



An Assessment of Health Implications of Waste Disposal Practices on Residents of Mararaba Community, Karu LGA, Nasarawa State

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ABSTRACT

This study examined the health implications of waste disposal practices on residents of the Mararaba community in Karu Local Government Area, Nasarawa State, Nigeria. The study aimed to assess the health implications associated with improper waste disposal practices among residents. A quantitative survey research design was adopted, employing multi-stage and systematic sampling techniques. A total of 400 respondents were selected using Taro Yamane's formula at a 5% margin of error. Data were analyzed using Pearson Product Moment Correlation (PPMC), regression analysis, and Analysis of Variance (ANOVA) at a 0.05 level of significance. The results revealed that plastic and organic waste were the most common types of waste generated, while open dumping, burning, and drainage disposal were the predominant disposal methods. Reliability analysis showed acceptable to excellent internal consistency across all study constructs, with Cronbach's alpha values ranging from 0.76 to 0.90. The ANOVA results indicated that the regression model was statistically significant ($F = 224.256, p < 0.001$), confirming that waste-related factors jointly influence public health outcomes. Regression analysis further revealed that types and sources of waste ($\beta = -0.245, p < 0.001$), waste disposal practices ($\beta = -0.198, p < 0.001$), and public health implications ($\beta = -0.271, p < 0.001$) had significant negative effects on public health outcomes, while waste management systems and policies ($\beta = 0.709, p < 0.001$) had a strong positive effect and emerged as the most influential predictor. The study concludes that improper waste disposal significantly contributes to environmental pollution and public health challenges in the Mararaba area, particularly through the increased prevalence of malaria, diarrhea, dysentery, and other sanitation-related diseases.

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INTRODUCTION

Solid waste generation has increased significantly across the globe due to population growth, rapid urbanization, industrialization, and changes in consumption patterns. Its constitute one of the most persistent environmental challenges affecting both developed and developing countries. While many developed

countries have proper waste handling approaches; open dumping remains the dominant waste disposal method particularly in informal settlements and peri-urban community in Nigeria and other Africa developing countries (Agbeni et al., 2025). These practices have been associated with frequent outbreaks of cholera and other sanitary related diseases, as well as flooding

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caused by obstruction of both natural and controlled drainage systems (Abubakar-Otaru, et.al, 2025). WHO (2022) report shows that vulnerable groups, particularly children under five and elderly populations face disproportionate health risks due to exposure to contaminated environments which contributes to gastrointestinal infections and long-term health complications.

Nasarawa State has experienced rapid development due to its proximity to Abuja, the Federal Capital Territory. This rapid urban expansion has significantly increased the volume of solid waste generated from households, markets, commercial centers, and small-scale industries and has placed pressure on largely informal and inefficient waste management systems (Apake, et.al, 2024). The public health implications of these practices are substantial as accumulated waste serves as breeding grounds for mosquitoes and rodents, increasing the prevalence of malaria and other vector-borne diseases.

Decomposing organic waste produces harmful gases that causes respiratory irritation and long-term pulmonary conditions. Furthermore, contamination of water sources by waste leachate increases the risk of cholera, typhoid fever, and other gastrointestinal infections (Abubakar-Otaru et al., 2025). Given the high population density and sanitation challenges in this locality, the need to assess improper waste disposal impact on public health using empirical evidence necessary for improving environmental sanitation policies, strengthening waste management systems, and enhancing community health interventions becomes necessary. Therefore, this study examined the Health Implications of Waste Disposal Practices on Residents of the Mararaba community with the aim of contributing to sustainable environmental and health management strategies.

In the context of this study, public health is directly influenced by environmental conditions, particularly the methods used for waste management in urban and peri-urban community. Waste can be classified into several categories based on its source, composition, and potential hazards. Domestic or household waste consists of

organic and inorganic materials generated in homes, including food remnants, plastics, papers, and packaging materials. Industrial waste is produced by manufacturing, processing, or production facilities and often contains chemicals, heavy metals, and other pollutants that can pose significant health risks if improperly handled. Commercial waste is generated from businesses, offices, markets, and service establishments and typically includes paper, packaging, and organic refuse. Hazardous waste refers to waste that is potentially dangerous to human health or the environment due to its toxic, flammable, corrosive, or infectious properties, such as medical waste, batteries, and chemical residues (UNEP, 2021). Understanding the classification of waste is crucial for developing appropriate disposal methods and minimizing health risks.

