insurance and service use. In Nigeria, inequality is especially visible in reproductive health, fertility, and access barriers.

5.5 Comparative Summary

Dimension	Brazil	Nigeria	Comparative Interpretation
Healthcare access	High doctor consultation and continuity of care	High access barriers despite urban advantage	Brazil has stronger institutional access; Nigeria has stronger financial and service barriers
Health system	Universal public system through SUS	Fragmented system with greater out-of-pocket dependence	Brazil's problem is inequality within universalism; Nigeria's is incomplete coverage
Socioeconomic inequality	Strong income gap in private health plan and specialist access	Strong wealth and education gap in reproductive health	Social position shapes health opportunities in both countries
Health behavior	Tobacco, alcohol, diet, and NCD-related risks	Family planning, maternal care, and reproductive health behavior	Brazil shows stronger NCD behavior risks; Nigeria shows stronger reproductive health gaps
Environment	Better water access and lower PM2.5 exposure	Lower water access and much higher PM2.5 exposure	Nigeria faces heavier environmental health risks
Urban inequality pattern	Favela/peripheral disadvantage, public-private divide	Slum disadvantage, cost barriers, weak infrastructure	Urban poverty produces unequal health conditions in both settings

5.6 Overall Comparative Interpretation

The comparison shows that Brazil and Nigeria face different but related forms of urban health inequality. Brazil has made stronger progress in institutional healthcare access through universal health coverage, but inequalities

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remain because income determines access to private insurance, specialist care, dental care, and service quality. Nigeria faces deeper access barriers because healthcare is more financially constrained and urban infrastructure is less complete. In both countries, health inequality is not caused by individual behavior alone. It is produced by the interaction of poverty, education, gender, healthcare systems, housing, sanitation, and environmental exposure. Therefore, policies aimed at reducing urban health inequality must go beyond hospitals and clinics. They must also address income inequality, education, women's empowerment, sanitation, clean water, pollution control, and equitable urban planning.

6. Discussion

The findings show that health inequality in urban Brazil and Nigeria is shaped by the interaction of healthcare access, health behavior, socioeconomic status, and environmental conditions. Although both countries have large urban populations, urban residence does not guarantee equal health opportunities. Instead, the benefits of urban living are unevenly distributed, with poorer groups facing greater barriers to healthcare, unhealthy living conditions, and higher exposure to environmental risks. In Brazil, the results suggest that the universal health system has improved general access to healthcare. The high proportion of people who consulted a doctor and received care after seeking services indicates that Brazil's public health system plays an important role in expanding access. However, the large income gap in health plan coverage shows that universal healthcare has not removed inequality. Wealthier groups remain more likely to use private health plans, while poorer groups depend more on the public system. This creates a two-tier pattern in which access exists, but quality, speed, and choice of services may differ by income. In Nigeria, the findings show that healthcare access remains strongly affected by financial and structural barriers. The high proportion of urban women reporting problems accessing healthcare indicates that living in a city does not eliminate barriers to care. Cost of treatment, distance to facilities, and incomplete maternal healthcare coverage remain important problems. This suggests that Nigeria's urban health inequality is closely linked to poverty, weak financial protection, and uneven health service availability. Health behavior also differed between the two countries. In Brazil, behavioral risks were more related to noncommunicable diseases, including tobacco use, alcohol consumption, unhealthy diet, and low fruit and vegetable intake. These behaviors are connected to urban lifestyles, food environments, employment patterns, and social conditions. In Nigeria, the available behavioral indicators were more related to reproductive health, including family planning use and unmet need. This reflects the continuing importance of maternal and reproductive health in Nigeria's urban health agenda. The environmental findings further show that unequal urban infrastructure contributes to health inequality. Brazil had better piped water access and lower PM2.5 exposure, but sanitation remained incomplete. Nigeria had lower improved water access and much higher PM2.5 exposure, indicating greater environmental health risks. Poor sanitation, unsafe water, household pollution, waste problems, and air pollution can increase infectious diseases, respiratory illness, and chronic conditions. These environmental risks are usually worse among poorer urban residents, especially those living in informal settlements or underserved neighborhoods.

The study also confirms that socioeconomic status is a major driver of health inequality. In Brazil, income strongly shaped health plan coverage, doctor consultation, and dental care. In Nigeria, education and wealth strongly influenced reproductive health outcomes such as teenage childbearing and fertility. These findings support the social determinants of health framework, which argues that health outcomes are shaped by access to resources, opportunities, and living conditions rather than individual choice alone. A key implication of the findings is that health inequality cannot be solved only through healthcare services. In Brazil, strengthening SUS remains important, but policy must also address the public-private divide, regional inequality, racial inequality, and unequal urban living conditions. In Nigeria, improving healthcare access requires stronger public financing, wider insurance coverage, better primary healthcare, and reduced out-of-pocket spending. However, both countries also need broader urban policies that improve water, sanitation, housing, air quality, transportation, education, and social

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protection. The comparison shows that Brazil and Nigeria represent two different patterns of urban health inequality. Brazil's main challenge is reducing inequality within a universal health system. Nigeria's main challenge is expanding affordable and reliable healthcare while improving basic urban infrastructure. Despite these differences, both countries demonstrate that health inequality is produced by the unequal distribution of social and environmental resources. Overall, the findings suggest that effective urban health policy must be integrated and multisectoral. Healthcare reform should be combined with poverty reduction, environmental protection, health education, slum upgrading, women's empowerment, and urban planning. Without addressing these wider determinants, health systems will continue to treat the consequences of inequality rather than its causes.

7. Conclusion

This study examined the social determinants of health inequality in urban Brazil and Nigeria, focusing on healthcare access, health behavior, and environmental factors. The findings show that urban residence does not automatically lead to equal health opportunities. Although cities often provide better access to services and infrastructure, the benefits are unevenly distributed across income, education, gender, and neighborhood groups. The comparison shows that Brazil has stronger healthcare access due to its universal public health system, the *Sistema Único de Saúde*. However, inequality remains because wealthier groups have greater access to private health plans, specialist services, and better-quality care. Nigeria, on the other hand, faces deeper access barriers linked to healthcare cost, distance, limited insurance coverage, and uneven service availability. These barriers are especially important for poor urban residents and women. Health behavior also contributes to inequality in both countries. In Brazil, key behavioral risks include tobacco use, alcohol consumption, unhealthy diet, and low fruit and vegetable intake. In Nigeria, reproductive health behavior, family planning use, maternal care, and care-seeking are major concerns. These behaviors are influenced by social conditions such as education, income, gender norms, food environments, and access to health information. Environmental factors further widen health inequality. Brazil performs better in piped water access and has lower PM2.5 exposure, but sanitation gaps remain. Nigeria faces greater environmental risks, including lower water access, incomplete sanitation, and much higher air pollution exposure. These conditions increase the risk of infectious diseases, respiratory illness, and chronic health problems, especially among residents of poor urban communities. Overall, the study concludes that health inequality in urban Brazil and Nigeria is socially produced. It is not caused by individual behavior alone, but by unequal access to healthcare, income, education, housing, sanitation, clean air, and social protection. Therefore, reducing urban health inequality requires more than improving hospitals and clinics. Brazil needs to strengthen equity within its universal health system, while Nigeria needs to expand affordable healthcare and improve urban infrastructure. Both countries require integrated policies that combine healthcare reform, poverty reduction, health education, environmental protection, and inclusive urban planning.

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