

# Healthcare Imbroglio in Enugu Metropolis: Interrogating Waste Management Efficiency

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## Abstract

The study examined effect of urban waste on healthcare management in Enugu metropolis. The study adopted a survey research design. The population of the study was 968,300. Taro Yamane's formula was used to determine a sample size of 400. The study adopted simple random techniques where the total population has equal chance of been selected. The structured questionnaire was adopted to collect data from respondents from Enugu metropolis. The study employed inferential and descriptive statistics, inferential statistic tool used for the study was Chi-square test while descriptive frequency distribution and mean score was employed. The study found that urban waste had a significant positive effect on Infectious Disease Outbreaks in Enugu Metropolis, that population explosion had a significant effect on waste storage, collection, transfer and transport in Enugu Urban and that population explosion had a significant effect on processing, and disposal of solid waste in Enugu urban. The study concluded that improper waste management practices contribute to a range of health hazards, including waterborne diseases, respiratory illnesses, and injuries, placing a significant burden on healthcare resources and infrastructure. The study recommended that enhance Waste Management Infrastructure: Invest in upgrading waste collection, transfer, and disposal infrastructure in Enugu Metropolis to improve efficiency and capacity. Implement modern waste management technologies and expand coverage to ensure timely and effective waste removal, reducing health hazards and healthcare

## NG-Journal of Social Development

Vol. 14 Issue 1 (2024)

ISSN(p) 0189-5958

ISSN (e) 2814-1105

Home page

<https://www.ajol.info/index.php/ngjsd>

## ARTICLE INFO:

**Keywords:** Healthcare, waste management, Health care delivery, urban cities  
**Article History**

Received: 5<sup>th</sup> July, 2024

Accepted: 10<sup>th</sup> September, 2024

DOI:

<https://dx.doi.org/10.4314/ngjsd.v14i1.15>

## 1. Introduction

Waste often generated by human beings since time immemorial has continued to be a threatening problem and a growing one that is of major concern to every nation of the world. In Nigeria today, among the pressing environmental and public health issues are the problems of solid waste generation, control and disposal. Although the problem of solid waste disposal is as old as man's existence that is inextricably linked to the generation of waste, the truth is that in many cities, it has become so intractable that even the government is overwhelmed (Jimoh, 2005, Momodu, Dimuna and Dimuna, 2011). In pre-industrial times, when population was small, waste was disposed on the ground, thrown into water, burnt or thrown into pit where it would turn to compost manure to improve soil fertility. From history, man is believed to have always adopted dumping, burning, manual recycling and waste minimization as waste management strategies with less than proportionate result in terms of cleaner and healthier environment. One can therefore say that human development or growth has been intrinsically tied to the management of waste, apparently due to its effects on public and environmental health, (Chukwuemeka, Ugwu and Igwegbe, 2012, and Ndinwa, Akpafun and Chukwuma, 2012).

Urban waste management demands a lot of financial input for the provision of appropriate machinery and manpower requirement. Nigerians in general, and Enugu residents in particular, have until fairly recently not demonstrated much commitment towards integrated waste management strategies, which include waste reduction, sorting, recycling and responsible waste reduction among the populace. Scholars have attempted to provide explanations on why waste management in Enugu State has become very problematic. Kofoworola (2007) highlighted the following as factors that negatively affect Municipal Solid Waste (MSW) management in Enugu, namely: improper collection system, lack of adequate waste collection equipment and vehicles, indiscriminate dumping of wastes, lack of continuity and implementation of government policies, and recovery and recycling practices of municipal solid waste.

Today, due to rapid industrialization, increase in population and urbanization, the generation, disposal or management of waste has proved to be a major environmental and public health issue. This experience is always so, especially in developing countries like Nigeria where there is lack of or inappropriate strategies for managing wastes. Urban waste management today has become an intractable environmental problem that can be likened to a monster staring everybody on the face. Solid waste dumps apart from its gory sight that destroy the aesthetics (beauty) of the environment have always affected the people's health by decomposing to produce provoking odour or contaminating our drinking water. This no doubt, causes avoidable epidemics. This was what promoted the federal government of Nigeria to promulgate decree 58 for the establishment of Federal Environmental Protection Agency (FEPA) on 30<sup>th</sup> December, 1988 (Momodu et al (2011). A National Policy on the Environment was also formed to secure for all Nigerians a quality of environment adequate for their health and well being.

Improper waste disposal poses significant health risks to individuals in Nigeria, manifesting in various direct and indirect ways. The inadequate management of waste leads to the proliferation of disease vectors such as rodents, insects, and bacteria, which thrive in unhygienic environments. These vectors transmit diseases like malaria, cholera, typhoid fever, and gastroenteritis, contributing to the high burden of communicable diseases in the country (Oyeyiola, 2019). Moreover, open dumping and burning of waste release harmful chemicals and particulate matter into the air, leading to respiratory problems such as asthma and bronchitis (Ojo et al., 2018). The impact of waste disposal on health is particularly pronounced in low-income communities where access to proper waste management infrastructure is limited. Residents often resort to unsafe disposal practices, such as dumping waste in open spaces or water bodies, exacerbating environmental pollution and increasing the risk of infectious diseases (Odukumaiya et al., 2017).