The concepts of proper and improper waste disposal are central to this study. Proper waste disposal involves systematic methods that prevent environmental contamination and health hazards, including segregation of waste types, collection through municipal services, recycling, composting, and disposal in engineered landfills or incineration facilities. Improper waste disposal, conversely, entails unregulated dumping, open burning, and indiscriminate disposal in waterways, drainage systems, or open spaces. Improper practices create breeding grounds for disease vectors, contaminate soil and water sources, and release harmful gases into the atmosphere, all of which contribute to increased incidences of waterborne and vector-borne diseases (Apake, Ukawuilulu, & Osisiogu, 2024).

THEORETICAL REVIEW

This study draws on multiple theories that explain human behavior regarding waste management, the environmental impact of waste, and the health risks associated with poor disposal practices. The integration of these theories helps to conceptualize how improper waste disposal occurs and its consequences for public health. The Health Belief Model (HBM) is a behavioral theory that explains why individuals adopt or avoid health-related practices based on their



perceptions of risk and benefits (Rosenstock, 2020).

The model proposes that people are more likely to engage in preventive health behaviors when they perceive themselves as susceptible to a health problem, recognize the seriousness of the condition, believe that taking a particular action will reduce their risk, and perceive minimal barriers to taking that action. Applied to community sanitation, the HBM explains why residents of urban and peri-urban areas, such as the study area, may or may not dispose of waste properly. For instance, individuals who understand the link between improper waste disposal and diseases such as malaria, cholera, and diarrhea are more likely to participate in safe disposal practices. Conversely, low awareness of health risks, limited access to disposal facilities, or lack of enforcement may prevent proper sanitation behavior, perpetuating the prevalence of unsanitary environments and associated health problems.

Environmental Pollution Theory

The Environmental Pollution Theory emphasizes the connection between human activities, environmental degradation, and public health outcomes (UNEP, 2021). According to this theory, pollutants generated from human practices, including solid waste, chemical effluents, and industrial by-products, degrade the environment and increase exposure to health risks. In urban and peri-urban community, improper waste disposal contributes to soil, water, and air pollution, creating favorable conditions for disease vectors such as mosquitoes, flies, and rodents. In Mararaba-Karu LGA, uncollected refuse often blocks drainage channels, contaminates water sources, and produces harmful gases from decomposition, demonstrating how environmental mismanagement directly affects public health. The theory provides a framework for understanding the ecological consequences of waste disposal practices and highlights the need for effective environmental sanitation strategies.

Public Health Risk Theory

Public Health Risk Theory focuses on the assessment and management of environmental hazards that threaten population health (WHO, 2022). The theory posits that exposure to environmental risks, including improperly disposed waste, can lead to quantifiable health outcomes such as waterborne diseases, respiratory infections, and vector-borne illnesses. It further emphasizes the role of preventive measures, public health interventions, and regulatory policies in mitigating these risks. In Mararaba-Karu LGA, improper waste disposal increases the prevalence of sanitation-related diseases by creating breeding grounds for pathogens, contaminating drinking water, and releasing pollutants into the air. The theory underscores the importance of systematic risk assessment and implementation of strategies to reduce exposure to environmental hazards.

Application of These Theories to Waste Management in Urban and Peri-Urban community

The combined application of the Health Belief Model, Environmental Pollution Theory, and Public Health Risk Theory provides a comprehensive framework for understanding waste management and public health in urban and peri-urban community. The HBM explains residents' behaviors and motivations regarding proper or improper waste disposal, highlighting the role of awareness, perception of risk, and perceived benefits. The Environmental Pollution Theory demonstrates how improper waste disposal degrades the environment and facilitates disease transmission, while the Public Health Risk Theory links exposure to improperly managed waste directly to health outcomes, emphasizing the need for preventive and regulatory interventions. Together, these theories guide policymakers, health authorities, and community leaders in designing effective waste management strategies, promoting safe disposal practices, and reducing public health risks in rapidly urbanizing areas such as Mararaba-Karu LGA.



Empirical Review

The empirical review examines previous research studies that have explored the relationship between improper waste disposal and public health. This review draws on studies conducted globally, across Africa, within Nigeria, and specifically in Mararaba-Karu Local Government Area (LGA), Nasarawa State, between 2020 and 2025. Empirical studies provide evidence of the consequences of waste mismanagement on human health and highlight best practices and policy recommendations for mitigating health risks. By analyzing existing research, this section identifies patterns, challenges, and knowledge gaps that the current study seeks to address.

