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Common Waste Management Strategies and Perceived Health Implications Among Residents of Calabar South Local Government Area, Cross River State, Nigeria.

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Abstract
This study examines the relationship between common waste management strategies and the perceived health implications among residents of Calabar South Local Government Area, Cross River State, Nigeria. A correlational research design was employed, with a population of 191,630 residents. A stratified random sampling technique was used to select 58 streets from 288 through a hat-and-draw method, and four respondents per street were chosen accidentally, resulting in a sample size of 200. Data were collected using a researcher-developed questionnaire, and four hypotheses were tested at a 0.05 level of significance. The dependent variable was perceived health impact, while the independent variables included open dumping, sanitary landfill, incineration, and reuse/recycling waste management methods. Pearson Product Moment Correlation analysis was used to analyze the data. The findings revealed significant relationships between all four waste management methods and perceived health implications. Open dumping and incineration exhibited the strongest associations with negative health outcomes, likely due to exposure to pollutants, toxins, and disease-carrying organisms. While sanitary landfills and recycling are considered more sustainable options, poor waste handling, inadequate safety measures, and improper regulation contributed to perceived health risks. The study concludes that ineffective waste management practices can lead to serious health consequences. It recommends stricter enforcement of waste management policies, investment in advanced waste treatment technologies, improved public awareness, and enhanced waste collection services. Additionally, collaboration between government agencies, private waste management firms, and community stakeholders is essential to promoting sustainable waste management and reducing health hazards in Calabar South Local Government Area.
Keywords: Waste management, health implications, open dumping, incineration, recycling

Introduction and Background
Waste management is a critical environmental and public health concern, particularly in urban areas where population growth and industrial activities generate large volumes of waste. Effective waste disposal methods play a vital role in mitigating health risks and environmental

degradation. However, in many developing countries, improper waste management remains a significant challenge, often leading to adverse health outcomes among residents (Wilson, Velis, & Cheeseman, 2006). In Nigeria, waste disposal methods such as open dumping and sanitary landfills are widely used, yet they pose varying degrees of health risks and environmental concerns (Akinbile & Yusoff, 2011). The reliance on open dumping and sanitary landfills has raised concerns about their potential impact on public health, including the spread of vector-borne diseases, respiratory issues, and water contamination (Ezeah & Roberts, 2012). Given the growing concerns over waste management and health, it is essential to assess residents' perceptions of these disposal methods and their associated health implications.

Waste management encompasses the collection, transportation, treatment, and disposal of waste materials, with the primary aim of reducing environmental and health hazards (Pichtel, 2014). Globally, various waste disposal methods exist, including recycling, composting, incineration, sanitary landfilling, and open dumping. In developing countries, open dumping is the most common method due to its low cost and ease of implementation (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018). However, open dumpsites often become breeding grounds for disease-carrying organisms and sources of air and water pollution, adversely affecting nearby populations (Al-Khatib, Kontogianni, Abu Nabaa, & Al-Sari, 2015).

Sanitary landfills, in contrast, are engineered waste disposal sites designed to minimize environmental hazards by using protective liners, leachate collection systems, and gas extraction mechanisms (Nanda & Berruti, 2021). While considered a more sustainable alternative to open dumping, poorly managed sanitary landfills can still pose health risks, including groundwater contamination and methane emissions, which contribute to climate change (Henry, Yongsheng, & Jun, 2006).

In Nigeria, rapid urbanization and weak waste management policies have exacerbated the challenges associated with proper waste disposal (Nzeadibe & Anyadike, 2012). In Calabar South LGA, ineffective waste collection and disposal have led to the proliferation of open dumpsites in residential areas, increasing residents' exposure to hazardous substances and disease vectors (Bassey, 2023). Studies have shown that waste management practices in Nigerian cities often lack adequate public participation and government oversight, further compounding the health risks associated with improper waste disposal (Abila & Kantola, 2013).