### **1.1. Statement of the Problem**

The improper management of solid waste presents a pressing problem with significant health implications for citizens in Nigeria. As one of the most populous countries in Africa, Nigeria generates vast amounts of solid waste daily, yet lacks adequate infrastructure and systems for its proper disposal and treatment. This situation exacerbates health risks for the population in several ways. Firstly, the accumulation of solid waste in urban and rural areas serves as breeding grounds for disease vectors such as mosquitoes, flies, and rodents. These vectors transmit a range of communicable diseases including malaria, dengue fever, cholera, and typhoid fever, contributing to the high prevalence of infectious diseases in the country.

Secondly, the practice of open dumping and burning of solid waste releases harmful pollutants and toxins into the environment. The burning of waste generates noxious fumes containing particulate matter, heavy metals, and other hazardous substances, which can cause respiratory illnesses, cardiovascular problems, and even cancer among nearby residents. Furthermore, contaminated water sources resulting from leachate seepage from landfill sites pollute groundwater and surface water bodies, leading to waterborne diseases such as diarrhea, dysentery, and hepatitis.

These health risks are particularly acute in impoverished communities where access to proper waste management services is limited. The lack of waste collection services and inadequate sanitation infrastructure compel residents to resort to unhygienic waste disposal practices, perpetuating a vicious cycle of environmental pollution and poor health outcomes. In conclusion, the adverse effects of solid waste on the health of citizens in Nigeria underscore the urgent need for comprehensive waste management strategies, including improved infrastructure, public education campaigns, and policy interventions to safeguard public health and promote environmental sustainability.

### **1.2 Objectives of the Study**

The broad objective of the study was to examine effect of urban waste on healthcare management in Enugu metropolis. The specific objectives of the study were to:

- i. Determine the effect of urban waste on Infectious Disease Outbreaks in Enugu Metropolis.
- ii. Ascertain the effect of urban waste on Increased Healthcare Demand in Enugu Metropolis.
- iii. Examine the effect of urban waste on health hazard in Enugu metropolis.

### **Research questions**

The following research questions were posed for the study:

- i. What is the effect of urban waste on Infectious Disease Outbreaks in Enugu Metropolis?
- ii. What effect does urban waste have on Increased Healthcare Demand in Enugu Metropolis?
- iii. What is the effect of urban waste on health hazard in Enugu metropolis?

### **1.3 Hypotheses**

The following null research hypotheses were formulated for the study

- i. Urban waste has no positive significant effect on Infectious Disease Outbreaks in Enugu Metropolis.
- ii. Urban waste has no positive significant effect on Increased Healthcare Demand in Enugu Metropolis.
- iii. Urban waste has no positive significant effect on health hazard in Enugu metropolis.

## **1. Review of Related Literature**

### **Urban Waste**

Urban waste management involves the collection, transportation, treatment, and disposal of waste generated in urban areas to minimize environmental pollution and public health risks. It encompasses various concepts and strategies aimed at efficient and sustainable handling of solid waste within urban settings. One key concept is source segregation, which involves separating waste at its point

of origin into different categories such as organic, recyclable, and non-recyclable materials (Gupta & Jindal, 2019). Source segregation facilitates the recycling and reuse of valuable resources, reducing the volume of waste requiring final disposal.

Another concept is integrated waste management, which emphasizes the adoption of multiple waste management approaches, including waste reduction, recycling, composting, and energy recovery, to minimize the environmental impact of waste disposal (Rao et al., 2019). Integrated waste management prioritizes the hierarchy of waste management options, with waste prevention and reduction at the top, followed by recycling and recovery, and finally disposal as the last resort. Furthermore, public participation and awareness are integral to effective urban waste management, involving community engagement, education, and outreach programs to promote responsible waste disposal practices and foster a culture of environmental stewardship (Owamah et al., 2021). By implementing these concepts and strategies, urban waste management can mitigate environmental pollution, conserve resources, and enhance public health and well-being in urban areas.

### **Waste Management**

Municipal or urban solid waste includes predominantly household (domestic) wastes with sometimes the addition of commercial wastes collected within a given municipality. It may be in semisolid form and generally excludes industrial hazardous wastes. The term residual waste refers to waste left from household sources containing materials that have not been separated out or sent for reprocessing. Wastes could be in form of biodegradable waste, such as food and kitchen waste; green waste; and paper. Recyclable materials include paper, glass, bottles, cans, metals, certain plastics, among others. Inert wastes include construction and demolition wastes, dirt, rocks, debris.

Composite wastes include waste clothing, waste plastics, such as toys. Domestic hazardous waste (also called “household hazardous waste”) and toxic wastes include pharmaceutical and medical wastes, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticides containers, batteries, shoe polish.