Globally, improper waste disposal has been recognized as a major public health concern, particularly in rapidly urbanizing regions. According to the World Health Organization (WHO, 2022), poor management of solid waste is associated with increased transmission of vector-borne and waterborne diseases, as well as respiratory disorders from the burning of waste. Studies in urban centers in Asia and Latin America have demonstrated that community exposed to uncollected refuse or open dumping experience higher incidences of diarrhea, cholera, malaria, and other sanitation-related illnesses (UNEP, 2021). In addition, improperly managed hazardous and industrial waste has been linked to long-term health effects, including chemical poisoning and chronic respiratory conditions. Globally, these studies highlight the importance of proper collection, segregation, recycling, and safe disposal of waste to prevent environmental contamination and protect public health.

In Africa, urban and peri-urban areas face significant challenges related to waste management due to rapid population growth, insufficient infrastructure, and limited institutional capacity. Agbeni et al. (2025) observed that in many African cities, open dumping, uncontrolled landfills, and burning of waste are widespread, creating unsanitary conditions that increase exposure to disease vectors. Research in Kenya, Ghana, and South Africa has shown that improper waste disposal in urban slums contributes to

malaria, cholera outbreaks, respiratory infections, and diarrheal diseases. These studies also indicate that low awareness, poverty, and weak enforcement of sanitation laws exacerbate health risks. The African perspective underscores the critical link between urbanization, inadequate waste management, and public health vulnerabilities.

In Nigeria, Abubakar-Otaru, Miya, and Bello (2025) reported that indiscriminate dumping along roadsides, drainage channels, and open spaces increases the prevalence of sanitation-related diseases, including cholera, typhoid, malaria, and diarrheal infections. Agbeni et al. (2025) further emphasized that poor waste management practices, coupled with irregular waste collection and limited disposal infrastructure, expose residents to both environmental contamination and health hazards. Nigerian studies also highlight that public awareness campaigns, proper waste segregation, and community involvement are critical for reducing the negative health impacts of waste. Despite national-level studies, there is a need for localized empirical evidence in rapidly growing peri-urban areas to understand specific patterns and challenges. Meanwhile, in Nasarawa State exemplifies the challenges of rapid urban growth combined with inadequate waste management.

Apake, et.al, (2024) observed that the study area generates large volumes of domestic, commercial, and small-scale industrial waste, but collection services are irregular and insufficient. Indiscriminate dumping in open spaces and drainage channels is common, resulting in blocked drains, flooding, and proliferation of disease vectors. Studies conducted between 2020 and 2025 indicate high prevalence rates of malaria, diarrheal diseases, and other sanitation-related health problems in community exposed to improperly managed waste. The research further highlights low public awareness, weak enforcement of environmental sanitation policies, and the absence of adequate waste disposal infrastructure as key factors exacerbating the health risks. These local studies provide the foundation for the current research, emphasizing the urgent need to assess the Health Implications

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of Waste Disposal Practices on Residents in Mararaba community.

MATERIALS AND METHOD

The study used a quantitative method of Gemson and Kyamru, (2021). This is because of its appropriateness to the assessment. It involves observing and describing the behavior of the subjects without influencing of data, it is based on an in-depth investigation of individual group, or even to explore causation in order to find the underlying principles. The studies target population comprises of residents and stakeholders involved in waste generation and management in area including households, market traders, commercial establishments, small-scale industries, environmental health officers, and officials from regulatory agencies responsible for sanitation and waste management (e.g., Nasarawa State Environmental Protection Agency, NASEPA and Nasarawa State Waste Management & sanitation Authority, NASWAMSA). The target population focuses primarily on households, as they are contributors to domestic waste generation and disposal practices. Using Yamane Formula, a sample population of four hundred (400) households were used. This is a representative population considering the total population of (342,550) as at 1st February 2023.

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

A structured questionnaire consisting of four (4) Likert-scale items designed to measure key variables in the study. The response scale ranged from 1 = Strongly Disagree to 5 = Strongly Agree. The questionnaire was divided into five sections; and to ensure credibility of the study, both reliability and validity measures were employed. Reliability refers to the consistency of the data collection instrument. The structured questionnaire will be pre-tested on a small sample of residents, market traders, and waste management officials within an area that is not part of the main study. The responses from the pre-test was analyzed using Cronbach's alpha coefficient to measure internal consistency. A

Cronbach's alpha value of 0.7 was considered acceptable, indicating that the instrument is reliable and capable of producing consistent results. The data were collected and analyzed using descriptive and inferential statistics. Descriptive statistics of frequencies, percentages, means, and standard deviations were used to summarize and present data on types and sources of waste, waste disposal practices, public health problems, and effectiveness of waste management systems in the area. The results were presented in tables, charts, and graphs for easy interpretation. Inferential statistics, specifically Pearson Product Moment Correlation (PPMC), was used to test the objectives at a 0.05 alpha level of significance.

