

AN ANALYSIS OF THE EFFECTS OF TOURIST NON-SELECTIVE DUMPING OF REFUSE ON HOUSEHOLD HEALTH EXPENDITURE IN ADAMAWA STATE, NIGERIA

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ABSTRACT

This study examined the effects of tourist non-selective dumping of refuse on household health expenditure in Adamawa State, Nigeria. A mixed-method research design was adopted, combining quantitative and qualitative approaches. Multi-stage sampling technique was used to select 400 households from three local government areas (Yola North, Yola South, and Madagali) in Adamawa State. Data were collected through structured questionnaires administered using mobile-based KoboToolKit, complemented by 24 in-depth interviews with household heads and community stakeholders. Quantitative data were analysed using descriptive statistics and spatial regression analysis, while qualitative data were subjected to thematic analysis. The results showed that tourist non-selective dumping of refuse is prevalent in the study area, with 91.1% of respondents aware of the practice and 48.7% living within 500 metres of a dumping site. Malaria (81.7%), typhoid fever (51.8%), diarrhoea (42.9%), and cholera (22.5%) were the most reported health conditions among households. Households spent an average of ₦12,450 monthly on health, with 34.6% incurring additional expenditures of ₦5,000–₦10,000 due to waste-related illnesses. Spatial regression analysis revealed a statistically significant positive relationship between proximity to dumping sites and household health expenditure ($\beta = 0.342$, $p < 0.01$), with households within 500 metres of a dumping site spending an average of ₦8,450 more per month on health than those living beyond 1 km. Socioeconomic factors significantly mediated the relationship between refuse dumping and household health expenditure, with income ($\beta = -0.412$, $p < 0.01$) and education ($\beta = -0.286$, $p < 0.01$) significantly reducing health expenditure, while household size ($\beta = 0.324$, $p < 0.01$) and age ($\beta = 0.134$, $p < 0.05$) increased it. Environmental effects were severe, with drainage blockage (52.4% very severe) and water contamination (46.1% very severe) being the most reported. All four null hypotheses tested were rejected, confirming that tourist non-selective dumping of refuse has significant effects on household health, health expenditure, and the environment. Based on the findings, it was recommended that government should strengthen environmental laws and enforcement, invest in modern waste management infrastructure, integrate waste management into tourism development policies, and implement social protection programs for vulnerable households. Community-based waste management initiatives, public awareness campaigns, and sustainable practices by tour operators were also recommended.

Keywords: Tourist waste dumping, Household health expenditure, Environmental degradation, Public health, Adamawa State, Nigeria



1. INTRODUCTION

1.1 Background to the Study

Tourism is a significant contributor to global plastic waste, with the sector demanding approximately 400 million tons of plastic products annually (UNEP, 2020; WWF, 2010). This has substantial implications for waste management systems worldwide. Efficient waste management is crucial for environmental and societal well-being. When waste is managed properly, it often goes unnoticed, but when neglected, it can harm public health, economies, and the environment (Rodic & Wilson, 2017).

The issue is globally significant, affecting the realisation of Sustainable Development Goals (SDGs), especially those linked to health, sanitation, and the environment (Niyobuhungiro & Schenck, 2020). While both developed and developing countries face waste management challenges, they are more pronounced in developing countries, notably in Africa, commonly attributed to rapid urbanization, migration, informal settlements, changing waste behaviours, and limited resources (Godfrey et al., 2019). This is evident in the low waste collection rates of only 48% in urban areas and 26% in rural regions of developing nations, contrasting sharply with developed regions where 90% of waste is collected (Kaza et al., 2018; Godfrey et al., 2019).

In Nigeria, Nigerians consume approximately 60 million sachets of 'pure water' daily (Vanguard, 2021), and plastic bottles, food containers, and polythene bags have become a daily routine for millions of Nigerians, including tourists. Tourist indiscriminate waste dumping in tourist centres is one of the major challenges confronting waste management in Africa, particularly Nigeria, mainly due to lapses in the enforcement of environmental laws and insufficient infrastructure. Nigeria generates about 32 million metric tonnes of waste annually, with a 2.4% growth rate and a daily per capita waste generation of around 0.51 kg (World Bank, 2023), with over 70% improperly disposed of (Sechoala et al., 2023). This waste is projected to rise to 107 million tonnes by 2050 (World Bank, 2023).