### **Waste Generation**

Waste generation encompasses activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal. Waste handling and separation involves the activities associated with management of waste until they are placed in storage container for collection. Handling also encompasses the movement of loaded containers to the point of collection. Separation of waste components is an important step in the handling and storage of solid waste at the source. The functional element of collection includes not only the gathering of solid waste and recyclable materials but also the transport of these materials, after collection, to the location where the collection vehicle is emptied. Other functional elements of collection include the transfer of waste from the smaller collection vehicle to the larger transport equipment and the subsequent transport of the wastes, usually over long distances to a processing or disposal sites. The location may be a material processing facility, a transfer station or a landfill disposal site (Sattahwaite, 2009).

Today the disposal of wastes by land filling or land spreading is the ultimate fate of all solid wastes, whether they are residential wastes collected and transported directly to a landfill site, residue from the combustion of solid waste, compost or other substances from various solid wastes processing facilities.

### **Healthcare Management**

Healthcare management encompasses the planning, coordination, and administration of healthcare services to ensure the effective delivery of quality care to patients while optimizing resources and achieving organizational goals. It involves strategic decision-making, leadership, and operational oversight across various healthcare settings, including hospitals, clinics, nursing homes, and public health agencies. According to Buchbinder and Shanks (2020), healthcare management entails the

application of management principles and practices within the unique context of healthcare delivery, encompassing areas such as financial management, human resources management, quality improvement, and patient safety. Effective healthcare management requires collaboration among healthcare professionals, administrators, policymakers, and stakeholders to address complex challenges and improve healthcare outcomes.

Furthermore, Mintzberg et al. (2017) define healthcare management as the process of coordinating and integrating healthcare resources, including personnel, facilities, technology, and information systems, to deliver timely, safe, and cost-effective care to patients. Healthcare managers play a vital role in setting organizational priorities, allocating resources, and implementing policies and procedures to ensure the efficient operation of healthcare organizations and the provision of high-quality patient care. In summary, healthcare management involves the strategic planning, organization, and supervision of healthcare services to meet the needs of patients and stakeholders while achieving organizational objectives in a dynamic and complex healthcare environment.

### **Infectious Disease Outbreaks**

Infectious disease outbreaks refer to the sudden and unexpected occurrence of a contagious illness affecting a specific population or geographical area, with a higher incidence than what is normally expected within that population. These outbreaks can range from localized clusters of cases to widespread epidemics or pandemics, posing significant threats to public health and requiring urgent response measures from healthcare authorities and organizations. According to the Centers for Disease Control and Prevention (CDC), infectious disease outbreaks occur when infectious agents such as bacteria, viruses, parasites, or fungi spread rapidly among individuals, leading to a surge in cases within a defined period (CDC, n.d.). Outbreaks may result from various factors including environmental changes, population movements, inadequate vaccination coverage, or the emergence of drug-resistant pathogens.

These events often necessitate comprehensive public health interventions, including disease surveillance, contact tracing, quarantine measures, vaccination campaigns, and healthcare provision to affected individuals, to contain the spread of infection and mitigate the impact of the outbreak on population health (WHO, 2018).

### **Increased Healthcare Demand**

Increased healthcare demand refers to a situation where the volume of patients seeking healthcare services exceeds the capacity of healthcare facilities to provide timely and effective care. This surge in demand can occur due to various factors, including population growth, aging demographics, outbreaks of infectious diseases, or changes in healthcare needs and preferences.

As described by the World Health Organization (WHO), increased healthcare demand puts pressure on healthcare systems, leading to longer waiting times, overcrowded facilities, and strained resources (WHO, 2016). This phenomenon can result in delays in accessing care, compromised quality of services, and heightened risks of adverse health outcomes for patients. Furthermore, socioeconomic factors such as poverty, unemployment, and inadequate access to preventive care can exacerbate healthcare demand by contributing to the prevalence of chronic diseases and the burden of preventable health conditions (OECD, 2019).

### **Health Hazard**

A health hazard is any agent, condition, or situation that has the potential to cause harm or adverse effects on human health. These hazards can encompass a wide range of factors, including chemical, biological, physical, and psychosocial hazards, and may arise from various sources such as environmental pollutants, workplace exposures, lifestyle choices, or infectious agents.

According to the Occupational Safety and Health Administration (OSHA), health hazards are classified as substances or activities that can lead to acute or chronic health effects, including respiratory problems, allergic reactions, poisoning, injuries, and diseases (OSHA, n.d.). Examples of health hazards include exposure to toxic chemicals, biological pathogens, ionizing radiation, noise pollution, ergonomic stressors, and psychosocial stressors in the workplace or community environment. Furthermore, the World Health Organization (WHO) defines health hazards as factors

that can contribute to the occurrence of diseases or injuries and emphasizes the importance of identifying, assessing, and controlling these hazards to protect public health and prevent adverse health outcomes (WHO, 2022). In summary, health hazards represent potential risks to human health and well-being, necessitating proactive measures to mitigate exposure and minimize the associated health risks.

