



## ORIGINAL RESEARCH

## Health Exposure and Environmental Challenges of Households Living Nearby an Open Landfill System in Nigerian Urban Centre

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### Abstract

**Aim:** Urbanization and poor town planning have contributed to large waste generation, poor management, and landfill are sited close to the living environment; hence, high health risk. The study assessed households living near open landfills' health-related exposure and environmental challenges.

**Methods:** The cross-sectional descriptive study was conducted among households living within a radius of 250m (Category A) and 500m (Category B) from the landfill based on the World Health Organization (WHO) criteria. The survey identified 122 and 137 households, and one adult was randomly selected to represent each household, resulting in 259 respondents (Category A = 122, Category B = 137). Data was collected through a designed questionnaire and analyzed through descriptive (frequency counts and percentage) and Inferential (Chi-square) statistics.

**Result:** The survey outcome revealed that respondents at both radius have health history of sickness such as malaria (42.6%, 42.3%), skin infection/irritation (13.9%, 24.1%), cholera and diarrhea (21.3%, 13.9%), asthma (12.3%, 5.8%), pneumonia (9.8%, 10.2%), and cancer (-, 3.6%). Individuals within both radii of 250-500m had health symptoms such as skin infection/irritation, nausea, and feverish cold; however, eye irritation, sore throat, diarrhea, and abdominal pain were peculiar symptoms with those within a radius of 250 m (category A). The statistical analysis indicated that households within 250m-500m from the landfills faced similar environmental issues such as littering of the environment, air and water pollution, bad odour, smoke from burning, dust, and infestation of disease-carrying organisms; however, differences in landfill impact on the environment and noise pollution.

**Conclusion:** Households living nearby landfill areas are at higher risk of health and environmental challenges; however, these risk reduces as households stay farther away (far beyond 500 m) from landfill areas.

### Keywords

Landfill, Health Risk, Public Health, Environmental Health, Dumpsite

### Introduction

As indicated by the report of World Health, 23 percent of mortalities and 26 percent of children mortalities among approximately 4 million children in the last 5 years are connected to environmental factors [1,2]. Similarly, among 102 groups of disease and morbidities, 85 are linked to related environmental factors [3]. The close connectivity between human and their environment influence the quality of life, wellness, and longevity, and if the environment is unhealthy, all components of the environment are potentially at risk [4]. Nigeria's environment is continuously witnessing various challenges due to unsustainable development in urban areas and lack of development in rural areas leading to a high migration rate into urban areas; hence, increasing the never-ending environmental challenges [2,5]. Such environmental challenges include air pollution, water pollution, municipal solid waste management (MSWM), urban poverty, deforestation, desertification, wind erosion, and flooding.



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MSWM specifically, can be linked to many of the urban environmental challenges, and it is due to increase population, poor town planning, urbanization, and inadequate resources [6,7]. Furthermore, a lack of proper waste management has led to an impact on the surrounding soil, water, air, and health [8-11]; hence, concerns for public health. Another concern is that many waste collection systems are open landfills, commonly called Dumpsites, located around the living environment. This situation, in many cases, is linked to urbanization pressure, while some are sited for easy drop-off. Irrespective of the causes, there are human health-related concerns in this regard, and several studies have indicated concerns for the well-being of those living near dumpsites [12-16].

There is a need to recognize waste management as vital for global sustainable development, and the Sustainable Development Goals (SDGs) will be unattainable unless the waste management issue is duly addressed [17]. Furthermore, Elsheekh, et al. [18] noted that an integrated approach toward solid waste management is capable of supporting the achievement of SDGs and catalyst to many specific targeted goals, while according to [19], "the environmentally sound management of waste touches on many vital aspects of development. All of these imply the need for alternative waste disposal and management in developing cities of Nigeria. Therefore, this study aimed to assess the health-related exposure and environmental challenges to households living nearby open landfill systems with a focus on the households' health history and related symptoms, perceived environmental issues, and the impact of the landfill on their life satisfaction and supporting mechanisms.

