



‘PROGRESS’: A pedagogic explanation of accessibility to health care as a basis for health inequality in sub-urban space

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Abstract.

Growth of urban centers has been acknowledged to be largely propelled by migration from the rural areas than natural birth increase in cities. Urban growth without substantial provision of basic services is one of the attending challenges of the process. Access to health care services in urban and peri-urban spaces is huge and it dictates the indicators for other urban developmental outcomes such as health status, social security and life expectancy. Thus, this paper discussed the factors that determine residents’ accessibility to health care services and the nexus between accessibility, the environment in which people live, and their health condition. Review of relevant literature on the issue of environment, accessibility to health care, environmental health, health care financing and health inequalities was carried out. Theories such as spatial interaction theory, Distance Decay and Accessibility theory were examined. The analysis of the opinion of various authors that were reviewed showed that health inequalities are determined by socio-economic, physical environment, individual behavior and perception, gene type and the quality of health care service provided. The accessibility of the people to health care is explained with the acronym “PROGRESS” to capture other emerging factors. There is therefore a nexus between health care service accessibility and health inequality with the attending outcome of poor health status of the suburban population.

KEY WORDS: Environmental Health, Health outcomes, Accessibility, Health care services, and sub-urban

1.0 Introduction

The growth of urban centers and the provision of urban services have been concerns among the government agencies, the professionals, academia and the public who are beneficiaries of the services. It has been observed that the urban growth leads to the demand for socio-physical infrastructure which consequently put pressure on urban environment. The origin of cities or urban formation informed the fact that natural geographic features such as rivers, good soil, favorable weather condition, mountain and caves are factors considered for choice of location. There is also the opinion that a link exists between the peoples’ health and the environmental condition within which they live and interact, (NCBI, 2021). This indicates that peoples’ health status are influenced by environmental risk factors such as biological, physio-chemical, and socio-economic whose impact are further determined by the degree of accessibility to the health care services provided in the settlements. It has been noted that 24

percent of global deaths are linked to environmental factors while 3.8 million deaths are caused by household air pollution (WHO, 2020).

Access to health care services is one of health determinants. In the past, conceptual discussion had been based on spatial theories in terms of allocation and location of health services based on threshold population. The limitation of such theories in explaining the realities of access to health care services among different population groups in urban space. Using thematic literature review, this paper critically examined some other variables such as the natural geographic factors and how such contribute to their environmental health status. This paper has 5 sections. Following the first section (introduction) is the conceptual issues in section 2. The third section is the nexus between health care accessibility and health inequalities. The fourth section considered the implication of the nexus for effective planning of health care services. The last section is the conclusion in which highlights of windows of opportunities are provided to show that health must be number one priority of urban managers.

2.0. Conceptual and Theoretical Issues.

This section will discuss concepts of the Environment, Environmental Health, Health Inequalities, Accessibility to Health care services, and characteristics of Settlements. Also some theories will be considered to locate this topic in the forum of academic discuss.

2.1. Conceptual Issues.

2.1.1. The Environment.

The word environment depicts the totality of all physical, cultural, natural, political, economical, technological features that surround the living and non-living organisms, (Oloukoi, 2021). It is conceived as a complex entity with multi-dimensional, interactive, cross-natural, cultural and economic systems which require inter-organizational collaboration (Merriam- Webster, 2021). It is described as the complex of physical, chemical, and biotic factors such as climate, soil, and living things that act upon an organism that determine its form and survival. The environment can be divided into physical environment, social environment, biological and cultural environment (Brainly, 2019).

Human environment is seen as the interaction and relationship between the people and the physical environment that surround them. The environment may include social, economic, cultural, physical and biological factors that surround the area (Toppr, 2020). The well-being of man is principally dictated by the physical environment. This confirms the interaction between human beings and the environment which supports his well being. The environment is the natural landscape with the non-human features, characteristics and processes. This natural concept submits that the wilderness and the pristine landscapes should not be influenced significantly by human activities. The human school of thought of the environment believed that the word environment includes human influence to some extent. Thus, while some people would see agricultural and natural landscape as part of the environment; others will see it as inclusive of other elements of the earth surface including urban and suburban areas. The implication of these diverse views is that the environment is the backdrop of human activities.