Tourist non-selective refuse dumping in tourist centres is common in virtually all states in Nigeria, including Adamawa State (Olorunlana & Ogunade, 2022; Joshua & Glanda, 2016). The state exemplifies the complexities of waste management in developing countries. Its rich cultural diversity and natural resources coexist with challenges like inadequate waste facilities, limited sanitation access, and population growth. These factors, coupled with socioeconomic disparities and environmental pressures, contribute to indiscriminate refuse dumping (Wilfred et al., 2020).

The consequences of indiscriminate dumping are profound, leading to water and soil contamination, habitat disruption, and disease vectors (Olorunlana & Ogunade, 2022; Okechukwu et al., 2012). In a resource-constrained state like Adamawa State, these

environmental and health issues translate into a significant financial burden for households, including medical expenses, lost productivity due to illness, and property damage repairs. This economic strain exacerbates healthcare inequalities and strains limited healthcare infrastructure, highlighting the interconnectedness of socioeconomic factors and refuse dumping.

1.2 Statement of the Problem

Tourism activities have contributed enormously to the improper disposal of trash, raw sewage, and toxic chemicals into the environment, posing a significant and widespread environmental challenge in numerous areas of Adamawa State. This haphazard disposal of solid waste raises substantial concerns about its profound impact on public health and the financial well-being of households. The issue takes various forms, including random dumping of waste in urban and rural areas, unlawful disposal of refuse in water bodies, and unregulated abandonment of hazardous materials.

While most households struggle to meet basic necessities such as food, shelter, and clothing, poor waste management and tourist non-selective refuse dumping in tourist sites/centres in Adamawa State are likely to worsen their conditions by causing health problems, including malaria, typhoid, and cholera outbreaks. These health issues, in turn, lead to increased household health spending and reduced productivity, with average and low-income earners being disproportionately affected.

Several pressing issues central to this research inquiry demand thorough exploration. First, the health implications of tourist non-selective dumping are significant but inadequately understood. Second, the economic burden resulting from household health expenditure due to illnesses linked to tourist non-selective refuse dumping remains poorly quantified. Third, it is crucial to investigate potential socioeconomic disparities in vulnerability and coping mechanisms. Furthermore, environmental degradation resulting from refuse dumping, including soil degradation, habitat disruption, and water contamination, is a well-documented concern, yet a comprehensive evaluation of the extent of these environmental impacts and their potential repercussions on public health and healthcare costs is essential.

1.3 Research Objectives

The main objective of the study is to investigate and analyse the effects of tourist dumping of refuse in tourist sites/centres on household health expenditure in Adamawa State, Nigeria. The specific objectives are:

1. To assess the health consequences of tourist non-selective dumping of refuse on households in Adamawa State.
2. To quantify the economic impact of tourist non-selective refuse dumping on household health expenditure related to illnesses and injuries.
3. To explore the role of socioeconomic factors in mediating the relationship between refuse dumping and household health expenditure.

4. To evaluate the environmental effects of non-selective refuse dumping, with a focus on soil degradation, habitat disruption, drainage blockage, and water contamination.

1.4 Research Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

- **H₀₁:** Tourist non-selective dumping of refuse has no significant effect on the health of households in Adamawa State.
- **H₀₂:** Tourist non-selective dumping of refuse has no significant effect on household health expenditure in Adamawa State.
- **H₀₃:** Socioeconomic factors do not significantly mediate the relationship between refuse dumping and household health expenditure.
- **H₀₄:** Non-selective refuse dumping has no significant environmental effects in Adamawa State.

1.5 Significance of the Study

This study holds significant importance on multiple fronts. It will enhance public health by providing critical insights into the complex relationship between waste management practices and the health of residents. The study aims to inform evidence-based interventions that can lead to improved public health outcomes. Additionally, communities in Adamawa State are at the forefront of the tourist non-selective dumping issue, directly affected by its consequences. This research will provide communities with knowledge and awareness regarding the health and financial risks associated with improper waste disposal practices.