## Materials and Methods

### Research design and study population

The cross-sectional descriptive study was conducted among the households living nearby an open landfill system in the Aluu community of Obio-Akpor Local Government Area of Rivers State, Nigeria. The community shares boundaries with the University of Port Harcourt campus, providing accommodation to many students, business owners, and indigenes. The study population consists of households (residents) living within a radius of 250m (Category A) and 500m (Category B) from the landfill based on the WHO criteria [1]. Based on the WHO criteria, a reconnaissance survey was conducted around the landfill to ascertain the number of households and other functional institutions (businesses, schools, and religious places) found within the radius of categories A and B. The survey identified 122 and 137 households within categories A and B, with an average of 4 persons per household. One person (Adult) was randomly selected to represent each household, resulting in 259 respondents (Category A =

122, Category B = 137).

### Research instrument

The questionnaire was designed based on reviewed literature and past related studies, pre-tested outside the study, and returned with a correlation coefficient of 0.7, indicating the response's consistency. The questionnaire used the Likert 4 points scale, open-ended and closed-ended format, and was sectioned into four (4); Section A: Socio-demographic details, including age, sex, marital status, education, occupation, household income, and length of residence. Section B: Household health history and symptoms among households. Section C: Environmental issues faced by households living nearby landfill. Section D: Life satisfaction and supporting mechanism impact of the landfill on nearby households.

### Data analysis

The filled questionnaires were coded using MS Excel and later transferred into the Data entry of the Statistical Package for Social Sciences (SPSS version 21). The study adopted descriptive statistics such as frequency counts and percentages and inferential statistics (chi-square) to test the differences between household responses in categories A and B.

### Ethical consideration

The study provided written consent on the first page of the questionnaire, which expresses the study's purpose and seeks the individual's permission to participate or decline.

## Result

### Socio-Demographic details

The socio-demographic details of the respondents from category A (250m radius of the landfill) and category B (500m radius of the landfill) were presented in Figure 1. As indicated, most respondents were male (57.40%) and (60.60%) for categories A and B, respectively. Most respondents are within the age range of 30-40 (37.71%) for category A and 18-29 (59.85%) for category B, with both having majorly secondary level education (49.18%, 39.42%). The survey observed that most respondents from both groups earn monthly income ranging from 50,000-80,000 NGN, while respondents in category A have been the residence of the location for about 9-12 years (30.58%), and category B has most respondents' years of residency for about 5-7 years (43.07%). Regarding the primary occupation, the category A respondents primarily engage in a professional occupation (32.79%), while category B mainly engages in a manual/partly skilled occupation (37.96%).

### Households health history and symptoms

For category A respondents, the most common sickness based on the survey was malaria (52-42.6%),