The environment as a system consists of all animals, plants, forests, fisheries, birds (living organisms); and non-living or abiotic elements which include water, land, sunlight, moon, rocks and the air. All these elements impacts on the living condition and well being of human beings. The environment can provide certain functions for the benefit of the habitats which may include: provision of renewable and non renewable resources (soil, wood, land,

water); sustain life by providing genetic and biodiversity; assimilation of waste generated by human activities; and enhance the quality of life by enjoying the beauty of nature such as rivers, mountains, deserts, basins and coastal planes (Soas, 2021). There is an explanation of the positive effects of the environment on human well being and health status. This was found in the work of the founder of modern medicine, Hippocrates in the 4th Century B.C(460 B.C -377 B.C) who noted that an holistic investigation of diseases require the consideration of time and season of the year. He also submitted that “Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces (for they are not at all alike, but differ much from themselves in regard to their changes). Therefore, geological forms, climatic conditions, seasons of the year, types of ecosystems, social living style are very important.

As the season and the year progresses, the environmental health specialists can tell or predict what epidemic diseases will attack the city either in summer or winter. It can also be predicted what each individual will be endangered due to change in the climatic regimen. A clear understanding of these factors will aid the development of a realistic environmental plan which will determine the health status of the people. The changing climate around mountain areas may lead to new distribution of vector- borne diseases. For instance, mountainous and uplands regions are prone to propagation of malaria, (Beniston, 2022), while populations within ocean basin are allergic to Flu, Pneumonia etc. high salinity, blue-green algal blooms, low dissolved oxygen levels, bushfires and turbidity, (NOS, 2021).

Ocean generates more than 50 percent of the world’s oxygen and absorbs 50 times more carbon dioxide than the atmosphere. The Ocean provides many medical products including ingredients for products to treat diseases such as cancer, arthritis, Alzheimer and heart diseases, (Smith, 2021). These are few cases of the effects of natural geographic features on the health condition of settlements around them.