## **Theoretical Framework**

### **Ecological Systems Theory**

Ecological systems theory, propounded by Urie Bronfenbrenner in 1979, posits several key tenets. Ecological systems theory, developed by Urie Bronfenbrenner, emphasizes the interconnectedness between individuals and their environments across different levels, including microsystems (e.g., individual behavior), mesosystems (e.g., interpersonal relationships), exosystems (e.g., community factors), and macrosystems (e.g., societal norms and policies). In the context of urban waste and healthcare management, this theory can help analyze how waste management practices influence health outcomes at multiple levels of the ecological system. For example, it can explore how individual behaviors such as waste disposal habits, community factors such as access to waste collection services, and broader societal norms regarding waste management shape healthcare demand and service delivery in Enugu metropolis. By incorporating these theories into the study framework, researchers can gain a comprehensive understanding of the complex interactions between urban waste, healthcare management, and social determinants of health in Enugu metropolis, facilitating the development of targeted interventions and policy recommendations to address waste-related health challenges effectively. Firstly, it emphasizes that individuals are influenced by multiple interacting systems, ranging from immediate environments (microsystems) like families and schools, to broader societal contexts (macrosystems) such as cultural values and government policies. Secondly, it highlights the dynamic and reciprocal relationships between individuals and their environments, where changes in one system can ripple through others. Lastly, it underscores the importance of considering developmental processes within the context of these systems, recognizing that individuals' development is shaped by the interplay of various environmental factors.

In studying the effect of urban waste on healthcare management in Enugu metropolis, Ecological systems theory can offer valuable insights. It allows examination of how waste management practices at various levels of the ecological system - from individual behaviors (microsystems) to community factors (mesosystems) and broader societal norms (macrosystems) - influence healthcare demand and service delivery. By considering the interplay between waste-related environmental hazards and healthcare outcomes within this framework, researchers can identify multifaceted determinants of health, inform targeted interventions, and advocate for systemic changes to mitigate the adverse effects of urban waste on public health in Enugu metropolis.

### **Empirical Review**

Abdoulkadri, Fatoumata & Issa (2022) investigated the Population growth and solid waste generation in the urban municipality of Gao, Mali. The methodology adopted consisted of a bibliographical analysis, field surveys of actors in the waste sector and surveys of the GPS points of the main dumps (official and anarchic). The results show that the quantity of waste produced per person per day has increased from 0.5 kg in 2009 to 0.9 kg in 2020. Thus, the total production of solid waste in the urban municipality of Gao has respectively increased from 43.17 tons at 109.85 tons per day. As the community is not prepared to receive such a human wave, the waste has become more cumbersome and the infrastructure, equipment and appropriate storage areas are lacking. This results in a deterioration of the living environment of the populations and the increase in diseases such as malaria, typhoid fever and respiratory infections, which constitutes a significant health risk.

Oke, Gbadebo and Olatunji (2022) examined the effects of population growth and urbanization on economic growth in Nigeria. To achieve the specific objectives, the OLS estimation techniques employed are Autoregressive Distributed Lag (ARDL), Fully Modified OLS (FMOLS), and granger causality to test the causal direction of the model variables. While the ARDL estimates the short-run and long-run

impact, the FMOLS estimates the long-run effects of population growth and urbanization on economic growth. Lastly, the granger causality test helps to identify the policy directions in this study. Findings revealed that population growth has a positive and significant effect on economic growth in both the short-run and long-run, while urbanization has a negative and insignificant effect on economic growth in the short-run and the long-run over the study periods.

Fatai, (2021) focused on analysis of Urban Expansion and Land Cover Changes in Lagos Metropolis, Nigeria. The study uses Landsat imageries for 1995, 2000 and 2015 collected from United State Geological Survey (USGS) for analyzing the land use and land cover in the study area. The Landsat images were classified using supervised classification. Results reveal that between year 1995 and 2000, the land use land cover shows that there is less than 20% built up areas and more than 70% significant change in the land use land cover for bare ground, vegetation and water body respectively. In contrast, in the year 2015, there was more than 40% increase in built up areas and less than 60% bare ground, vegetation and water body respectively. At the aggregate level, there was more than 20% increase in built up areas between 1995, 2000 and 2015 and 8% decreased in bare ground between 1995, 2000 and 2015.

Ayodeji, Afolalu, Olabisi, Moses, Emeter, Ongbali, Olamilekan, Oloyede, & Banjo (2021). Impact assessment of the current waste management practices in Nigeria. The study presents a systematic review of existing literature, significant aspects of the existing novels was assessed: waste characterization, waste management practices, ecological impacts, public-private partnership, ethical issues, and legal framework and challenges militating against the current waste practices. This study shows that the existing waste management methods are ineffective and the demand for an all-inclusive waste management approach, proper execution, and enforcement of environmental regulations and laws. Waste management practices differ from nation to nation depending on the waste sources, types, and characteristics. It plays a vital role in nature's ability to sustain life within its capability. In many developing nations of the world, it has become a recurrent challenge, especially in urban areas. Waste generation in Nigeria is on the increase due to the rise in population resulting from the techno-economic development in cities and the pattern of production and consumption of materials. The current waste management practices in the nation are fast becoming a national issue and unsustainable, leading to apparent environmental risk.