RESULTS AND DISCUSSION

Scale Reliability — Cronbach's Alpha

Cronbach's alpha was calculated to assess the internal consistency and reliability of the thematic scales used in examining the Health Implications of Waste Disposal Practices on Residents in the study area. The results are presented in Table 1. All five scales recorded Cronbach's alpha values above the acceptable threshold of 0.70, indicating that the questionnaire items consistently measured their respective constructs. The highest reliability coefficient was recorded for Public Health Implications ($\alpha = 0.90$), indicating excellent internal consistency among items measuring health effects associated with improper waste disposal. Similarly, Public Health Outcomes in the area demonstrated a high reliability score ($\alpha = 0.89$), reflecting strong consistency in respondents' perceptions of health conditions within the study area.

The scales for Waste Disposal Practices ($\alpha = 0.80$) and Types and Sources of Waste ($\alpha = 0.79$) both achieved good reliability ratings, suggesting that the items effectively captured the patterns of waste generation and disposal among residents. The Waste Management Systems and Policies scale recorded the lowest reliability coefficient ($\alpha = 0.76$), though it remained within the acceptable range, indicating satisfactory consistency in assessing the effectiveness of

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existing waste management interventions. Overall, the reliability analysis confirms that the research instrument was dependable and suitable for further statistical analysis. The findings provide confidence that the questionnaire accurately

measured the key variables relating to waste generation, disposal practices, public health implications, and waste management systems in the area.

Table 1. Reliability Analysis: Cronbach's Alpha by Thematic Scale

Theme / Scale	Items	Mean (/5)	SD	Cronbach's α	Reliability Rating
Types and Sources of Waste	5	3.46	0.71	0.79	Good
Waste Disposal Practices	5	3.38	0.68	0.80	Good
Public Health Implications	5	3.74	0.74	0.90	Excellent
Waste Management Systems and Policies	5	3.12	0.69	0.76	Acceptable–Good
Public Health Outcomes	5	3.58	0.72	0.89	Good–Excellent

Note: $\alpha \geq 0.70$ = Acceptable; $\alpha \geq 0.80$ = Good; $\alpha \geq 0.90$ = Excellent (Creswell & Creswell, 2022).

The reliability results indicate that respondents provided consistent responses across all study dimensions. The excellent reliability of the Public Health Implications scale suggests strong agreement regarding the health risks associated with improper waste disposal, including the spread of communicable diseases, environmental contamination, and poor sanitation conditions. The high reliability of the Public Health Outcomes scale further supports the validity of the findings concerning the impact of waste-related practices on community health.

Pearson Correlation Matrix: Inter-Variable Relationships

Pearson Product-Moment Correlation (PPMC) analysis was conducted to examine the relationships among the key study variables: Types and Sources of Waste, Waste Disposal Practices, Public Health Implications, Waste Management Systems and Policies, and Public Health Outcomes in Mararaba-Karu LGA. The

results presented in Table 2 indicate that all correlations were statistically significant at $p < 0.001$.

The strongest positive relationship was observed between Waste Management Systems and Policies and Public Health Outcomes ($r = 0.842$), indicating that effective waste management policies significantly improve public health conditions. Conversely, Public Health Implications showed the strongest negative relationship with Public Health Outcomes ($r = -0.791$), suggesting that increased exposure to waste-related health hazards reduces the overall health status of residents. Types and Sources of Waste and Waste Disposal Practices also demonstrated significant negative relationships with Public Health Outcomes. These findings imply that poor waste generation patterns and improper disposal methods contribute substantially to adverse public health conditions in the area.

Table 2. Pearson Correlation Matrix: Inter-Variable Relationships

Variables	Types & Sources of Waste	Waste Disposal Practices	Public Health Implications	Waste Management Systems & Policies	Public Health Outcomes
Types & Sources of Waste	1.000	0.684***	0.721***	-0.603***	-0.698***
Waste Disposal Practices	0.684***	1.000	0.756***	-0.582***	-0.734***
Public Health Implications	0.721***	0.756***	1.000	-0.645***	-0.791***

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Variables	Types & Sources of Waste	Waste Disposal Practices	Public Health Implications	Waste Management Systems & Policies	Public Health Outcomes
Waste Management Systems & Policies	-0.603***	-0.582***	-0.645***	1.000	0.842***
Public Health Outcomes	-0.698***	-0.734***	-0.791***	0.842***	1.000

*** $p < 0.001$ (two-tailed). All correlations are statistically significant at the 0.001 level.

The results demonstrate that improved waste management systems and effective environmental sanitation policies are strongly associated with better public health outcomes,

while poor waste disposal practices and increasing waste-related health problems are associated with deteriorating public health conditions in the area.