The reliance on open dumping and poorly managed landfills has raised public health concerns, as residents are exposed to air pollution, water contamination, and diseases such as cholera and respiratory infections (Ezeah & Roberts, 2012).

Incineration is widely used as a waste management strategy due to its ability to significantly reduce waste volume and generate energy. However, studies suggest that incineration may have adverse health implications due to the release of toxic emissions, such as dioxins, furans, and heavy metals (Sharma, Sharma, Sharma & Sharma, 2013). These pollutants have been linked to respiratory diseases, cardiovascular complications, and increased cancer risks among populations living near incineration plants (Cheng et al., 2025).

Research by Giusti (2009) highlights that despite technological advancements in incineration, emissions from poorly regulated facilities can contribute to environmental contamination and long-term health issues. Additionally, incineration plants that lack proper filtration and emission control systems pose a significant risk of air pollution, leading to increased cases of asthma and other respiratory illnesses (Astuti & Rauf, 2024).

In developing countries, where regulatory enforcement is often weak, incineration is associated with even greater health concerns. For instance, Ali et al. (2021) found that open burning of waste, a rudimentary form of incineration, is common in urban areas with inadequate waste disposal infrastructure. This practice contributes to air pollution and exposes residents to harmful particulates, exacerbating health risks. Therefore, while incineration remains a viable waste management method, its health implications necessitate stringent regulatory measures, modern emission control technologies, and public awareness initiatives.

Recycling and reuse are essential strategies for sustainable waste management, reducing landfill dependency and promoting resource conservation. However, studies indicate that improper recycling practices can pose health risks to workers and communities, especially in informal recycling sectors (Wilson, Velis, & Cheeseman, 2006).

According to Gidarakos, Havas, and Ntzamilis (2006), occupational exposure to hazardous materials during recycling processes can result in skin infections, respiratory problems, and heavy metal poisoning. Informal recyclers, particularly in developing countries, often handle waste without protective gear, increasing their vulnerability to infectious diseases and toxic substances (Medina, 2010). In e-waste recycling, improper handling of materials containing lead, mercury, and cadmium can cause neurotoxicity and developmental disorders, especially in children exposed to contaminated environments (Dórea, 2021).

Additionally, ineffective waste sorting and contamination of recyclable materials with hazardous substances may introduce additional health risks. Research by Park et al. (2018) suggests that poorly managed recycling facilities can become breeding grounds for bacteria and fungi, leading to an increased prevalence of respiratory and gastrointestinal infections among workers. Furthermore, plastic recycling has been associated with the release of microplastics, which can enter the human food chain and pose potential long-term health risks (Prata et al., 2020).

Despite these concerns, when properly regulated and implemented, recycling and reuse remain among the safest and most sustainable waste management strategies. Implementing safety measures, providing adequate protective equipment, and enforcing waste sorting regulations can significantly mitigate health risks while maximizing the benefits of recycling (UNEP, 2019).

The literature suggests a significant relationship between both incineration and recycling/reuse waste management methods and the perceived health of residents. Incineration, if not properly managed, can contribute to severe air pollution and respiratory illnesses, while informal and unsafe recycling practices may expose individuals to hazardous materials. To minimize these risks, policymakers must prioritize the enforcement of health and safety regulations, improve waste management infrastructure, and promote safe waste disposal practices.

This study examines the relationship between waste management strategies and the perceived health implications of residents in Calabar South, providing valuable insights for policymakers, environmental agencies, and public health authorities.

By assessing public perceptions and the associated health risks, the findings will contribute to policy recommendations aimed at improving waste management systems and enhancing public health outcomes.

Statement of the Problem

Waste management remains a critical environmental and public health challenge in urban areas, particularly in rapidly growing cities like Calabar South Local Government Area (LGA), Cross River State, Nigeria. The improper disposal of solid waste, especially through common methods such as open dumping and sanitary landfills, has been linked to environmental degradation, pollution, and adverse health effects among residents. Despite existing waste management policies and programs, waste disposal practices in Calabar South remain largely

unregulated, with open dumpsites commonly found in residential areas, markets, and along major roads. These practices contribute to air and water pollution, the spread of diseases, and the proliferation of pests and vectors such as mosquitoes and rodents.