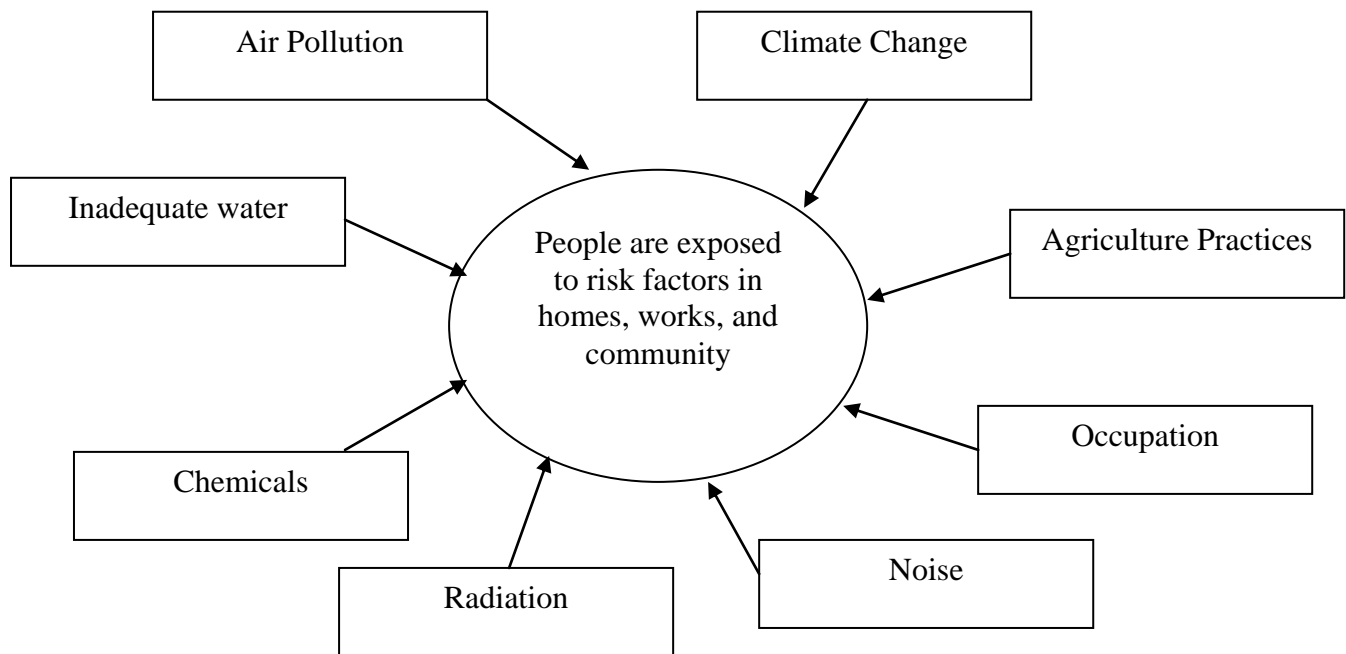


Figure 1. How the Environment impacts on human health condition.
 Source: WHO.(2019) <https://www.who.int/phe/infographics/environmental-impacts-on-health/en>

Health condition of the people are influenced by their rate of exposure to these environmental risk factors (Figure 1). The type of occupation of an individual or a group will also impact on their health condition. For example, people working in the cement manufacturing company will be prone to certain health issues such as cancer and respiratory malfunction. If people work or exposed to an area where there is too much noise, they are prone to have hearing impairment.

2.1.2. Environmental Health.

Environmental health has been defined as a broad subject which principally seeks the understanding of the relationship of environmental factors with biological systems; and it is a multidisciplinary approach to understand how the environment influence health outcomes. The author identified human interactions with physical, chemical and biological stressors as having resultant effects on health outcomes. Environmental health is the process of examining and assessing the effects of man-made chemicals on human health or wildlife, impacts on ecological system and spread of illness or diseases, (Harper, 2021). It was observed that the well-being of man is principally dictated by the physical environmental condition. Environment was defined to include outdoors, home, work place or public buildings, (Science Direct, 2021). The effects of hazards, pathogens, toxicants on human health are examined, and the link between peoples accessibility and its effects on human health condition was not the primary discussion in the article.

Pollution (air, water), spillage from oil, deforestation, desertification, erosion and flooding were identified as environmental health threats in Nigeria. These environmental factors cause most of diseases that result in death of the people. These environmental factors cause diseases such as Malaria, Diarrheal, Lower respiratory infection, Neonatal disorders, Tuberculosis, Meningitis, Cirrhosis, Ischemic heart disease and stroke. A study that examined secondary data from Global Burden of Diseases (GBD) to ascertain the causes of Death and Disability-adjusted Life (DALYs) in Nigeria noted that air pollution that caused lower respiratory infection has increased in Nigeria, and has occupied 4th rank in the causes of death in 2007; and has now ranked 1st in 2017. Other causes of death are chronic respiratory diseases, cardiovascular disease, enteric infections, diarrheal, maternal, neonatal and nutritional diseases. These had accounted for eight hundred thousand deaths and twenty six (26) million people living with DALYs every year, (Okareh, 2015). The disease risk factors identified include malnutrition, unsafe sex, alcohol use, high blood pressure, tobacco, drug use and high fasting plasma glucose.

Environmental health is seen as a component of public health when one looks at assessment and control of the physical, chemical and biological factors that affect human health, (Regis, 2021). The author noted that environmental health focused on natural and built environments for the good of human health. It was observed that conceptual terminology in environmental health has not been fully established in European countries. Environmental health terms have been used interchangeably, and can lead to misapplication and misconstrue. . The field of environmental health has been greatly influenced by three disciplines which are environmental epidemiology, toxicology and exposure science. The epidemiology examines the relationship between environmental exposures to chemical, radiation, and microbiological agents and their impacts on human health. The limitation of environmental epidemiology is the ethical issue which makes it unethical to deliberately expose humans to agents that will directly affect their health. This results into inability to use experimental study designs on human beings; but rather juxtaposing effects on animal studies with effects on human beings. This may bring some technical error in the real sense, since there are many differences in animal and human physiology. The toxicology examines how environmental exposures can

lead to specific health outcomes generally in outcomes in animals as a means to understand possible health outcomes in humans. Toxicology has advantage over epidemiology because studies can be randomly conducted and controlled on animal subjects. The author examined the relationship the relationship between environmental health and urban and regional planning practice. Both professions aimed at improving human health outcomes in the environment through policy and process development. The issue of the impact of the natural geographic features on the environmental health, and accessibility to health care services was not within the scope of the work. It was observed according to WHO data source that more than 100 illnesses and injuries can be directly linked to environmental health.