1.6 Scope of the Study

The study covers Adamawa State, located in northeastern Nigeria, with a population of approximately 4,902,100 people (2022 projection) occupying a land area of 39,940 square kilometres. The state shares borders with Cameroon, Borno, Gombe, and Taraba States and has Yola as its capital and largest city. The study focused on three local government areas: Yola North, Yola South, and Madagali, selected based on the presence of tourist sites including the Sukur World Heritage Site, Yola Zoo, and Yola Museum.

2. LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 Tourist and Tourism Waste

A tourist is a voluntary, temporary traveller, travelling in the expectation of pleasure from novelty and change experienced on a relatively long and non-recurrent round-trip (Cohen, 1974). Tourist activities lead to massive piles of waste, old house items, or used products dumped by tourists in non-selective dumping sites. This trend is on the rise and is increasingly becoming a problem because it hinders the objective of keeping the environment clean and can seriously impact wildlife and habitats. According to environmental protection agencies, this malpractice is referred to as illegal dumping and is considered unlawful because of the harm it causes to the environment.

2.1.2 Waste Management

Waste management is a global challenge of increasing concern to all nations (Olorunlana & Ogunade, 2022). It encompasses materials with little to no economic value, often posing harm to both human health and the environment, necessitating proper disposal. Waste includes materials discharged at various stages of daily life, exerting adverse effects on human well-being and the environment (Okeniyi & Anwan, 2012). It encompasses unusable materials generated during raw material extraction, processing, product consumption, and other human activities (Ozoh et al., 2021).

Dede (2006) categorizes waste by composition, distinguishing organic and biodegradable waste, non-biodegradable waste, solid waste, liquid waste, gaseous waste, and regulated medical waste. Domestic waste, originating from households, comprises organic residues from food preparation, ashes, rags, nylons, and other by-products.

2.1.3 Health and Economic Implications of Waste Dumping

Environmental contamination stemming from poor waste management includes heavy metal pollution in water, soil, and plants due to uncontrolled waste disposal and emissions of pollutants like CO, CO₂, SO, NO, PM₁₀, and others from open waste burning (Vongdala et al., 2019; Wiedinmyer et al., 2014). It results in visual impacts, air pollution, odours, greenhouse gas emissions, disease vectors, and surface and groundwater pollution, impacting communities globally (Ferronato & Torretta, 2019). Indiscriminate dumping of waste is common, compounding environmental and public health hazards (Ogedengbe & Oyedele, 2006).

2.2 Empirical Review

Solid waste management (SWM) is an integral component of urban governance and public health in both developed and developing societies. Effective SWM systems play a pivotal role in maintaining healthy ecosystems and safeguarding the well-being of communities. However, there are several difficulties associated with waste material creation, disposal, collection, transport, and processing, especially among developing nations.

Okechukwu et al. (2012) in Ghana evaluated the knowledge, attitudes, and practices of households and communities towards waste disposal and its associated health implications, showing that 82.8% of surveyed households dump their refuse in refuse dumps and open gutters, while only 7.6% resort to open areas and a mere 0.8% burn their waste. Similarly, Omang et al. (2021) found in Cross River State that indiscriminate refuse dumping is associated with

incidences of cholera (18.2%), malaria (47.2%), Lassa fever (10.7%), and diarrhoea (23.9%), with malaria emerging as the most prevalent infection.

Ogundele et al. (2018) in Ibadan found specific health outcomes resulting from poor waste disposal including diseases such as watery stools, typhoid, skin infections, vomiting, sore throat, and abdominal pains, establishing the link between improper waste generation and management and adverse health effects. Olorunlana and Ogunade (2022) found that various methods were employed for solid waste disposal, including open dumpsites, drainage and street dumping, disposal into streams and river channels, nearby bush dumping, burning, and excavation by waste management authorities. These were found to result in health concerns including infectious diseases, airborne diseases, the creation of breeding grounds for disease vectors, and contamination of food and water sources.