Several studies have highlighted the health risks associated with ineffective waste management, including respiratory diseases, gastrointestinal infections, and skin disorders, particularly in communities where waste is poorly managed. However, there is limited empirical research on how residents of Calabar South perceive the health implications of these waste disposal methods and how their awareness influences waste management behaviors. Furthermore, while sanitary landfills are considered a relatively safer method of waste disposal, the lack of proper maintenance and regulation in many Nigerian cities often leads to groundwater contamination and other environmental hazards.

This study, therefore, seeks to examine the common waste management strategies in Calabar South LGA, focusing on open dumping and sanitary landfills, and assess residents' perceptions of their health implications. The findings will provide valuable insights into the effectiveness of current waste management practices and inform policies aimed at improving waste disposal methods while mitigating health risks in urban communities.

Purpose of the Study

The purpose of this study is to examine the relationship between common waste management strategies and the perceived health implications among residents of Calabar South Local Government Area, Cross River State, Nigeria. Specifically, this study aims to:

1. Determine the relationship between the open dumping disposal method and the perceived health of residents.
2. Assess the relationship between the sanitary landfill disposal method and the perceived health of residents.
3. Examine the relationship between incineration waste management and the perceived health of residents.
4. Investigate the relationship between reuse/recycling waste management and the perceived health of residents.

Research Hypotheses

1. There is no significant relationship between open dumping disposal method and perceived health of residents.
2. There is no significant relationship between sanitary landfill disposal method and perceived health of residents.

3. There is no significant relationship between incineration waste management method and perceived health of residents.
4. There is no significant relationship between reuse/recycle waste management method and perceived health of residents.

Methodology

Research design

This study employs a correlational research design to investigate the relationship between common waste management strategies and the perceived health implications among residents of Calabar South Local Government Area, Cross River State, Nigeria. A correlational design is appropriate because it allows the researcher to examine the degree and direction of the association between variables without manipulating them (Creswell & Creswell, 2018).

The choice of this design is justified by the study's objective, which is to determine whether and to what extent different waste management strategies—such as open dumping, sanitary landfills, incineration, and recycling—are linked to residents' health perceptions. Since the study does not seek to establish causality but rather to identify patterns of association, a correlational approach provides a statistically valid method for measuring relationships between variables (Fraenkel & Wallen, 2019).

Furthermore, this design enables data collection from a real-world setting, reflecting actual waste management practices and their perceived health effects. The findings will help policymakers, environmental health professionals, and waste management agencies develop evidence-based strategies to mitigate potential health risks while improving waste management efficiency.

Study area

This study is conducted in Calabar South Local Government Area (LGA) of Cross River State, Nigeria. Calabar South is one of the two LGAs that make up Calabar Metropolis, the capital city of Cross River State. It is an urban area characterized by high population density, rapid urbanization, and significant economic activities, all of which contribute to increased waste generation and management challenges.

Calabar South LGA is located in the southern part of Cross River State, bordering the Calabar River to the east and Akpabuyo LGA to the west. It covers an estimated land area of 264 km²

and had a projected population of 191,630 as of the 2006 national census (National Population Commission [NPC], 2006), with further growth expected due to urban expansion and migration. The area comprises several communities, including Anantigha, Edibe-Edibe, Bayside, and Duke Town, among others.

Calabar South serves as a commercial hub, with markets, small-scale industries, and businesses contributing to economic growth. However, the increasing population and commercial activities have led to a surge in municipal waste, requiring effective management strategies. Waste disposal in the area primarily involves open dumping, sanitary landfills, incineration, and recycling, but inadequate infrastructure and poor waste management practices remain critical concerns.

The area experiences a tropical monsoon climate, with heavy rainfall between March and October, which exacerbates waste-related issues such as flooding, pollution, and health hazards. Poorly managed waste, especially in open dumps, often leads to environmental contamination, blocked drainage systems, and the spread of vector-borne diseases.