2.1.3. Health Inequalities.

Differences in health condition are determined by quality, accessibility, affordability, and quantity of health care system, (Tugwell, 2018). Health inequalities are commonly examined across the global population between countries or states; and between urban and suburban settlements. There are also inequalities within geographical locations or neighbourhood. Such group of people are classified by factors such as race/ethnicity, gender, education, income, and occupation, (Arcaya, et al. , 2021).

The simplest measure of health inequality is to compare the health status of those in the lowest socio-economic groups with those in the higher economic group. Comparison can be in absolute or relative terms. Health inequality can also be measured by the fundamental structures of social and economic hierarchy in which people grow, live, work and age, (Marmot, 2007). This constitute the health determinants which are the socio-economic and physical environment, individual behaviours, genetics, and quality of health care system. The complex interaction of these health care determinants defines the health inequalities of the people, (Tugwell, 2018). It was noted that the determinants of health inequalities are different from the determinants of health. The discussion on health inequality pointed to the fact that cause of inequality can be grouped into fundamental causes and environmental causes. The fundamental causes are the unequal distribution of income, power and wealth which often lead to poverty and marginalization of individuals and groups. The environmental causes are the wider environment which people live and work which may result to low income, poor and unhealthy housing condition, discrimination, and lack of access to health care services, (Public Health Scotland, 2021). The author submitted that health inequalities is a common discussion among various disciplines concerned with health status, and has manifested in the health care delivery system. Health inequalities do not occur randomly but are socially determined by social circumstances beyond the control of individual or groups. The social circumstances can be from bad health care delivery or inaccessibility of the people to the health care services. It was observed that in advanced country particularly Scotland, the people in rich areas; men experience 23.8 more years of good health and women experience 22.6 more years when compared to the most deprived areas.

The opinion that there is a wide gap in health inequality between the rich and the poor was espoused by observing a wide gap between the rich and the poor in Nigeria. The author noted that focus of health care providers both at the regional and international level have been on health inequality especially between the rich and the poor, the haves and the have-nots, (Nwokoro, 2008). It was submitted that although the most traditional method of measuring inequality is using economic parameter; that other approaches have been considered as more important to measure health differentials. It was opined that gender inequality is also a major determinant of poverty and ill-health; and that poor women and girls are more vulnerable to access health resources, especially the widows and elderly women. It was also observed that

socio-economic factors have significant impact on the health status of women; and the age of women also affect their health status. The attention was more on gender as a factor of health inequality particularly among the low income group in Lagos metropolis.

The research carried out in 1999 emphasized two sets of health determinants and the roles they play in influencing socio-economic inequalities. The first is the physical or natural geography which means the location and its influence in child and adult mortality in developing countries; and the second is the manmade features such as roads, infrastructures as they affect peoples' health,(Pickett, et al., 2001). Health inequalities are systematic differences in the health status of different population groups, and differences in the distribution of health resources between different population groups, (WHO, 2021). The wider environment within which people live and work result to low income, poor housing, discrimination and poor access to health services, (Public Health Scotland, 2021). A measuring tool for health inequality was suggested and acronym as "PROGRESS". The full meaning is as stated below: (Medicine.Net, 2021).

P= Place of residence.

R= Race/ethnicity/culture.

O=Occupation.

G=Gender.

R=Religion.

E= Education.

S= Social status.

S=Social capital

The "P" can be interpreted to mean 'Accessibility' in the acronym. There then informed the need to examine in detail the effect of accessibility to health care services in reduction of health inequality between urban and suburban settlements. This is to be discussed in the next section.

2.1.4. Accessibility to Health Care Services.

Accessibility to health care services is the ability of the people to get medical care and services when needed, (ODPHP, 2021). The factors that influence accessibility to health services include the price of health products, the stigma attached to the product by the people, discrimination, availability of the services, physical (location), attitude and information communication. Result of studies showed that screening is an effective means to catch health problems at the early stage particularly among women. It was also noted that the type of tests a woman needs is dependent on her age, personal and family health history and specific risk factor. Accessibility to health care services is important to prevent disease and disability by detecting and treat illnesses or other bad health conditions, increase the quality of life, and reduce the occurrence of early death, (WHO, 2021). Availability of health services when they are within easy reach both from the physical and financial point of view, ability and willingness to pay, and quality of care in terms of drug and attitude of health workers are factors affecting accessibility to health care.