Several studies have contributed to our understanding of waste management and disposal in Adamawa State. Edan et al. (2014) utilized advanced technologies to map solid waste disposal sites in Jimeta, revealing the prevalence of open dumping and its detrimental impact on the region, including recurrent floods. Zarma (2017) examined the solid waste collection system in Jimeta, highlighting the inadequacy of waste collection methods despite significant waste generation. Joshua and Glanda (2016) focused on slum areas in Jimeta-Yola, emphasizing the role of proper waste management in enhancing living conditions. Abba et al. (2019) explored the energy potential of municipal solid waste in Yola, providing insights into waste composition. Jahknwa et al. (2019) investigated challenges and prospects of sustainable waste management in Jimeta Metropolis, uncovering health risks associated with haphazard waste dumps. Wilfred et al. (2020) studied the environmental impacts of solid waste landfilling in Yola North Local Government Area, revealing extensive adverse effects on residents. Medugu et al. (2022) highlighted issues in the Barama environment of Lokuwa Ward, Mubi, including indiscriminate dumping due to the absence of an official refuse dump.

2.3 Research Gap

The existing body of research on waste management and disposal in Adamawa State has offered valuable insights into various facets of this critical issue. However, a significant research gap remains unaddressed, which pertains to the complex and multifaceted impact of tourist non-selective refuse dumping on household health expenditure in the state. While prior studies have touched upon aspects like waste generation, composition, management, and environmental consequences, they have not conducted an exhaustive investigation into the economic burdens placed upon households due to improper waste disposal practices. This research gap underscores the need for a comprehensive study that scrutinizes the financial implications of indiscriminate refuse dumping, encompassing components such as medical expenses, productivity losses, property damage costs, and the mediating role of socioeconomic factors.

2.4 Theoretical Framework

The study draws upon several relevant theoretical frameworks. The Health Belief Model (HBM) provides insightful information on how people think about and make decisions related to health hazards brought on by incorrect waste disposal. It elucidates how households in Adamawa State

may assess the severity of health consequences, perceive the benefits of preventive actions, and consider barriers to health-protective behaviours.

In addition, the Social Determinants of Health framework offers an important contextual perspective by highlighting the impact of social, economic, and environmental determinants on health outcomes. This framework underscores the role of income, education, housing, and environmental conditions in shaping households' vulnerability to health risks and their capacity to manage health-related expenditures. Collectively, these theories offer a comprehensive understanding of the intricate dynamics between refuse dumping, health behaviours, and household health expenditure in Adamawa State.

3. METHODOLOGY

3.1 Research Design

This study employed a mixed-method research design to holistically investigate the impact of indiscriminate dumping of refuse on household health expenditure in Adamawa State, Nigeria. The choice of a mixed-method approach is well-suited to this research question, as it recognizes the multidimensional nature of the issue and aims to capture a rich tapestry of data that quantitative or qualitative methods alone would struggle to elucidate.

3.1.1 Quantitative Method

The quantitative aspect of the research involved structured questionnaires administered to selected households. This component yielded numerical data that were analysed statistically. The questionnaires gathered essential information on household demographics, health-related expenditures, and the incidence of illnesses linked to refuse dumping.

3.1.2 Qualitative Method

Complementing the quantitative component, the qualitative phase involved in-depth interviews with a subset of households. These interviews delved deeper into the lived experiences, perceptions, and narratives of the participants regarding the impact of indiscriminate refuse dumping on their health and household finances.

3.2 Study Area

Adamawa State, located in northeastern Nigeria, has a population of approximately 4,902,100 people (2022 projection) occupying a land area of 39,940 square kilometres. The state shares borders with Cameroon, Borno, Gombe, and Taraba States and has Yola as its capital and largest city. The economy is predominantly agrarian, focusing on crop cultivation and livestock farming. The study covered three local government areas: Yola North, Yola South, and Madagali, selected based on the presence of tourist sites.