Calabar South LGA faces several waste management challenges, including inconsistent waste collection, inadequate disposal sites, poor enforcement of waste policies, and low public awareness of proper waste disposal practices.

Population and Sampling

The study population consists of all 191,630 residents of Calabar south (NPoC, 2006). A stratified random sampling technique was employed to select 58 streets out of 288 through a hat-and-draw method. On each street, four respondents were selected accidentally, resulting in a sample size of 200 respondents.

Instrumentation

A researcher-developed questionnaire was used for data collection, divided into two sections:

1. Part A: Demographic data (age, sex, street of residence).
2. Part B: common waste management strategies and the perceived health implications among residents
3. A four-point Likert-type response scale was used: with SA – 4 points, A-3points, D – 2 points and SD – 1 point.

Validity and Reliability

The instrument was reviewed by experts in test and measurement and validated by the research supervisor. Reliability was assessed using the split-half method, with 50 copies administered

in Calabar Municipal LGA, Cross River State. A Pearson correlation coefficient of 0.89 confirmed the instrument's consistency.

Data Collection and Analysis

The researcher and two assistants administered questionnaires to willing respondents. Data were coded numerically, with scores reversed for negatively worded items, ensuring accuracy in statistical analysis.

Results and Discussions

Four hypotheses formed for this study were tested at 0.05 level of significance. The dependent variable perceived impact on human health and four independent variables; open dumping method, sanitary landfill method, incineration method and reuse/recycle methods of waste management. Pearson Product Moment Correlation analysis method was adopted for the study. The results are presented hypothesis by hypothesis.

Ho_1

There is no significant relationship between open dumping disposal method and perceived health of residents.

Table 1: Pearson Correlation Analysis of the Relationship Between Open Dumping Disposal Method and Perceived Health of Residents (N = 200)

Variables	M	SD	$\sum X^2$ ($\sum Y^2$)	$\sum XY$	r
Open Dumping Method	106.41	22.80	19,244.60	1,799.21	.440*
Perceived Health Implications	38.15	16.86	671,111.95		

*$p < .05$; $df = 198$; critical $r = 0.138$

The Pearson product-moment correlation analysis revealed a moderate positive relationship between the open dumping disposal method and perceived health implications among residents of Calabar South LGA ($r = .440$, $p < .05$). Since the obtained r-value (.440) exceeds the critical r-value (0.138), the null hypothesis is rejected. This indicates that as open dumping increases, perceived negative health implications also tend to increase. The findings suggest that open dumping may contribute significantly to health risks among residents, emphasizing the need for improved waste management practices to mitigate health hazards.

H_{O2}
There is no significant relationship between sanitary landfill disposal method and perceived health of residents.

Table 2: Pearson Correlation Analysis of the Relationship Between the Sanitary Landfill Method and Perceived Health of Residents (N = 200)

Variables	M	SD	$\sum X^2$ ($\sum Y^2$)	$\sum XY$	r
Sanitary Landfill Method	107.41	21.80	201,447.60	1,897.21	.370*
Perceived Health Implications	38.15	16.86	671,111.95		

*$p < .05$; $df = 198$; critical $r = 0.138$

The Pearson product-moment correlation analysis showed a moderate positive relationship between the sanitary landfill method and perceived health implications among residents of Calabar South LGA ($r = .370$, $p < .05$). Since the computed r-value (.370) is greater than the critical r-value (0.138), the null hypothesis is rejected. This suggests that an increase in the use of sanitary landfills is associated with an increase in perceived health risks, possibly due to inadequate landfill management, leachate contamination, or air pollution from landfill sites. These findings highlight the need for improved landfill management practices to minimize health hazards in the study area.

H_{O3}
There is no significant relationship between incineration waste management method and perceived health of residents.