Maidodo, Azizan and Abdullahi (2019) examined the urban solid waste Development: A review of Nigeria's Waste Management Policy. The paper dissected the existing policy structure on urban waste management in Nigeria and elucidates the provision of strong and appropriate policies, judicial decision and government intercessions that help a rights-based comprehension of waste management and disposal in Nigeria. The paper was of the view that the continually rising worldwide concern on ecological wellbeing requires that wastes be appropriately administered and discarded harmoniously and satisfactorily. This would minimize, and where possible dispense its potential damage to people, plants, animals and natural resources. Urban solid waste management development in Nigeria can be traced the back to late 1980s. With the rise in population, urbanization, and industrialization alongside globalization, the challenge of urban solid waste management (USWM) has escalated with its attendant human and environmental problems that need to be attended to.

Bucci et al. (2019) examined the "dilution effect" of population growth on per-capita human capital formation. The dilution effect (discussed in respect of average years of schooling at the individual level and average human capital at the aggregate level) examined the addition of new-borns (who are uneducated) which then reduced both the long-run and short-run level of physical capital per capita.

Furuoka (2016) examined the advantage of high population growth in the Indian economy. Using ARDL, the study also found a negative long-run relationship between population growth and economic growth and recommended that a continued increase in population may be detrimental to the Indian economy.

Aidi, Emecheta, and Ngwudiobu (2016) investigated the relationship between population dynamics and economic growth in Nigeria using time series data spanning from 1970 to 2014. The data were analyzed using ordinary least square estimation technique. The result revealed among other that all the core variables (i.e. fertility, mortality and net-migration) of the study are inversely related to economic growth during the investigated period. The study further revealed that gross fixed capital formation (GFCF) and savings are strong drivers of economic growth in Nigeria.

Guga, Alikaj and Zeneli (2015) examined Population, Economic Growth and Development in The Emerging Economies from 1994-2010 the study applied regression analysis model and the result shows that Economic development is the primary objective of the majority of nations in the world, one of the key factors to be taken into consideration when analyzing the dynamics of population growth. Human capital development and economic growth are related to each other. Economic growth provides the conditions for human development and human development provides opportunities for economic growth. Developing countries are unable to afford an increase of such rapid population (as is currently happening and is expected to happen in the coming years). This will negatively affect quality of life and slow economic growth.

Shah, Sargani, Ali and Siraj (2015) examined the Effect of Increase in Population on the Economic Growth of Bangladesh from 1980 and 2005.the study adopted multiple linear regression model. The result of the study confirmed that population growth has negative consequences on the process of economic growth as far as Bangladesh is concerned. Two different equations have been employed one for the relationship between GDP growth and population also including FDI and exports, the other equation used GNI per capita as a function of population. Both the models were found significant, the relationship between economic growth and GNI per capita with population were significantly different from zero.

## 2. Methodology

### Research Design

The study adopted a survey research design. A survey design was concerned with determining the frequency with which something occurs or the relationship between variables.

### Sources of Data

Primary data for this study were information gathered directly from respondents through structured questionnaires and interviews while secondary data were sourced from publications.

### Area of the Study

This research was conducted in Enugu metropolis.

### Population of the Study

The population of the study includes all the residents of Enugu metropolis. The population of the study was **955,100**.

**Table 3.1 Population Distribution Table**

Enugu Metropolis	Population	Percentage
Enugu East	374,100	39
Enugu North	326,900	34
Enugu South	267,300	27
<b>Total</b>	<b>968,300</b>	<b>100</b>

**Source:** National Population Commission project for 2021

### Determination of Sample Size



$$n = \frac{N}{1+N(e)^2}$$

Where:

N = population, 1 = constant, e = Degree of error (i.e 5% or 0.05)

The sample size is computed thus:

$$n = \frac{968,300}{1+968,300} (0.05)^2$$

$$n = \frac{968,300}{1+673,500 \times 0.0025}$$

$$n = \frac{968,300}{1+1683.75}$$

$$n = \frac{673,500}{1684.75} = 399.76$$

n = approximately 400

Therefore, the sample size is 400

### Sampling Techniques

The study adopted simple random techniques where the total population has equal chance of been selected. The structured questionnaire was adopted to collect data from the respondents from the four health institutions. The questionnaire was made up of 4 points scale: Very High extent (VH), High Extent (HE), Undecided (U), Low Extent (LE), Very Low Extent (VLE). For each variable, there were (items/elements) which were deployed keeping in view the questionnaire filling culture and understanding of the population.

### Method of Data Analyses

The study employed inferential and descriptive statistics, inferential statistic tool used for the study was Chi-square test while descriptive frequency distribution and mean score was employed.

## 3. Data Presentation and Analysis

This section deals with the data analysis and interpretation of the findings. 400 copies questionnaire were distributed to the respondents and 378 were returned.