3.3 Sampling Technique

The study employed a multi-stage sampling approach:

Stage 1: Selection of Local Governments – Purposive selection of three local governments based on the intensity of tourist sites: Sukur World Heritage Site (Madagali), Yola Zoo (Yola North), and Yola Museum (Yola South).

Stage 2: Selection of Wards – Two tourist sites each were selected from Yola North, Yola South, and Gulak wards from Madagali Local Government. The selection was based on criteria such as the intensity of economic activities and population density.

Stage 3: Household Selection – Random selection of 25 households situated in close proximity to tourist refuse dumping sites within each of the selected wards using systematic random sampling.

3.4 Sample Size

The sample size of 400 households was determined using Taro Yamane's formula based on the projected population of 682,700 (National Population Commission, 2023):

Where n = sample size, N = total population, e = error margin (0.05).

Table 1: Sample Size Distribution

LGAs	Total No. of Wards	No. of Wards Selected	Projected Population	Sample per Ward	Total Sample
Yola North	11	6	307,900	25	150
Yola South	11	6	233,600	25	150
Madagali	10	4	141,200	25	100
Total	32	16	682,700		400

Source: Designed by the Researcher (2025)

3.5 Data Collection

Data collection instruments were designed for both quantitative and qualitative data. Quantitative data were collected using structured questionnaires administered to selected households. Qualitative insights were gathered through in-depth interviews. An innovative mobile-based tool, KoboToolKit (Kobocollect), was utilized for data collection, offering advantages such as environmental sustainability, efficiency, accuracy, cost-effectiveness, and instant data transmission.

3.6 Method of Data Analysis

Quantitative data were analysed using descriptive statistics (mean, median, mode, standard deviation, skewness, kurtosis) and spatial regression analysis. Exploratory data analysis techniques including graphs, charts, and diagrams were used to visually represent the data. Spatial regression analysis allowed for the examination of the relationship between tourist non-selective refuse dumping and health expenditure while controlling for other variables.

Qualitative data were subjected to thematic analysis, which involved carefully reviewing and coding qualitative data to identify recurring themes or patterns related to the research objectives.

4. RESULTS AND FINDINGS

4.1 Response Rate

A total of 400 structured questionnaires were administered, out of which 382 were properly filled and returned, representing a response rate of 95.5%. Additionally, 24 in-depth interviews were conducted with household heads and community stakeholders.

Table 4.1: Questionnaire Distribution and Response Rate

Local Government Area	Distributed	Returned	Response Rate (%)
Yola North	150	145	96.7
Yola South	150	142	94.7
Madagali	100	95	95.0
Total	400	382	95.5

Source: Field Survey, 2024

4.2 Demographic Characteristics of Respondents

Table 4.2: Demographic Characteristics of Respondents (n = 382)

Variable	Category	Frequency	Percentage (%)
Gender	Male	198	51.8
	Female	184	48.2
Age	18–30 years	112	29.3
	31–45 years	148	38.7

	46–60 years	89	23.3
	Above 60 years	33	8.6
Marital Status	Single	64	16.8
	Married	246	64.4
	Divorced/Separated	38	9.9
	Widowed	34	8.9
Educational Qualification	No formal education	72	18.8
	Primary	98	25.7
	Secondary	124	32.5
	Tertiary	88	23.0
Occupation	Farming	118	30.9
	Trading/Business	96	25.1
	Civil Service	64	16.8
	Artisan	58	15.2
	Others	46	12.0
Household Size	1–3 persons	86	22.5
	4–6 persons	174	45.5
	7–9 persons	92	24.1
	10+ persons	30	7.9
Monthly Income	Below ₦30,000	128	33.5
	₦30,000–₦60,000	142	37.2
	₦61,000–₦100,000	78	20.4
	Above ₦100,000	34	8.9

Source: Field Survey, 2024

The results show that 51.8% of respondents were male, while 48.2% were female. The majority (38.7%) were within the age bracket of 31–45 years. In terms of marital status, 64.4% were married. Regarding educational qualifications, 32.5% had secondary education, 25.7% had primary education, 23.0% had tertiary education, and 18.8% had no formal education. Occupation-wise, farming (30.9%) and trading/business (25.1%) were the predominant livelihoods. Household sizes of 4–6 persons were most common (45.5%), and 33.5% of respondents earned below ₦30,000 monthly.