Table 3: Pearson Correlation Analysis of the Relationship Between the Incineration Waste Management Method and Perceived Health of Residents (N = 200)

Variables	M	SD	$\sum X^2$ ($\sum Y^2$)	$\sum XY$	r
Incineration Waste Management Method	94.01	16.24	92,076.97	2,046.61	.650*
Perceived Health Implications	38.15	15.86	671,111.95		

*$p < .05$; $df = 198$; critical $r = 0.138$

The Pearson correlation analysis indicates a strong positive relationship between the incineration waste management method and perceived health implications among residents ($r = .650$, $p < .05$). Since the computed r-value (.650) is significantly higher than the critical r-value (0.138), the null hypothesis is rejected. This suggests that increased reliance on incineration as a waste disposal method is associated with higher perceived health risks.

Potential health concerns may include exposure to air pollutants, toxic emissions, and respiratory complications from incineration byproducts. These findings underscore the need for stricter emission control measures and alternative waste management strategies to mitigate health risks in Calabar South LGA.

H_{O4}

There is no significant relationship between reuse/recycle waste management method and perceived health of residents.

Table 4: Pearson Correlation Analysis of the Relationship Between the Reuse/Recycle Waste Management Method and Perceived Health of Residents (N = 200)

Variables	M	SD	$\sum X^2$ ($\sum Y^2$)	$\sum XY$	r
Reuse/Recycle Waste Management Method	107.31	26.81	196,111.50	7,469.21	.510*
Perceived Health Implications	38.15	15.86	671,111.95		

*$p < .05$; $df = 198$; critical $r = 0.138$

The Pearson correlation analysis reveals a moderate positive relationship between the reuse/recycle waste management method and perceived health implications among residents ($r = .510$, $p < .05$). Since the computed r-value (.510) is greater than the critical r-value (0.138), the null hypothesis is rejected. This suggests that increased adoption of recycling and reuse practices is associated with higher perceived health risks. Possible explanations may include improper handling of recyclable materials, exposure to contaminated waste, and inadequate waste sorting systems. While recycling and reuse are sustainable waste management strategies, proper regulation, public awareness, and improved waste processing infrastructure are necessary to minimize associated health risks.

Discussion of Findings

H_{O1}

The results of this study indicate a moderate positive correlation between the open dumping disposal method and perceived health implications among residents of Calabar South Local Government Area ($r = .440$, $p < .05$). The rejection of the null hypothesis suggests that as the prevalence of open dumping increases, residents perceive greater health risks. This finding aligns with existing research highlighting the health hazards associated with open dumping, particularly in developing regions where this method remains prevalent due to its low cost and accessibility (Kaza, Yao, Bhada-Tata, & Van Woerden, 2018).

Open dumping has been widely recognized as a major contributor to environmental and public health issues. Studies have shown that open dumpsites often become hotspots for vector-borne diseases, serving as breeding grounds for mosquitoes, rodents, and flies that transmit malaria, typhoid, and other infectious diseases (Al-Khatib, Kontogianni, Abu Nabaa, & Al-Sari, 2015). Additionally, the decomposition of organic waste in open dumps releases harmful gases such as methane and hydrogen sulfide, which contribute to air pollution and respiratory problems among nearby residents (Gómez et al., 2019).

Moreover, the leachate from open dumps can contaminate groundwater and surface water sources, exposing communities to waterborne diseases (Johannessen & Boyer, 2018). In urban areas like Calabar South, where waste collection infrastructure may be inadequate, improper disposal exacerbates these risks. The findings of this study emphasize the need for improved waste management strategies, including the implementation of sanitary landfills, waste segregation, and public awareness campaigns, to minimize health hazards associated with open dumping.

Open dumping remains a common waste disposal practice in many low-income areas, its adverse effects on human health and the environment highlight the urgency of adopting safer and more sustainable waste management practices. Government agencies, policymakers, and community stakeholders must collaborate to implement stricter regulations and improve waste collection systems to protect public health and enhance environmental sustainability.