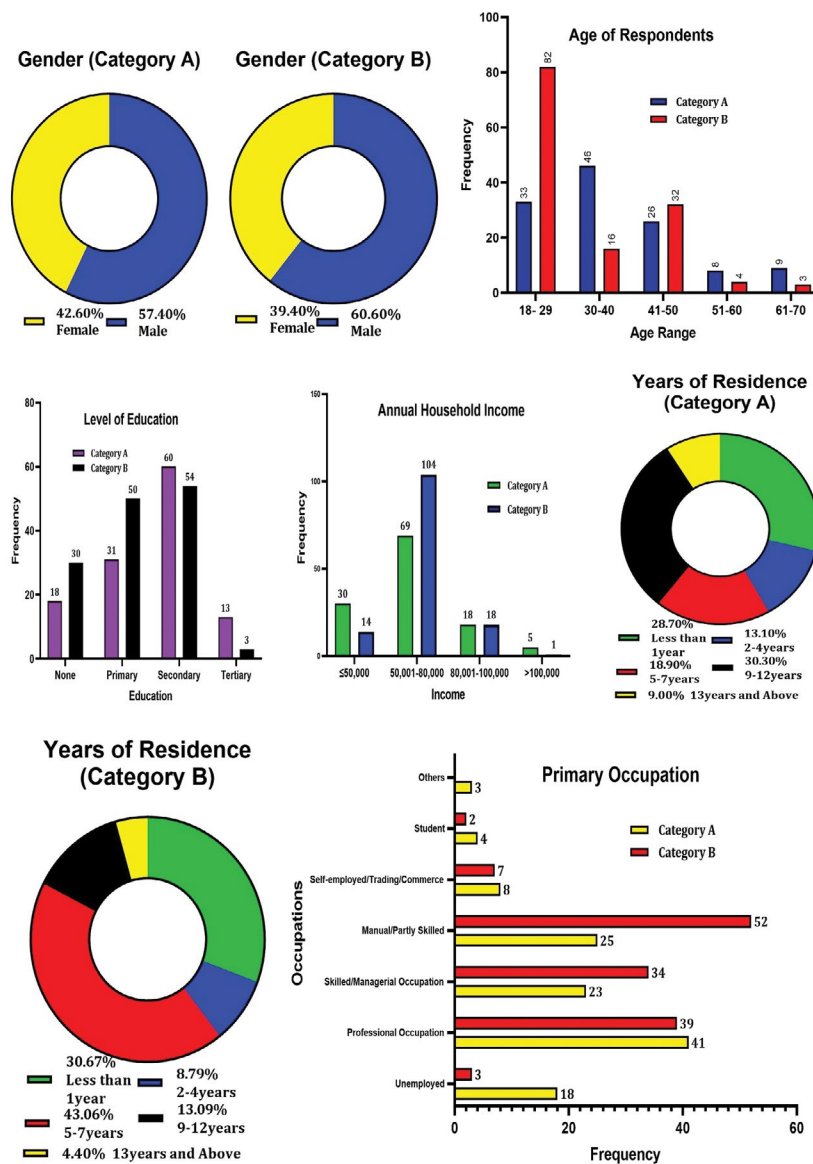


Figure 1: Socio-Demographic details of the category A and B respondents.

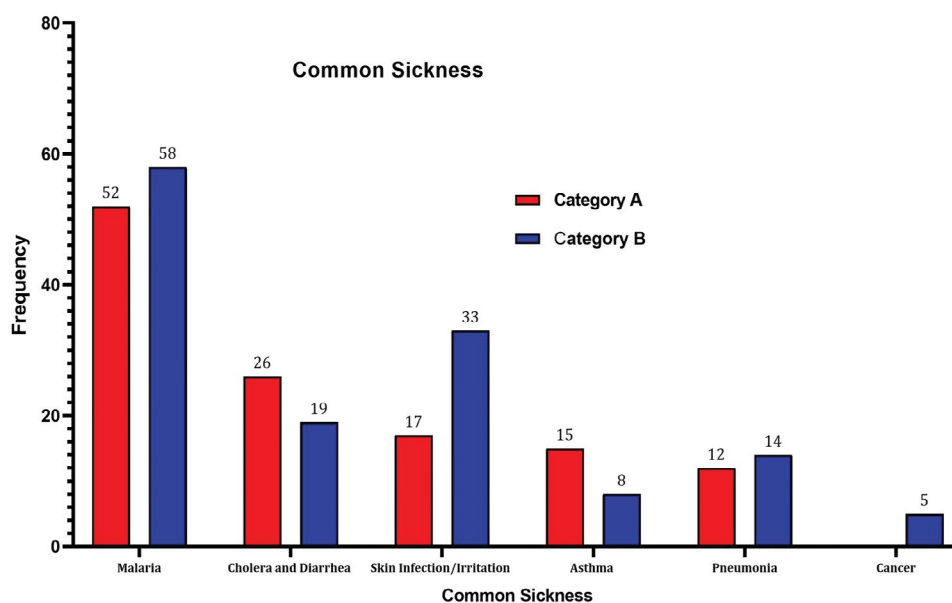


Figure 2: Common sickness among category A and B respondents.

followed by cholera and diarrhea (26-21.3%), skin infection/irritation (17-13.9%), asthma (15-12.30%), and pneumonia (12-9.8%). Similarly, malaria (58-42.3%) was observed to be the most common sickness among category B households, which is followed by skin infection/irritation (33-24.1%), cholera and diarrhea (19-13.9%), Pneumonia (14-10.2%), Asthma (8-5.8%) and cancer (5-3.6%) as shown in [Figure 2](#).