4.3 Prevalence of Tourist Non-Selective Dumping

Table 4.3: Awareness and Observation of Tourist Non-Selective Dumping

Item	Frequency	Percentage (%)
Awareness of tourist dumping		
Yes	348	91.1
No	34	8.9
Proximity to dumping site		
Less than 500 metres	186	48.7
500 metres–1 km	124	32.5
Above 1 km	72	18.8
Frequency of observation		
Daily	214	56.0
Weekly	108	28.3
Occasionally	60	15.7
Types of waste commonly dumped		
Plastic/polyethylene bags	342	89.5
Food waste	298	78.0
Bottles and cans	276	72.3
Sewage/toxic chemicals	164	42.9
Others	98	25.7

Source: Field Survey, 2024

The results indicate that 91.1% of respondents were aware of tourist non-selective dumping in their areas. Nearly half (48.7%) lived within 500 metres of a dumping site, and 56.0% observed dumping activities daily. Plastic/polyethylene bags (89.5%), food waste (78.0%), and bottles/cans (72.3%) were the most commonly dumped waste types, while 42.9% reported sewage and toxic chemicals.

4.4 Health Consequences of Tourist Non-Selective Dumping

Table 4.4: Reported Health Conditions Among Household Members (n = 382)

Health Condition	Frequency	Percentage (%)
Malaria	312	81.7
Typhoid fever	198	51.8
Diarrhoea	164	42.9
Cholera	86	22.5
Respiratory infections	142	37.2
Skin infections	108	28.3
Lassa fever	42	11.0
Others	64	16.8

Source: Field Survey, 2024

Note: Multiple responses were allowed.

Malaria was the most reported health condition (81.7%), followed by typhoid fever (51.8%), diarrhoea (42.9%), respiratory infections (37.2%), skin infections (28.3%), cholera (22.5%), and Lassa fever (11.0%).

Table 4.5: Perceived Link Between Health Conditions and Refuse Dumping

Response	Frequency	Percentage (%)
Strongly agree	186	48.7
Agree	124	32.5
Disagree	48	12.6
Strongly disagree	24	6.3
Total	382	100.0

Source: Field Survey, 2024

The results show that 81.2% of respondents perceived a link between their health conditions and refuse dumping in their environment.

4.5 Economic Impact on Household Health Expenditure

Table 4.6: Monthly Household Health Expenditure (n = 382)

Expenditure Range (₦)	Frequency	Percentage (%)
Below 5,000	74	19.4
5,000–10,000	118	30.9
10,001–20,000	102	26.7
20,001–30,000	56	14.7
Above 30,000	32	8.4
Total	382	100.0

Source: Field Survey, 2024

Table 4.7: Additional Health Expenditure Due to Waste-Related Illnesses

Response	Frequency	Percentage (%)
Below ₦5,000	86	22.5
₦5,000–₦10,000	132	34.6
₦10,001–₦20,000	98	25.7
Above ₦20,000	66	17.3
Total	382	100.0

Source: Field Survey, 2024

The findings reveal that 34.6% of households incurred additional health expenditures of ₦5,000–₦10,000 due to waste-related illnesses, while 25.7% spent ₦10,001–₦20,000, and 17.3% spent above ₦20,000. Spatial regression showed a statistically significant positive relationship between proximity to dumping sites and household health expenditure ($\beta = 0.342$, $p < 0.01$). Households within 500 metres of a dumping site spent an average of ₦8,450 more per month on health than those living beyond 1 km.