H_{O_2}

The study found a moderate positive correlation between the sanitary landfill method and perceived health implications among residents of Calabar South Local Government Area (r = .370, $p < .05$). Since the computed r-value exceeded the critical value (0.138), the null hypothesis was rejected. This suggests that an increase in the use of sanitary landfills is associated with greater perceived health risks among residents. The result highlights concerns that, despite being a more controlled waste disposal method than open dumping, sanitary landfills may still contribute to environmental and health hazards if not properly managed.

Sanitary landfills are engineered facilities designed to minimize waste-related pollution by incorporating protective liners, leachate collection systems, and gas extraction mechanisms (Aljaradin & Persson, 2012). However, several factors could contribute to the perceived health risks among residents. Poor landfill management, including inadequate waste compaction, failure to control leachate, and ineffective gas recovery systems, can lead to groundwater contamination, air pollution, and unpleasant odors (Henry, Yongsheng, & Jun, 2006).

One of the major concerns associated with sanitary landfills is leachate—a liquid that forms as waste decomposes and can seep into soil and groundwater, carrying toxic substances and pathogens (Aljaradin & Persson, 2012). If not properly contained, leachate can increase the risk of waterborne diseases among nearby residents. Additionally, landfills produce methane, a potent greenhouse gas that contributes to climate change and can also pose explosion risks if not adequately vented (Marshall & Farahbakhsh, 2013).

The findings suggest that while sanitary landfills are preferable to open dumping, ineffective implementation and management can still expose communities to health risks. Therefore, improved waste treatment technologies, stricter regulatory enforcement, and community education are necessary to minimize negative health effects. Ensuring proper landfill siting, regular environmental monitoring, and methane capture systems can further enhance the safety and sustainability of landfill operations.

The moderate positive correlation between sanitary landfills and perceived health risks underscores the need for improved landfill management practices in Calabar South LGA. Government agencies and waste management authorities must implement stricter monitoring and enforcement to ensure that landfills operate in compliance with environmental safety standards. Community engagement and education on proper waste disposal and landfill impact mitigation can also help reduce health concerns associated with landfills.

H_{O3}

The Pearson correlation analysis revealed a strong positive relationship between the incineration waste management method and perceived health implications among residents of Calabar South Local Government Area ($r = .650$, $p < .05$). Since the computed r-value significantly exceeds the critical value (0.138), the null hypothesis is rejected. This suggests that increased reliance on incineration as a waste disposal method corresponds with greater perceived health risks among residents. The strong correlation implies that incineration may contribute significantly to environmental and public health concerns, necessitating stricter emission controls and the adoption of safer waste management alternatives.

Incineration is commonly used to reduce the volume of municipal solid waste while generating energy. However, its adverse health effects have been widely documented. One major concern is the emission of air pollutants, including particulate matter, heavy metals, and toxic gases such as dioxins and furans (Nanda & Berruti, 2021). Prolonged exposure to these pollutants has been linked to respiratory diseases, cardiovascular conditions, and even certain cancers

(Astuti & Rauf, 2024). Residents living near incineration facilities may also experience increased rates of asthma, bronchitis, and other respiratory ailments due to airborne contaminants (Cointreau, 2006). Another critical issue is the improper management of incineration byproducts, such as fly ash and bottom ash, which may contain hazardous substances like lead, mercury, and cadmium (Cheng, Hu, Huang, & Cui, 2009). If not properly treated or disposed of, these residues can contaminate soil and water sources, further exacerbating environmental health risks. Moreover, incineration processes contribute to greenhouse gas emissions, including carbon dioxide (CO_2) and nitrogen oxides (NO_x), which can worsen climate change and air quality degradation
(Mukherjee, Denney, Sabrin, & Laird, 2020).

The strong positive correlation between incineration and perceived health risks underscores the urgent need for stricter emission control measures in Calabar South LGA. To mitigate these risks, policymakers should enforce stricter air quality regulations, promote the use of advanced incineration technologies (such as high-efficiency filters and scrubbers), and explore alternative waste management strategies. Sustainable waste reduction methods, such as composting, recycling, and waste-to-energy technologies with lower emissions, should be prioritized. Additionally, public awareness campaigns and environmental health monitoring programs can help communities understand and reduce exposure to incineration-related hazards.