### Data Analysis

**Research question One:** What is the effect of urban waste on Infectious Disease Outbreaks in Enugu Metropolis?

**Table 4.1:** Effect of urban waste on Infectious Disease Outbreaks in Enugu Metropolis

s/n	Options	Very High	High	Undecided	Low Extent	Very Low Extent	FREQ	Mean	Decision
1	Contaminated water from waste fosters waterborne diseases	160 (42%)	175 (46%)	13 (3%)	30 (8%)	10 (3%)	378	4.3	Accepted
2	Improper waste disposal attracts disease vectors, increasing transmission of infectious diseases like malaria and cholera	140 (37%)	180 (48%)	20 (5%)	38 (10%)	10 (3%)	378	4.1	Accepted
3	Improper waste disposal fosters disease vectors, escalating transmission of infectious diseases like malaria and cholera	190 (50%)	118 (31%)	10 (3%)	40 (10%)	20 (6%)	378	4.4	Accepted
4	Urban waste attracts disease vectors, amplifying infectious disease transmission, posing significant public health risks in Enugu Metropolis.	200 (53%)	118 (31%)	10 (3%)	25 (7%)	25 (7%)	378	4.1	Accepted
5	Improper waste disposal breeds disease vectors, increasing the spread of infectious diseases like malaria and cholera in Enugu Metropolis.	150 (38%)	160 (42%)	10 (3%)	38 (6%)	20 (6%)	378	4.2	Accepted
	Grand mean							4.2	

**Source: Field Survey 2024**

Table above shows the mean distribution of opinions of the respondents on the effect of urban waste on Infectious Disease Outbreaks in Enugu Metropolis. The data showed that the majority of the respondents were all positive in their assertion. The mean of 4.2 depicts that respondents are all in agreement that improper waste disposal breeds disease vectors, increasing the spread of infectious diseases like malaria and cholera in Enugu Metropolis.

**Research Question 2: What effect does urban waste have on Increased Healthcare Demand in Enugu Metropolis?**

**Table 4.2: Effect of urban waste have on Increased Healthcare Demand in Enugu Metropolis**

s/n	Item	VH	High	Undecided	LE	VLE	Total	Mean	Decision
1	Waste-related illnesses strain healthcare facilities, leading to increased demand for services in Enugu Metropolis	120 (32%)	170 (45%)	20 (6%)	38 (10%)	30 (8%)	378	4.0	Accepted
2	Higher prevalence of diseases from waste elevates healthcare needs, overwhelming existing healthcare resources in Enugu Metropolis.	150 (38%)	150 (38%)	20 (6%)	30 (8%)	18 (5%)	378	4.1	Accepted
3	Waste-borne diseases surge, necessitating more medical attention and resources, escalating healthcare demand in Enugu Metropolis	150 (38%)	138 (37%)	30 (8%)	30 (8%)	30 (8%)	378	4.0	Accepted
4	Environmental pollution from waste amplifies health risks, leading to a rise in healthcare needs in Enugu Metropolis.	170 (45%)	138 (37%)	20 (6%)	30 (8%)	40 (11%)	378	4.2	Accepted
5	Improper waste disposal leads to injuries and infections, requiring medical treatment and contributing to healthcare demand	140 (37%)	158 (42%)	10 (3%)	40 (11%)	40 (11%)	378	4.0	Accepted
	<b>Grand mean</b>							4.06	

**Source: Field Survey 2024**

Table above shows the mean distribution of opinions of the respondents on effect does urban waste have on Increased Healthcare Demand in Enugu Metropolis. The grand mean of 4.06 is an indication that the respondents accepted that all the listed items.

**Research question 3: What is the effect of urban waste on health hazard in Enugu metropolis?**

**Table 4.3: Effect of urban waste on health hazard in Enugu metropolis**

s/n	Item	Very High	High	Undecided	Low Extent	Very Low Extent	Total	Mean	Decision
1	Improper waste disposal can contaminate water sources, leading to waterborne diseases such as cholera and typhoid fever	140 (37%)	140 (37%)	20 (6%)	48 (13%)	30 (8%)	378	4.0	Accepted
2	Open burning of waste releases harmful pollutants into the air, contributing to respiratory problems like asthma and bronchitis.	150 (38%)	140 (37%)	10 (3%)	48 (13%)	20 (6%)	378	4.1	Accepted
3	Accumulated waste provides breeding grounds for disease vectors such as mosquitoes and rats, increasing the risk of diseases like malaria and leptospirosis.	150 (38%)	120 (32%)	30 (8%)	40 (11%)	30 (8%)	378	4.1	Accepted
4	Inadequately managed waste can contain sharp objects or hazardous materials, leading to injuries and infections among residents.	138 (37%)	160 (42%)	10 (3%)	60 (16%)	20 (6%)	378	4.0	Accepted
5	Improper disposal of food waste can attract pests and contaminate food items, increasing the risk of foodborne illnesses such as salmonellosis and E. coli infection	138 (37%)	160 (42%)	10 (3%)	60 (16%)	20 (6%)	378	4.0	Accepted

Grand Means							4.94	
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**Source: Field Survey 2024**

Table above shows the mean distribution of opinions of the respondents on of urban waste on health hazard in Enugu metropolis. The grand mean sore of 4.04 revealed that the respondents accepted all the items listed in the table.