It was noted that in America in the early part of this decade, 1 in 4 Americans do not have a primary care provider (PCP), and 1 in 5 Americans (children and adults below age 65) do not have medical insurance. The effect of lack of medical insurance is reflected on the peoples' lack of source to medical care, and more possibility of skipping routine medical care due to

cost. The relationship in the concepts of availability, accessibility, quality, and acceptability were examined in the issue of health care service delivery. Availability was conceptualized as the sufficient supply and appropriate stock of health workers with competencies and skill mix to match the needs of the population,(Gulliford et al, 2021). Accessibility is described as the equitable distribution of these health workers considering the demographic composition, rural-urban mix, and under-served areas or populations. Acceptability is considered when health workforce characteristics and ability (sex, language, culture, age etc) to treat all patients with dignity and create peoples' trust and promotion of demand for the services are factored into assessment of health inequality. Quality is considered when health workforce competencies, skills, knowledge and behavior are assessed according to professional norms and standard as perceived by the users of the services. It was submitted that sufficient availability guarantee accessibility to health workers. When the health workers are available and accessible, without acceptability, the health services may be left unused. When the quality of the health workforce is inadequate, it will affect the overall improvements in health outcomes negatively.

It was also observed that the definition of access to health services is a complex concept and requires the consideration of four aspects: adequate supply of services, utilization of services, relevancy of services to the need of the people, acceptability of services provided by the people based on their socio-cultural perspective, (Moe and Rheingans, 2006). The authors noted that access measured in terms of utilization depends on financial, organizational and social or cultural barriers. These limit the level of utilization of the services by the users. However, accessibility measured based on utilization of services is dependent on affordability, physical accessibility, and acceptability of the services provided; not merely adequacy of supply. For instance, in developing countries, limited access to water and sanitation was noticeable which gives rise to serious health problems due to lack of resources to maintain the distribution infrastructure and disinfectant residual, (UNO, 2021) It was also noted that the rapid urbanization in developing countries has created overwhelming demands on existing water supply coupled with illegal connection to the distribution systems in poor neighbourhoods. This has a serious consequence on water supply and accessibility. Availability of quality water is linked to human health for ingestion, hygiene and for food production; and about 1.6 to 5 litres of water is recommended to be taken per day by an individual. A higher intake is required in the warm climates especially during pregnancy by women. It was also estimated that about 2.6 billion people must have access to water and 2.1 billion to sanitation to meet the Millennium Development Goal (MDG) for 2015 globally, (Uweje and Standen, 2021). Lack of accurate and adequate information on the access, affordability and sustainability of water and sanitation for the poorest households especially in developing countries has mitigated the achievement of the millennium development goal on water and sanitation. The array of discussion on accessibility focused on water and sanitation more profoundly and was based on estimation.

African countries have adopted various approaches to bridge inequality in health care services, access to quality services continue to be non-existent or low for the majority of the population.

The availability of services and barriers to access should be considered and must be based on peoples' perspectives, health needs and cultural setting of the diverse groups in the society. Thus, equity or inequality of access may be measured in terms of availability and utilization of health services.

2.1.6. Human Settlements.

Human settlements are agglomeration of dwellings of any type or size which accommodate human living. Human settlements are broadly subdivided into urban and rural with their distinct features and characteristics. It can be classified into hamlets, rural, suburban and urban settlements. On the basis of distribution, human settlements can be classified into scattered, nucleated and linear settlements. The suburban settlements as the mid-way between the urban and rural settings develop as a result of population and economic expansion of the urban centers which brings about subsequent incursion into rural areas. Suburban settlements is also known as sprawl, and has received increasing attention from researchers and policy makers. Suburban settlement or sprawl is characterized by low density single family dwellings, peoples' dependence on public transport system to commute between their homes and work place, emergence of haphazard growth from the existing urban centers, irregular and uncoordinated pattern of development, strip or ribbon development, and existence of undefined edge between the urban and rural areas.

