

Perception of residents and workers toward the environmental health effects of a dumpsite in Solous Igando, Lagos, Nigeria

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ABSTRACT

Dumpsites are an ideal breeding ground for disease vectors such as rats and mosquitoes, which may channel severe health issues to the nearby residents and dumpsite workers. The present study aimed to assess the effects of waste disposal at a dumpsite on the surrounding human settlements and health of the workers. In this descriptive study, the data were collected from the households within the 0-3 km radius to the dumpsite, as well as the dumpsite workers using structured questionnaires. In total, 150 respondents from the human settlements around the dumpsite participated in the study, including 61 dumpsite workers. Test of independence indicated a significant correlation between the perception of the dumpsite workers and community dwellers toward the dumpsite as a source of health-deteriorating agents ($\chi^2 [1; n=211]=14.00; P=0.001$). Dumpsite odor, insect and rodent infestation, and burning activities could predict the ill health status of the dumpsite workers with the final predictive model (ill health status= $0.439 + [0.645*\text{odor of dumpsite}] + [0.106*\text{insect and rodent infestation}] + [-0.151*\text{burning activities on dumpsite}]$; $F[3,57]=21.70; P<0.05$). According to the results, the human settlements in the vicinity of the dumpsite were discontented with the landfill and its adverse health effects (e.g., malaria, typhoid, skin infection). However, the dumpsite workers disagreed with the viewpoint regarding disease contraction from the dumpsite, stating that they were not dissatisfied with working in the dumpsite.

Keywords: Community, Dumpsite, Health, Infestation, Vectors

Introduction

The words rubbish, garbage, trash, and refuse are often used synonymously in the discussions regarding solid waste.¹ According to Moeller,² sources of solid waste are of various types, such as residential waste, and industrial, commercial, institutional, agriculture, municipal services. Modernization, technological advancement, and global population growth have increased the demand for food and other essentials, which have, in turn, resulted in the higher rate of daily waste generation by households.³

Effective and sustainable solid waste management is becoming a burgeoning issue for national and local governments due to the rapid increase in the volume and types of solid and hazardous wastes as a result of continuous economic growth, urbanization, and industrialization.⁴ Furthermore, the rate of consumption continues to increase domestic waste generation worldwide. As such, solid waste management has become increasingly difficult, which involves the systematic control of the generation, storage, collection, transportation, separation, processing, recovery, and disposal of solid wastes.⁵

According to Scheinberg,⁶ developing countries are faced with monumental challenges in proper waste management, and tremendous efforts are made to reduce the final waste volumes and generate sufficient funds

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for waste management. In the major cities of Nigeria, the disposal of solid wastes within the past few decades has caused major environmental and public health issues as the majority of open dumpsites that were initially located on the outskirts are now in the heart of these cities due to urbanization and migration.⁷

The residents living in the vicinity of municipal solid waste (MSW) landfills may be exposed to the pollutants emitted by the plants or contaminated soil and water.⁸ These residents have displayed concern about several hazardous pollutants produced by landfill operations.⁹ Some of these pollutants have been linked to waste dumping on landfills, such as litter, dust, excess rodents, and unexpected landfill fires.¹⁰ In addition, the influential factors in the by-products or emissions of landfills include the quantity, type, and nature of the deposited wastes, age of the landfill, and climatic conditions of landfill sites.¹¹

Waste decomposition into constituent chemicals is a source of local environmental pollution. The leachate emanating from dumpsites is another concern in this regard, and liquid leachate management varies throughout the landfills of developing countries, which poses a threat to local surface and ground water systems.¹² The foul odor and litter blown by wind from dumpsites have also been regarded as important environmental concerns.

Continuous inhalation of toxic fumes and dust along with exposure to the chemicals emitted from landfill sites cause severe health issues,¹¹ which mostly affect the dwellers living in the vicinity of these sites as investigated in several studies.^{13, 14} These residents have been reported to suffer from a wide range of medical conditions, such as asthma, malaria, cough, cuts, reoccurring flu, cholera, stomach pain, diarrhea, skin irritation, and tuberculosis more frequently than those living far from landfill sites.^{15, 16} Some of these diseases are transmitted by the vectors that breed on dumpsites.

It is essential to determine the nature of the contaminants, route of exposure, duration

and distribution of exposure, individual susceptibility to hazardous chemicals, and levels of individual exposure to properly evaluate the health impacts of landfills.¹⁷ A study in this regard was conducted near Poland's largest municipal waste site, revealing that psychological, digestive tract, respiratory, and allergic complaints may be associated with the waste site.¹⁸

The present study aimed to assess the effects of the disposed wastes at a dumpsite on the surrounding human settlements and health of the workers in Solous dumpsite located in Igando, Alimosho Local Government Area, Lagos, Nigeria.

Materials and Methods

Description of the study area and context

The targeted population of the current research consisted of the workers of Solous dumpsite, which is located within the longitude of 3°26 E-3°25 E and latitude of 6°56N-6°57N in the Ikotun/Igando Local Council Development Area of Alimosho Local Government in Lagos State, Nigeria and the residents within the 0-3-km radius of the dumpsite (Fig. 1).

Study population

The study population included 320 residents living in the vicinity of Solous dumpsite and 100 workers in the dumpsite. The subjects were selected via a random sampling as it was virtually impossible to assess the entire population due to time and cost constraints. However, the samples had to be representative of the population from which they were selected. In order to determine the sample size, 5% significance level was considered. The sample size was derived using Yamane¹⁶ formula (Eq. 1), as follows:

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

where n is the sample size, N shows the study population, e is the significance level/error estimate at 5%, and 1 represents the constant.