**Test of Hypotheses**

Data generated from the study were used to test the hypotheses using the chi-square test tool with formular as:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where O = observed frequency

E = Expected frequency

**Assumptions:** Level of significance = 0.05

**Decision rule:** Reject Ho it the calculated value of  $\chi^2$  is greater than the critical value of  $\chi^2$  otherwise accept Ho.

**Test of hypothesis one**

**Statement of hypothesis one**

Ho: Urban waste has no significant positive effect on Infectious Disease Outbreaks in Enugu Metropolis.

**Table 4.4: Chi-Square Tests**

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	103.403(a)	16	.000
Likelihood Ratio	90.626	16	.000
Linear-by-Linear Association	9.602	1	.002
N of Valid Cases	280		

a 13 cells (52.0%) have expected count less than 5. The minimum expected count is .24.

**SOURCE: SPSS Output version 23**

D.F = Degree of freedom; D.F = 16;  $\chi^2_{cal} = 103.403$ ,  $p = 0.05$ ,  $d.f = 16 \therefore \chi^2 = 26.30$

**Result:** The chi-square test showed that if calculated value is greater than the table value, then we reject the null hypothesis and accept the alternative hypothesis.

**Decision:** Since the calculated value of  $\chi^2 = 103.403$  is greater than the table value of  $\chi^2 = 26.30$  we therefore reject the null hypothesis and accept the alternative hypothesis. The statistical significance indicated that Urban waste has a significant positive effect on Infectious Disease Outbreaks in Enugu Metropolis.

**Test of hypothesis Two**

**Statement of hypothesis Two**

Ho: Urban waste has no significant positive effect on Increased Healthcare Demand in Enugu Metropolis.

**Table 4.5: Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	190.310(a)	16	.000
Likelihood Ratio	125.398	16	.000
Linear-by-Linear Association	40.659	1	.000
N of Valid Cases	280		

a 8 cells (40.0%) have expected count less than 5. The minimum expected count is .47.

**SOURCE: SPSS Output version 23**

D.F = Degree of freedom; D.F = 16

$\chi^2_{cal} = 190.310$ ,  $p = 0.05$ ,  $d.f = 16: \chi^2 = 26.30$

**Result:** The chi-square test showed that if calculated value is greater than the table value, then we reject the null hypothesis and accept the alternative hypothesis.

**Decision:** Since the calculated value of  $\chi^2 = 190.310$  is greater than the table value of  $\chi^2 = 26.30$ , we therefore reject the null hypothesis and accept the alternative hypothesis. The statistical significance indicated that Urban waste has a significant positive effect on Increased Healthcare Demand in Enugu Metropolis.

### Test of hypothesis Three

#### Statement of hypothesis Three

Ho: Urban waste has no positive significant effect on health hazard in Enugu metropolis.

**Table 4.7: Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	208.236(a)	12	.000
Likelihood Ratio	152.495	12	.000
Linear-by-Linear Association	76.788	1	.000
N of Valid Cases	280		

a. 9 cells (45.0%) have expected count less than 5. The minimum expected count is .34.

**SOURCE: SPSS Output version 23**

D.F = Degree of freedom

D.F = 16

$\chi^2_{cal} = 208.236$ ,  $p = 0.05$ ,  $d.f = 16 \therefore \chi^2 = 26.30$

**Decision Rule:** The decisions rule for  $\chi^2$  is that if the calculated value of  $\chi^2$  is less than the table value, then we accept the “null hypothesis” but if the calculated value is greater than table value we reject the null hypothesis.

**Decision:** Since the calculated value of  $\chi^2 = 208.236$  is greater than the table value of  $\chi^2 = 26.30$ , we therefore reject the null hypothesis and accept the alternative hypothesis. The statistical significance indicated that Urban waste has a significant positive effect on health hazard in Enugu metropolis.

#### 4. Discussion of Findings

The result of hypothesis one indicated that Urban waste has a significant positive effect on Infectious Disease Outbreaks in Enugu Metropolis. This is evident from the study that the value of  $\chi^2 = 103.403$  is greater than the table value of  $\chi^2 = 26.30$  we therefore reject the null hypothesis and accept the alternative hypothesis. The findings suggest a clear association between urban waste and the increased incidence of infectious disease outbreaks in Enugu Metropolis. The accumulation of waste creates a conducive environment for the proliferation of disease vectors such as mosquitoes, flies, and rodents, which serve as carriers for infectious pathogens. These vectors thrive in waste piles, sewage systems, and stagnant water bodies, facilitating the transmission of diseases such as malaria, dengue fever, and cholera. Moreover, improper waste disposal practices, including open dumping and burning, release harmful pollutants and toxins into the air and water, exacerbating environmental contamination and health risks. The inhalation of airborne particulate matter and exposure to toxic chemicals from burning waste can lead to respiratory illnesses, while contaminated water sources pose a threat of waterborne diseases to residents.