2.2. Theoretical Considerations.

This paper made us of three distinctive theories to locate it in the stream of knowledge. These are: the Spatial Interaction theory, the Distance Decay and Accessibility theory, and Burgess Concentric Spatial theory. The Maslow need theory was only mentioned to support the decision to rank health care as belonging to the physiological need of human being which have influence on the determination of peoples' access to health care. .

2.2.1. Spatial Interaction Theory.

It is a theory that explained the flow of passengers between an origin and a destination. It is a transport demand/supply relationship expressed over a geographical space. This theory was developed by Huffs in 1963 and was conceived to explain the complex interactions within the total system of retail trade areas in a region. It was noted that spatial interaction models perform well empirically and are good to explain human spatial behavior. Spatial interaction model was based on four main frameworks. These are: spatial interaction as social physics; spatial interaction as statistical mechanics; spatial interaction as aspatial information processing; and spatial interaction as spatial information processing, (Sasu, 2022). . Thus, spatial interaction models are the products of a spatial theoretical framework that incorporates concepts such as random utility maximization from economics and social cognition in Psychology and Behavioral Geography. A gravity type of spatial interaction model provides the framework for conceptualization of human choice flows; and has been mathematically expressed as follow:

$$F_{ij} = K \cdot P_i^{B_{pi}} \cdot P_j^{B_{pj}} \cdot \exp(-y \cdot d_{ij}),$$

where,

F_{ij} = flow from origin I to destination j;

K = constant of opportunity;

P_i = mass measure at origin I;

P_j =mass measure at destination j;

B_{pi} and B_{pj} are exponent parameters for the mass measure;

D_{ij} = distance separating locations i and j ;

Exp(.) is the exponential function;

y is the distance-decay parameter;

The principles of spatial interaction as proposed by transportation geographer, Edward Ullman are complementarity, transferability, and intervening opportunity.

A simpler version of the Gravity model explains the interaction between two places can be determined by the product of the population of both places divided by the square of their distance from one another. It can be mathematically represented below:

$$G = \frac{(P_1)(P_2)}{(D_2 - D_1)^2}$$

Where G is the gravity velocity; P₁ is the population of the first variable; P₂ is the population of the second variable; D₂ is the distance of the second variable; D₁ is the distance of the first variable.

The second theory that was explored is the Distance Decay and Accessibility Theory.

2.2.2. Distance Decay and Accessibility Theory.

This is a geographical concept which states that the interaction between two objects declines as the distance between them increases. The concept posited that between locations or ethnic groups, the more the distance between them, the less the rate or regularity of interaction between the two objects of phenomenon. The distance decay model stated that distance and interaction are inversely proportional; and that the shorter the distance the more likely the rate of interaction. It also stated that the “friction of distance” increases with distance; and relative distance is measured in terms of time and cost of travel and transferability (Fotheringham, 2001).

The distance decay concept can be further explained by Waldo Tobler’s First Law of Geography. The law stated that “ Everything is related to everything else, but near things are more related than distant things”. This law is applicable to various phenomena relationships ranging from human settlements to geo-linguistics or ecology. Distance decay happens in the city centers, suburban and rural areas. In the city, there are likely to be more businesses, better public transit, better sanitation services and better quality roads. The more you move further from the city center, these services begin to break-down; businesses give way to residential areas, public transit runs less frequently, septic tanks and wells replace central sewage system and municipal water and roads are poorly maintained. The outskirts of an area may have few small businesses, no transit system, rudimentary sanitation and dirt roads. All these features exist in the suburban areas which is the field of this study. The effect of the distance between the city center and the suburban may affect the distribution of health care facilities and consequently affect the accessibility of the people to the supposed health care services.

The distance decay concept also reflects in biomes. The physical distance between two geographic locations is directly related to a loss of similarity between them in terms of ecology and biodiversity (Dempsy, 2022). For example, increasing the physical distance between two areas increases the odds that climate and geographical features like lakes and mountains will influence weather patterns in one area and not in the other; which in turn will influence which species can inhabit them. Longer distances also make seed dispersal more problematic for plants. This means the rate of transmutability of diseases will reduce as the distance between the population group increases.