4.6 Role of Socioeconomic Factors

Table 4.8: Regression Results for Socioeconomic Factors and Health Expenditure

Variable	Coefficient (β)	Std. Error	t-value	p-value
Income	-0.412	0.078	-5.28	0.000
Education	-0.286	0.092	-3.11	0.002
Age	0.134	0.064	2.09	0.037
Gender (Male=1)	0.098	0.112	0.88	0.381
Marital Status	0.156	0.088	1.77	0.077
Household Size	0.324	0.071	4.56	0.000
Proximity to Dumpsite	0.342	0.083	4.12	0.000
Constant	12,450	1,230	10.12	0.000
$R^2 = 0.612$	Adjusted $R^2 = 0.598$	$F = 42.36$		

Note: $p < 0.05$; $p < 0.01$

The regression results show that income ($\beta = -0.412$, $p < 0.01$) and education ($\beta = -0.286$, $p < 0.01$) had significant negative relationships with health expenditure. Household size ($\beta = 0.324$, $p < 0.01$) and proximity to dumpsite ($\beta = 0.342$, $p < 0.01$) had significant positive relationships. Age was also positively associated with health expenditure ($\beta = 0.134$, $p < 0.05$). Gender and marital status were not statistically significant predictors. The R^2 value of 0.612 indicates that the model explains 61.2% of the variance in household health expenditure.

4.7 Environmental Effects of Non-Selective Refuse Dumping

Table 4.9: Perceived Environmental Effects of Refuse Dumping

Environmental Effect	Very Severe (%)	Severe (%)	Moderate (%)	Mild (%)	Not Severe (%)
Soil degradation	42.9	28.3	16.8	7.6	4.4
Habitat disruption	38.7	30.9	18.8	7.9	3.7

Drainage blockage	52.4	26.7	12.6	5.2	3.1
Water contamination	46.1	29.8	14.7	6.3	3.1

Source: Field Survey, 2024

Drainage blockage (52.4% very severe) and water contamination (46.1% very severe) were the most severe environmental effects reported. Soil degradation (42.9% very severe) and habitat disruption (38.7% very severe) were also significant.

4.8 Test of Hypotheses

Table 4.10: Summary of Hypothesis Testing

Hypothesis	Test Statistic	p-value	Decision
H ₁ : Dumping → Health	Chi-square = 48.62	0.000	Rejected
H ₂ : Dumping → Health Expenditure	t = 4.12	0.000	Rejected
H ₃ : Socioeconomic Mediation	F = 42.36	0.000	Rejected
H ₄ : Dumping → Environmental Effects	Chi-square = 56.78	0.000	Rejected

Source: Field Survey, 2024

All four null hypotheses were rejected, indicating that tourist non-selective dumping of refuse has significant effects on household health, health expenditure, and the environment, and that socioeconomic factors significantly mediate the relationship between dumping and health expenditure.

4.9 Qualitative Findings

Qualitative findings from in-depth interviews corroborated the quantitative results. A 42-year-old female respondent in Yola North stated:

"During the rainy season, the waste from the dumping site near the market flows into our compound. My children often suffer from malaria and diarrhoea. We spend money on drugs almost every month."

Another respondent in Madagali noted:

"The smell from the refuse dump attracts mosquitoes and flies. We have recorded cases of cholera in this community twice in the last two years."

A 38-year-old male respondent in Yola South remarked:

"I earn about ₦40,000 monthly. Last month, I spent ₦15,000 treating my wife and two children for typhoid. This is affecting our feeding and school fees."

A community leader in Madagali stated:

"The drainage system is always blocked during the rainy season because of the waste. This causes flooding, and the water carries refuse into our homes. Our wells are contaminated."

5. DISCUSSION OF FINDINGS

The findings of this study reveal a strong association between tourist non-selective dumping of refuse and adverse health outcomes among households in Adamawa State. Malaria, typhoid fever, diarrhoea, and cholera were the most reported health conditions, consistent with the studies of Omang et al. (2021), Ogundele et al. (2018), and Olorunlana and Ogunade (2022). The high prevalence of these diseases can be attributed to the breeding of disease vectors and contamination of water sources by indiscriminate waste disposal.

The economic burden of waste-related illnesses on households was substantial. The finding that households near dumping sites spent an average of ₦8,450 more per month on health than those farther away corroborates the assertion of Wilfred et al. (2020) that indiscriminate dumping imposes significant economic costs. The fact that 33.5% of respondents earned below ₦30,000 monthly while 23.1% spent above ₦20,000 on health highlights the disproportionate burden on low-income households.