[Table 1](#) shows household health history and symptoms. All respondents from both categories agreed that health-related impact is associated with an open landfill system (69.7%, 75.9%), leading to regular health challenges (66.4%, 83.2%). Regarding health symptoms, the respondents in category A agreed to health symptoms such as eye irritation (77.1%), skin irritation/infection (68%), nausea (76.2%), feverish cold (70.5%), sore throat (63.1%), diarrhea (65.6%), and abdominal pain (66.4%). In contrast, the respondents in category B revealed that health symptoms such as eye irritation (60.6%), sore throat (59.9%), diarrhea (61.3%), and abdominal pain (62.1%) are not perceived to be shared among them. Furthermore, there was no statistically significant difference in the health history and symptoms among respondents of both categories (where  $p\text{-value} > 0.05$ ) except for diarrhea ( $p\text{-value} 0.053 \leq 0.05$ ) and abdominal pain ( $p\text{-value} 0.002 \leq 0.05$ ), as indicated in [Table 2](#).

### Environmental issue

Considering the environmental issue surrounding the open landfill system in [Table 3](#), the respondents of both categories observed that the landfill impact on the environment is fairly severe (47-38.5%, 43-31.4%). The category A respondents suggested that the garbage and littering of the environment due to landfill is fairly severe (49-40.2%), while the category B respondents perceived such issue to be severe (64-46.7%). The respondents from both categories noted that air pollution, foul odour, and smoke from burning are severe (55-45.1%, 52-38%)

environmental issues. However, environmental issues such as water and noise pollution were perceived to be less severe among respondents of categories A (40-32.8%, 37-30.3%) and B (114-83.2%, 63-46%). Dust was observed to be a severe environmental issue among respondents of category A (42-34.4%) and less severe among category B (46-33.6%), while an infestation of disease-carrying organisms such as rats, cockroaches, bedbugs, and mosquitos was noted to be a severe environmental issue among both categories (43-35.2%, 38-27.7%). There were no statistically significant differences among environmental issues such as littering of the environment, air and water pollution, foul odour, smoke from burning, dust, and infestation of disease-carrying organisms among the categories ( $p\text{-value} 0.000, 0.003, 0.000, 0.009$  and  $0.015 \leq 0.05$ ); however, environmental issues such as landfill impact on the environment and noise pollution revealed a statistically significant difference (where  $p\text{-value} 0.551, 0.247 > 0.005$ ) as shown in [Table 3](#).

### Life satisfaction and supporting mechanism impact

[Table 2](#) presents the survey outcome on the life satisfaction and supporting mechanism impact due to the nearness of the landfill system. Respondents from both categories revealed "fair concerns" for fear of the household's future health and well-being (48-39.3%, 57-41.6%), little opportunity for income generation due to the landfill (50-41%, 64-46.7%), difficulty in selling a property because of the location (44-36.1%, 53-38.7%), renting of properties made difficult due to closeness of the landfill (45-36.9%, 57-41.6%), desirable business enterprise staying away (49-40.1%, 49-35.8%), infestation by disease-carrying organisms (57-46.7%, 66-48.2%), and air and water pollution being a challenging issue (56-45.9%, 77-56.2%). There were no statistically significant differences among life satisfaction and supporting mechanism impacts such as fear of the household's future health and well-being, little opportunity for income generation due

**Table 1:** Households health history and symptoms.

Households Health History and Symptoms	Frequency (%) Category A		Frequency (%) Category B		Significant (p-value)
	Yes	No	Yes	No	
Health impact associated with open landfill system	85 (69.7)	37 (30.3)	104 (75.9)	33 (24.1)	0.489
Regular health challenges	81 (66.4)	41 (33.6)	114 (83.2)	23 (16.8)	0.464
Eye Irritation	94 (77.1)	28 (22.9)	54 (39.4)	83 (60.6)	0.082
Skin Infection/Irritation	83 (68)	39 (32)	107 (78.1)	30 (21.9)	0.183
Nausea	93 (76.2)	29 (23.8)	112 (81.8)	25 (18.2)	0.701
Feverish Cold	86 (70.5)	36 (29.5)	84 (61.3)	53 (38.7)	0.767
Sore Throat	77 (63.1)	45 (36.9)	55 (40.1)	82 (59.9)	0.1
Diarrhea	80 (65.6)	42 (34.4)	25 (18.2)	84 (61.3)	0.053*
Abdominal Pain	81 (66.4)	41 (33.6)	52 (38.0)	85 (62.1)	0.002*

Chi-square test, \*no statistically significant  $< 0.05$ .