3.0. The Nexus between Access to healthcare services and health Inequalities.

Health inequalities may be defined by the complex interaction of the health determinants such as socio-economic, physical environment, behavior of the individual, genetics and quality of healthcare system, (Tugwell, 2018). A further analysis of health inequalities pointed that health inequalities are caused by fundamental and environmental causes. The fundamental causes are the unequal distribution of income, power and wealth which leads to

marginalization of the people. The environmental causes are related to the physical environment which people live and work which may manifest in low income, poor and unhealthy housing condition, discrimination (gender, ethnic, religious) and lack of access to health care services. A research carried out in 1999 pointed out two sets of health determinants which are physical/natural environment (location) and the man made features such as roads and infrastructure as they affect peoples' health, (Public Health Scotland, 2021). The “place” factor in the “ PROGRESS” tool for inequalities can be taken to mean “Accessibility” which is of more physical location of people and the intended health services.

Accessibility is the ability of the people to get medical care and services when needed. The factors that influence accessibility are the price of health products, the stigma perception of the people to the product, discrimination, availability of the services, physical location of the services to the users and information dissemination. Accessibility can be measured in absolute terms by the number of people that enjoy a particular type and quality of health services. E.g. Primary care or medical insurance. As noted earlier, 1 out of 4 Americans have access to primary health care while 1 out of 10 do not have access to health insurance. In terms of access to health care, the table below ranked Denmark as the first in health care in 2020 while Nigeria is in 140th position (Table 1).

Table 1. Access to Health Care Ranking in 2020.

Country.	LPI 2020 Ranking.	LPI 2019 Ranking.
Denmark	1	2
Norway	2	1
Switzerland	3	3
Sweden	4	4
Nigeria	140	140

Source: Worldpopulationreview.com, 2022.

Access to health care is seen as fundamental human right by the people and the government particularly among developed nation of the world. Quality health care system should be stable, accessible and affordable. This often reflects in the quality of life and life expectancy ratio, (Health.gov, 2022).

Therefore, there is a nexus between health determinants and accessibility of the people to health care services. It was noted and published that these ten countries have the best health care in the world: South Korea, Taiwan, Denmark, Austria, Japan, Australia, France, Spain, Belgium and United Kingdom, (Worldpopulationreview.com, 2022). The interrelationship between Accessibility indicators and Accessibility influencers is shown in Figure 2. There is also an inter-connectivity between Accessibility of the people (i.e location/place) and other health indicator variables such as the environment, Life style, Health care system, Accessibility indicators and Inequality measurement tools.