The mediating role of socioeconomic factors, particularly income and education, is consistent with the Social Determinants of Health framework. Higher income and education levels were associated with lower health expenditures, suggesting that these factors enhance households' capacity to adopt preventive measures and access quality healthcare. This finding aligns with the Health Belief Model, which posits that individuals' health behaviours are influenced by their perceptions of susceptibility, severity, benefits, and barriers.

The environmental effects of refuse dumping, particularly drainage blockage and water contamination, were severe. This finding supports the work of Edan et al. (2014), who reported recurrent floods in Jimeta due to open dumping, and Medugu et al. (2022), who documented indiscriminate dumping in Mubi. The implication is that poor waste management not only affects health but also undermines environmental sustainability and agricultural productivity.

6. CONCLUSION

This study has provided empirical evidence that tourist non-selective dumping of refuse in Adamawa State has significant negative effects on household health, health expenditure, and the environment. The findings underscore the urgent need for a holistic and integrated approach to waste management that addresses the root causes of indiscriminate dumping, protects public health, and reduces the economic burden on households.

The study concludes that:

1. Tourist non-selective dumping of refuse in Adamawa State is a pervasive environmental and public health challenge that significantly affects households in the vicinity of tourist sites and dumping grounds.
2. The health consequences of tourist non-selective dumping are profound, with high incidences of malaria, typhoid fever, diarrhoea, cholera, and respiratory infections reported among affected households.
3. The economic burden of waste-related illnesses on households is substantial, with those living closer to dumping sites bearing a disproportionate share of the burden.
4. Socioeconomic factors such as income, education, age, and household size play a critical mediating role in the relationship between refuse dumping and household health expenditure.
5. The environmental effects of tourist non-selective dumping are severe and far-reaching, including drainage blockage, water contamination, soil degradation, and habitat disruption.

7. RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are made:

7.1 For Government and Policymakers

1. The Adamawa State Government should review and strengthen existing environmental laws to impose stricter penalties for indiscriminate dumping of refuse. Enforcement agencies should be adequately funded and empowered to monitor and sanction violators.
2. The government should invest in modern waste management infrastructure, including the establishment of properly designed sanitary landfills, recycling facilities, and waste-to-energy plants.
3. Government should encourage public-private partnerships in waste management to leverage private sector expertise, innovation, and resources.
4. Policymakers should integrate waste management considerations into tourism development policies. Tour operators and hospitality businesses should be mandated to adopt sustainable waste disposal practices.
5. The government should strengthen the healthcare system in Adamawa State to effectively respond to waste-related diseases.
6. Given the significant economic burden of waste-related illnesses on low-income households, the government should consider implementing social protection programs, such as health insurance subsidies and cash transfers.

7.2 For Communities and Households

1. Communities should be encouraged to take an active role in waste management through the formation of community-based waste management committees.
2. There is a need for sustained public awareness campaigns to educate residents on the health and environmental risks of indiscriminate dumping.
3. Households should adopt preventive health measures to reduce their vulnerability to waste-related diseases.
4. Communities should be actively involved in decision-making processes related to waste management.

7.3 For Tour Operators and the Hospitality Industry

1. Tour operators and hospitality businesses should adopt sustainable waste management practices, including waste segregation, recycling, composting, and proper disposal of hazardous materials.
2. Tour operators should provide environmental education to tourists, emphasizing the importance of responsible waste disposal.
3. Tour operators and hospitality businesses should collaborate with local communities and waste management authorities to develop and implement waste management plans.

7.4 For Non-Governmental Organizations and Development Partners

1. NGOs and development partners should provide technical and financial support for community-based waste management projects.
2. NGOs and development partners should support research on the health, economic, and environmental impacts of indiscriminate waste disposal.
3. NGOs and development partners should invest in capacity building for local government officials, community leaders, and waste management practitioners.

8. ACKNOWLEDGEMENTS



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