**Table 2:** Life satisfaction and supporting mechanism impact.

Life Satisfaction and Supporting Mechanism Impact	Frequency (%) Category A						Frequency (%) Category B						Significant (p-value)				
	C		FC		LC		NC		C		FC			LC		NC	
Fear of the household's future health and well-being	32 (26.2)	48 (39.3)	10 (8.2)	32 (26.2)	10 (7.3)	57 (41.6)	25 (18.2)	45 (32.8)	0.006*								
Little opportunity for income generation due to the landfill	42 (34.4)	50 (41)	12 (9.8)	18 (14.8)	60 (43.8)	64 (46.7)	3 (2.2)	10 (7.3)	0.011*								
Difficulty in selling property because of the location	26 (21.3)	44 (36.1)	23 (18.9)	29 (23.8)	28 (20.4)	53 (38.7)	27 (19.7)	29 (21.2)	0.022*								
Renting of properties made difficult due to the closeness of the landfill	28 (23)	45 (36.9)	31 (25.4)	18 (14.8)	37 (27)	57 (41.6)	30 (21.9)	13 (9.5)	0.186								
Desirable business enterprises staying away	16 (13.1)	49 (40.1)	13 (10.7)	44 (36.1)	20 (14.6)	49 (35.8)	38 (27.7)	30 (21.9)	0.022*								
Infestation by disease-carrying organisms, e.g., rats, cockroaches, bedbugs, and mosquitos, make life difficult.	14 (11.5)	57 (46.7)	13 (10.7)	38 (31.1)	8 (5.8)	66 (48.2)	38 (27.7)	25 (18.2)	0.108								
Air and water pollution is challenging	36 (29.5)	56 (45.9)	13 (10.7)	17 (13.9)	28 (20.4)	77 (56.2)	6 (4.4)	26 (19)	0.230								

Chi-square test, \*no statistically significant < 0.05.

**Table 3:** Environmental issue around the landfill system.

Environmental Issue	Frequency (%) Category A						Frequency (%) Category B						Significant (p-value)				
	S		FS		LS		NS		S		FS			LS		NS	
Landfill impact on the environment	31 (25.4)	47 (38.5)	11 (9)	33 (27)	48 (35)	43 (31.4)	20 (14.6)	26 (19)	0.551								
Garbage and littering of the environment due to landfill	28 (23)	49 (40.2)	10 (8.2)	35 (28.7)	64 (46.7)	21 (15.3)	49 (35.8)	3 (2.2)	0.000*								
Air pollution, foul odour, smoke from burning	55 (45.1)	42 (34.4)	3 (2.5)	22 (18)	52 (38)	39 (28.5)	14 (10.2)	32 (23.4)	0.003*								
Water pollution	30 (24.6)	34 (27.9)	40 (32.8)	18 (14.8)	13 (9.5)	10 (7.3)	114 (83.2)	-	0.000*								
Noise Pollution	28 (23)	33 (27)	37 (30.3)	24 (19.7)	24 (17.5)	17 (12.4)	63 (46)	33 (24.1)	0.247								
Dust	42 (34.4)	28 (23)	30 (24.6)	22 (18)	33 (24.1)	23 (16.8)	46 (33.6)	35 (25.5)	0.009*								
Infestation of disease-carrying organisms, e.g., rats, cockroaches, bedbugs, mosquitos.	43 (35.2)	34 (27.9)	19 (15.6)	26 (21.3)	38 (27.7)	34 (24.8)	29 (21.2)	36 (26.3)	0.015*								

Chi-square test, \*no statistically significant < 0.05.

to the landfill, difficulty in selling property because of the location, and desirable business enterprise staying away among the categories ( $p$ -value 0.006, 0.011, 0.022 and  $0.022 \leq 0.05$ ); however, impacts such as renting of properties made difficult due to closeness of the landfill, infestation by disease-carrying organisms and air and water pollution being challenging revealed a statistically significant difference (where  $p$ -value 0.186, 0.108 and  $0.230 > 0.005$ ) as shown in [Table 2](#).