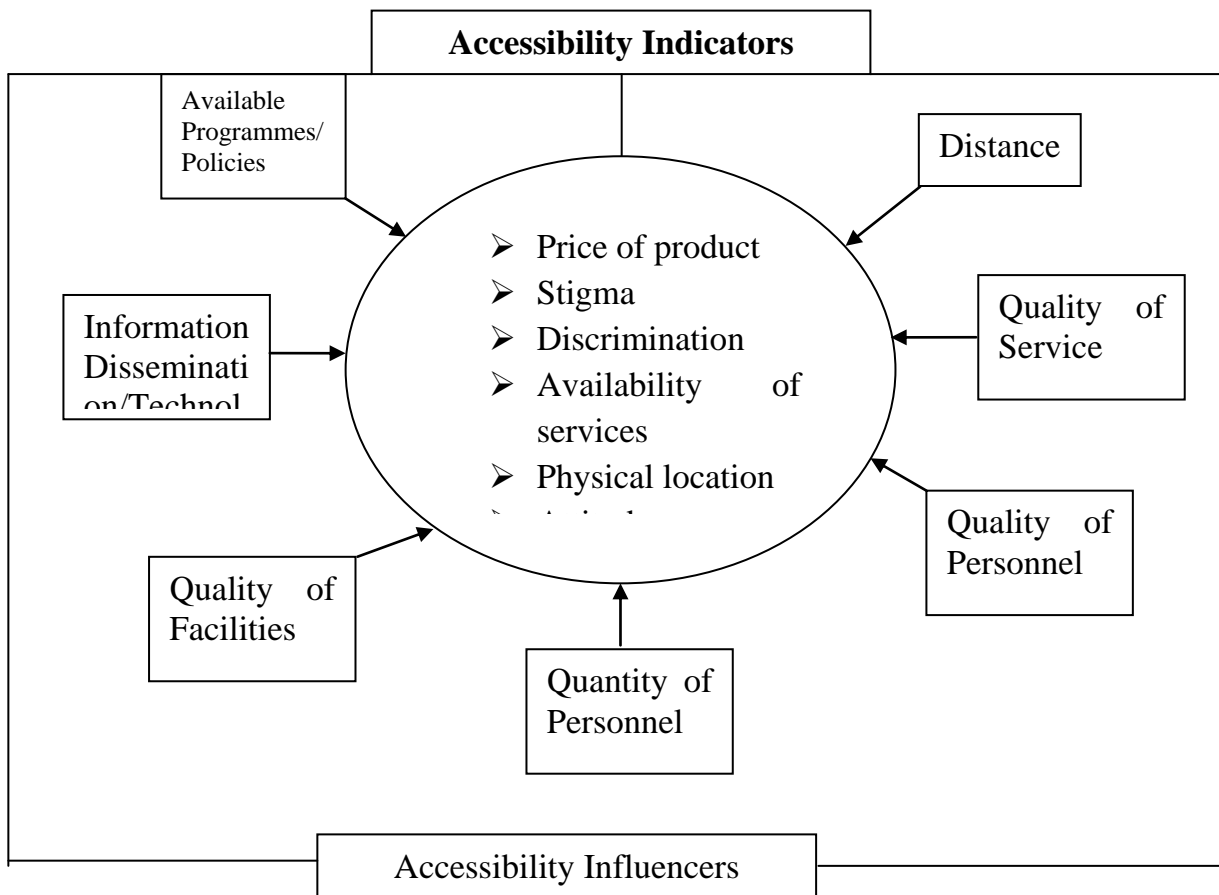


Figure 2: Relationship between Accessibility Indicators and Accessibility Influencers in Health care System
Source: Authors Conceptualization, 2022

Mathematically, the relationship between Accessibility, Distance to health facilities and accessibility indicators is presented below:

$$A_{St} = \frac{d(a+b+c\dots n) (K)}{Dt}$$

Where:

A_{st} , is the degree of accessibility of the people in a settlement,

d , is the distance of the people to the facilities,

$[a+b+c\dots\dots\dots n]$ is the accessibility indicators;

Dt is the Total distance to the farthest part of the settlement to the facility location;

K is the inequality value which will have value between 0.1 and 1.0; and it is determined by Gaussian law or theory.

$a + b+c + \dots\dots\dots n$ may have varying score values or average value.

A_{st} will also have values between 0.1 and 1.0. The Gaussian formular is represented mathematically below:

$$: Gw = E. dS = \left(\frac{q}{4\Lambda\epsilon_0} \cdot \frac{\hat{r}}{r^2} \right) \cdot (\hat{n} \cdot ds)$$

4.0. Implication for Environmental Health Planning and Policy.

It has been pointed out that the health status of the people is dependent on their access to health care facilities and services provided by the health delivery agencies. Also in measurement of health inequalities, the location of the facilities and the accessibility of the people to the services is one of the environmental factors that determine health inequalities. It is then important that both in policy formulation and implementation of health care delivery programmes, the issue of nearness of location of the facilities to the intended users should be given high priority. The socio-economic factor such as income, price and wealth distribution should be considered in the design and implementation of policies and programmes. The health care delivery should also take cognizance of the natural environmental factors in the neighbourhood with which the people interact, live and work. These natural features such as weather, reliefs, and water source have preponderance effect on the type and spread of disease in the settlements.

5.0. Conclusion.

This paper has been able to examine the issue of accessibility to health care services and health inequalities of settlements using Oyo state as a case in point. Literature was thematically reviewed in areas of environment, health inequalities and health accessibility. Theories of Causality, Spatial interaction, Burgess concentric spatial distribution and Distance decay and accessibility were discussed to support the discussion on the theme. It was observed that place or physical location is a fundamental factor common to both health care determinants and health inequality measurement. Thus, the location of health facilities and the ease of accessibility of the people to the facilities both in socio-economic and physical terms is prima to health care service delivery.

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