The findings underscore the urgent need for comprehensive waste management strategies in Enugu Metropolis to mitigate the health risks associated with urban waste. Investments in waste collection infrastructure, recycling facilities, and public education campaigns on proper waste disposal practices are essential to address the root causes of infectious disease outbreaks linked to waste accumulation. Additionally, interdisciplinary approaches involving collaboration between public health authorities, environmental agencies, and local communities are crucial to developing sustainable solutions for managing urban waste and safeguarding public health in Enugu Metropolis.

The result of hypothesis two indicated that Population explosion has a significant effect on waste storage, collection, transfer and transport in Enugu Urban. This is evident from the value of  $\chi^2 = 190.310$  which is greater than the table value of  $\chi^2 = 26.30$ . The findings indicate that population explosion in Enugu Urban has profound implications for waste management practices, particularly in terms of storage, collection, transfer, and transport. With rapid population growth, the volume of

waste generated increases significantly, putting pressure on existing waste management infrastructure and services. The surge in waste production overwhelms storage facilities and necessitates more frequent waste collection schedules to prevent overflow and environmental pollution. Moreover, the growing population density exacerbates logistical challenges in waste collection, transfer, and transport, leading to inefficiencies and delays in waste management operations. Inadequate waste disposal infrastructure and limited resources further compound the problem, resulting in inadequate waste management practices and environmental degradation. These findings underscore the importance of proactive measures to address the impact of population explosion on waste management in Enugu Urban. Investments in expanding waste storage capacity, upgrading transportation systems, and implementing efficient collection methods are essential to meet the growing demands for waste management services. Additionally, public education campaigns on waste reduction and recycling can help alleviate the strain on waste management infrastructure and promote sustainable waste management practices in Enugu Urban

Lastly, the result of hypothesis three revealed that Population explosion has a significant effect on processing, and disposal of solid waste in Enugu urban. This is based on the fact that value of  $\chi^2 = 208.236$  is greater than the table value of  $\chi^2 = 26.30$ . The findings highlight a concerning relationship between urban waste and health hazards in Enugu Metropolis, with urban waste exerting a significant positive effect on the prevalence of health hazards. Improper waste management practices, including open dumping, burning, and inadequate sanitation infrastructure, contribute to the proliferation of disease vectors and environmental contamination, leading to increased health risks for residents. Contaminated water sources, air pollution from waste burning, and the accumulation of toxic chemicals in the environment pose a range of health hazards, including waterborne diseases, respiratory illnesses, and long-term health impacts such as cancer and neurological disorders. Additionally, physical injuries resulting from hazardous waste materials further compound the health risks associated with urban waste. These findings underscore the urgent need for comprehensive waste management strategies and investments in Enugu Metropolis to mitigate health hazards associated with urban waste. Improving waste collection and disposal infrastructure, implementing pollution control measures, and promoting public awareness of proper waste management practices are essential steps toward safeguarding public health and well-being in the metropolis.

### **Summary of Findings**

- i. Urban waste had a significant positive effect on Infectious Disease Outbreaks in Enugu Metropolis.
- ii. Population explosion had a significant effect on waste storage, collection, transfer and transport in Enugu Urban.
- iii. Population explosion had a significant effect on processing, and disposal of solid waste in Enugu urban.

### **Conclusion**

In conclusion, the effect of urban waste on healthcare management in Enugu Metropolis is profound and multifaceted. Improper waste management practices contribute to a range of health hazards, including waterborne diseases, respiratory illnesses, and injuries, placing a significant burden on healthcare resources and infrastructure. The proliferation of disease vectors and environmental contamination exacerbates health risks for residents, leading to increased demand for healthcare services and compromising the delivery of quality care. Investments in waste management infrastructure, pollution control measures, and public education campaigns are essential to mitigate health hazards associated with urban waste and promote public health and well-being in Enugu Metropolis.

### **Recommendations**

Based on the findings, the following recommendations are made:

1. **Enhance Waste Management Infrastructure:** Invest in upgrading waste collection, transfer, and disposal infrastructure in Enugu Metropolis to improve efficiency and capacity. Implement

- modern waste management technologies and expand coverage to ensure timely and effective waste removal, reducing health hazards and healthcare demand.
2. Promote Public Awareness and Education: Launch public awareness campaigns to educate residents about proper waste disposal practices, recycling initiatives, and the health risks associated with improper waste management. Foster community participation and responsibility in waste reduction efforts to alleviate pressure on healthcare services.
  3. Strengthen Intersectoral Collaboration: Foster collaboration among government agencies, healthcare providers, environmental organizations, and community groups to develop integrated waste management solutions. Coordinate efforts to address environmental pollution, mitigate health hazards, and improve healthcare management in Enugu Metropolis through a multidisciplinary approach.

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