## Discussion

The survey outcome revealed that respondents in both radii have a health history of sicknesses such as malaria, skin infection/irritation, cholera and diarrhea, asthma, pneumonia, and cancer. The outcome corroborated with the assessment of WHO [20], which highlighted a wide range of health issues related to exposure to landfill. There was a similarity with the report of malaria, cholera and skin infection [6], cancer [14], asthma and respiratory issues [21] among individuals living nearby landfill sites. The study indicated that individuals within a radius of 250-500m had health symptoms such as skin infection/irritation, nausea, and feverish cold; however, eye irritation, sore throat, diarrhea, and abdominal pain were peculiar symptoms with those within a radius of 250m (category A). Ogundele, et al. [12] reported that symptoms such as skin infection/irritation, diarrhea, and abdominal pain could be due to water contamination. Symptoms such as sore throat [7], eye irritation [14], and nausea and diarrhea [22] were reported in similar studies. Respondents from both radii agreed that landfill nearness is associated with health impact, and they regularly face health challenges. The finding shared a similar view with other studies, which indicated that individuals living nearby landfill (500 m-1 km) have higher chances of health-related issues than those farther from such sites [23-25].

Households from both categories suggested that environmental issues such as air pollution, foul odour, smoke from burning, and infestation of disease-carrying organisms such as rats, cockroaches, bedbugs, and mosquitos are severe in their environment. Also, landfill impact on the environment is fairly severe, while water and noise pollution was perceived to be less severe. Garbage and littering of the environment due to landfill was perceived to be fairly severe (within 250 m and severe (within 500 m), and dust was observed to be severe environmental issues among category A and less severe among category B respondents. Rao [26] suggested that landfill sites are breeding grounds for many disease-carrying organisms and can impact human health [6]. In addition, studies have indicated that poor waste management can lead to surface and groundwater contamination [27], air pollution [28] soil contamination [29], and health risk [30]. The statistical analysis indicated that households within 250 m-500 m from the landfills faced similar environmental issues such

as littering of the environment, air and water pollution, foul odour, smoke from burning, dust, and infestation of disease-carrying organisms; however, differences in landfill impact on the environment and noise pollution. The outcome confirmed the position of [6], which indicated that the severity of health and environmental impact reduces as individuals move farther away from landfill areas. Also, this further corroborated the suggestion of individuals staying about 2 km away from landfill areas [1].

All the households across the 250 m-500 m radius showed fair concerns about the landfill's impact on their life satisfaction and supporting mechanism. However, the households showed no statistically significant difference in landfill impacts to four (4) life satisfaction and supporting mechanism variables; this includes fear of the household's future health and well-being, little opportunity for income generation due to the landfill, difficulty in selling property because of the location, and desirable business enterprise staying away among the categories. A similar outcome was reported by Ogundele, et al. [12] and Njoku, et al. [14] regarding the health, environment, and external challenges posed by living nearby landfill areas. However, households showed a statistically significant difference in landfill impacts to three (3) life satisfaction and supporting mechanisms; that is, renting properties made difficult due to the closeness of the landfill, infestation by disease-carrying organisms, and air and water pollution being challenging. This indicates that specific attributes change or differ the more household farther away from landfill areas.

## Conclusion

Waste management remains a challenging issue for many developing cities, affecting the well-being of households and the surrounding environment. Several experimental studies have established many issues ranging from pollution to risk of health challenges of various forms. Through a cross-sectional survey, this present study assessed household perceptions about living nearby landfill areas and its impact on their health, environment, and life satisfaction. The study concluded that households living nearby landfill areas are at higher risk of health and environmental challenges, and life satisfaction and support mechanism could be significantly affected; however, these risk reduces as households stay farther away (beyond 500 m) from landfill areas. Therefore, landfill should be sited far beyond the living environment, and environmentally sustainable practices should be considered during the establishment of a landfill.

## Statement of Authors' Contribution

All authors equally contributed to the research development of this manuscript, and they have read and agreed to the published version of the manuscript.

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