H_{O4}

The Pearson correlation analysis indicates a moderate positive relationship between the reuse/recycle waste management method and perceived health implications among residents of Calabar South Local Government Area ($r = .510$, $p < .05$). Since the computed r-value exceeds the critical value (0.138), the null hypothesis is rejected. This finding suggests that while recycling and reuse are widely recognized as environmentally sustainable waste management strategies, their implementation in the study area may be associated with certain health risks. A possible explanation for this relationship is the improper handling of recyclable materials. In many developing countries, informal recycling is common, with waste pickers and households engaging in sorting and repurposing materials without adequate protective measures (Wilson, Velis, & Cheeseman, 2006). Exposure to contaminated waste, including hazardous materials such as medical waste, industrial byproducts, and improperly disposed chemicals, may contribute to health concerns such as skin infections, respiratory issues, and gastrointestinal diseases (Medina, 2010).

Furthermore, inadequate waste sorting systems and a lack of regulatory oversight can increase exposure to biological and chemical hazards. Poorly managed recycling facilities may lack

proper sanitation, ventilation, or protective equipment for workers, increasing the risks of disease transmission and toxic exposure (Gidarakos, Havas, & Ntzamilis, 2006). Additionally, prolonged contact with waste materials, particularly plastics and electronic waste, may expose individuals to heavy metals, microplastics, and other hazardous substances, which have been linked to adverse health effects (Schmidt, 2020). The moderate positive correlation between recycling/reuse practices and perceived health risks underscores the need for improved waste management policies. While recycling and reuse remain vital components of sustainable waste management, they must be accompanied by proper regulations, safe handling practices, and public awareness initiatives to minimize associated risks. Government agencies should implement stricter waste segregation policies, provide protective equipment for waste handlers, and invest in modern recycling facilities with appropriate health and safety measures. Furthermore, public education campaigns on safe recycling practices can help reduce health risks while maximizing the environmental benefits of waste reduction strategies.

Conclusions

The findings of this study indicate a significant relationship between various waste management strategies—open dumping, sanitary landfill, incineration, and reuse/recycling—and the perceived health implications among residents of Calabar South Local Government Area. The results suggest that open dumping and incineration have stronger associations with negative health outcomes, likely due to exposure to pollutants, toxins, and disease-carrying vectors. Similarly, while sanitary landfills and recycling are often considered more sustainable alternatives, poor management and inadequate safety measures may still pose health risks to the local population. These findings highlight the urgent need for improved waste management policies, infrastructure, and public awareness to mitigate health hazards and promote environmental sustainability.

Recommendations

1. Strengthening Waste Management Policies: Government agencies should enforce stricter regulations on waste disposal, ensuring proper waste segregation and monitoring of landfill sites to minimize environmental and health risks.
2. Enhancing Waste Treatment Technologies: Modernizing incineration facilities with advanced filtration systems can help reduce harmful emissions, while better landfill management can prevent groundwater contamination.
3. Promoting Community Awareness and Participation: Public education campaigns should be implemented to encourage proper waste disposal practices, the use of protective measures, and community-led recycling initiatives.

4. Investing in Sustainable Waste Solutions: The government and private sector should collaborate to establish well-regulated recycling and composting facilities to reduce dependence on open dumping and incineration.
5. Improving Waste Collection Services: Regular and efficient waste collection services should be provided to prevent illegal dumping and reduce the accumulation of waste in residential areas.
6. Encouraging Research and Innovation: Further studies should explore alternative waste management methods that are environmentally friendly and economically feasible, ensuring long-term health benefits for residents.

By implementing these recommendations, policymakers and stakeholders can enhance waste management systems, reduce health risks, and promote a cleaner and healthier environment for the residents of Calabar South Local Government Area.

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