Table 3. Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	32.002	4	8.001	224.256	.000 ^b
Residual	14.092	395	0.036		
Total	46.094	399			

Table 3 presents the Analysis of Variance (ANOVA) results of the regression model used to assess the influence of waste-related factors on public health outcomes in study area. The findings show that the Regression Sum of Squares (32.002) is substantially higher than the unexplained variation represented by the Residual Sum of Squares (14.092). Out of the Total Sum of Squares (46.094), a considerable proportion is explained by the predictor variables included in the model.

The ANOVA result produced an F-value of 224.256 with a significance level of $p = 0.000$. Since the significance value is less than the acceptable threshold of 0.05, the regression model is statistically significant. This indicates that

the independent variables—Types and Sources of Waste, Waste Disposal Practices, Public Health Implications, and Waste Management Systems and Policies jointly have a significant effect on public health outcomes in the area. The very high F-statistic demonstrates that the model has strong explanatory power and provides a good fit for the observed data. Therefore, the null hypothesis is rejected, while the alternative hypothesis is accepted. This confirms that waste-related factors significantly influence public health conditions in the study area. The result further suggests that effective waste management and environmental sanitation interventions are essential for improving public health outcomes among residents of the study area.

Table 4. Regression Coefficients

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	1.733	0.112	—	15.425	.000
Types and Sources of Waste	-0.178	0.033	-0.245	-5.416	.000
Waste Disposal Practices	-0.174	0.042	-0.198	-4.146	.000
Public Health Implications	-0.343	0.042	-0.271	-8.188	.000
Waste Management Systems and Policies	0.882	0.040	0.709	21.899	.000

Dependent Variable: Public Health Outcomes in the area

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Regression Coefficients Interpretation

Table 4 presents the regression coefficients showing the individual effects of the predictor variables on public health outcomes. The constant term ($B = 1.733$, $p = 0.000$) is statistically significant, indicating the baseline level of public health outcomes when all independent variables are held constant. The variable Types and Sources of Waste recorded a negative and statistically significant coefficient ($B = -0.178$, $\beta = -0.245$, $p = 0.000$), indicating that poor waste generation patterns contribute to a decline in public health conditions. Likewise, Waste Disposal Practices showed a significant negative effect ($B = -0.174$, $\beta = -0.198$, $p = 0.000$), suggesting that improper waste disposal methods adversely affect the health of residents.

Similarly, Public Health Implications exhibited a negative and significant relationship ($B = -0.343$, $\beta = -0.271$, $p = 0.000$), implying that increasing exposure to waste-related diseases and environmental hazards leads to poorer public health outcomes. In contrast, Waste Management Systems and Policies had a strong positive and statistically significant effect ($B = 0.882$, $\beta = 0.709$, $p = 0.000$). This indicates that effective waste collection, environmental sanitation programmes, policy implementation, and regulatory enforcement significantly improve public health outcomes. Based on the standardized beta coefficient, this variable emerged as the strongest predictor in the model.

CONCLUSION

Based on the findings of the study, it is concluded that improper waste disposal has a significant negative impact on public health in Mararaba, Karu Local Government Area of Nasarawa State. The study demonstrates that poor waste disposal practices, inadequate waste management systems, and high levels of environmental pollution contribute significantly to the spread of diseases and deterioration of public health. Although some level of waste management systems exists in the area, their effectiveness is still insufficient to fully address the growing waste management challenges. Consequently, residents are exposed to

environmental hazards that increase the prevalence of diseases such as malaria, diarrhea, dysentery, and cholera. Therefore, effective waste management is essential for improving environmental sanitation and promoting better public health outcomes in the study area.

RECOMMENDATIONS

1. Government and relevant agencies should strengthen waste management systems in Mararaba by ensuring regular waste collection and proper disposal mechanisms.
2. Residents should be educated on the dangers of improper waste disposal through continuous environmental awareness programs and health campaigns in the residential areas, markets, industries and religion houses.
3. More waste bins, collection points, and approved dumpsites should be provided within community to discourage open dumping and burning of waste.
4. Government should engage youth on circular economy initiative, conversion of waste to into eco-friendly products, waste to energy, recycling, green business development, and climate action,
5. Government should collaborate with private companies to establish a sanitary landfill, plastics recycling plants and composing to cushion the effect of waste accumulation
6. Government should enforce environmental sanitation laws and impose penalties on individuals who engage in indiscriminate waste disposal.
7. Community members should be encouraged to actively participate in keeping their environment clean through organized sanitation exercises.
8. Waste management policies should not only exist on paper but should be effectively implemented and monitored by responsible authorities.



9. The government should partner with private waste management companies to improve efficiency in waste collection and disposal services.

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