The following equation was considered for the residents dwelling in the vicinity of the dumpsite:

For residents dwelling around the dumpsite

$$n = \frac{320}{1 + 320 (0.05)^2} = \frac{320}{1 + 0.8} = \frac{320}{1.8} = 177$$

For Workers on Dumpsite

$$n = \frac{100}{1 + 100 (0.05)^2} = \frac{100}{1.25} = 80$$

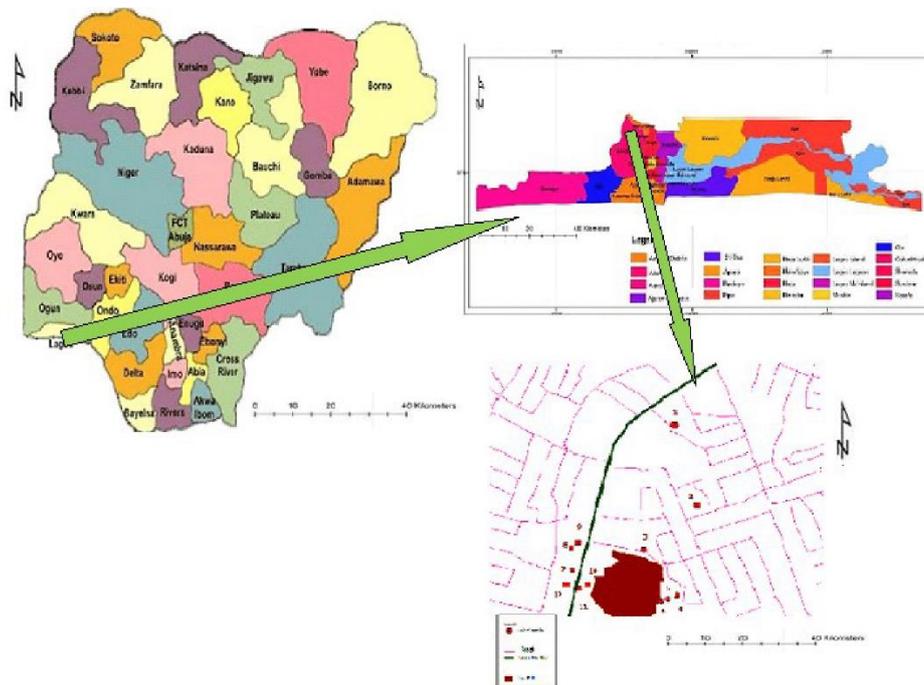


Fig. 1. Map of sites where questionnaires were administered (extracted from Alimosho Local Government, Lagos, Nigeria; location of Solous dumpsite)

Data collection

Data were collected using a structured questionnaire, which was self-generated and structured into two sections of sociodemographic data and perceptions of the dumpsite hazards.

Reliability of the instrument

The reliability of the instrument was determined using the Cronbach's alpha reliability test for the section regarding the perception on the dumpsite hazards in SPSS version 22.

Statistical analysis

Data analysis was performed in SPSS version 22 using descriptive and inferential statistics with focus on the major research questions in order to determine the results. In addition, Chi-square was used to assess the generated response regarding the perception of the workers and residents about the dumpsite as a source of health-deteriorating agents

($P < 0.05$). Multiple regression analysis was also carried out, with the health status considered as the dependent variable and burning, odor, and rodent infestation in the dumpsites as the explanatory variables with the significance level of $P < 0.05$.

Results and Discussion

In total, 177 questionnaires were distributed among the residents living around the dumpsite, and 80 questionnaires were distributed among the dumpsite workers, with 157 questionnaires returned by the residents and 150 completed properly. As for the workers, 66 questionnaires were returned, and five questionnaires were not completed properly.

According to the information in Table 1, 53.3% of the respondents living in the vicinity of the dumpsite were male, and 46.7% were female. In terms of age, 17.3% of the respondents were aged 18-25 years, 43.3% were aged 26-35 years, 26.7% were aged 36-

50 years, and 12.7% were aged 51 years or more. Among the respondents, 37.3% lived within less than 1 km of the dumpsite, while 62.7% lived within 1-3 km from the dumpsite.

Table 1. Sociodemographic data of respondents living near dumpsite (n=150)

Variables	Frequency	Percentage (%)
Gender		
Male	80	53.3
Female	70	46.7
Age		
18-25	26	17.3
26-35	65	43.3
36-50	40	26.7
51 and above	19	12.7
Marital status		
Single	58	38.7
Married	92	61.3
Divorced	-	-
Widow	-	-
Living duration		
<5 years	33	22
5-10 years	74	49.3
>10 years	43	28.7
Housing status		
Tenant	119	79.3
Owner	31	20.7
Educational qualification		
Primary	17	11.3
Secondary	104	69.3
Tertiary	27	18
No formal education	2	1.3
Employment status		
Employed	31	20.7
Self-employed	102	68
Unemployed	17	11.3
Distance of house from dumpsite		
<1 km	56	37.3
1-3 km	94	62.7

According to the information in Table 2, 86.9% of the respondents who worked in the dumpsite were male, and 13.1% were female. In addition, 19.7% of these respondents were aged 18-25 years, 42.6% were within the age range of 26-35 years, 21.3% were aged 36-50 years, and 16.4% were aged 51 years or more.

Table 3 shows the perception of the respondents living near the dumpsite at the Cronbach's alpha of 0.749, indicating that 99.3% acknowledged the possibility of disease

contraction from the dumpsite, while 98.7% perceived odor from the dumpsite, and 84% of these individuals considered the odor to be unbearable. Among the respondents, 97.3% believed that the dumpsite odor might adversely affect their health. Malaria was the major sickness experienced by 98% of the respondents, while 67% stated that they experienced typhoid, and 56% reported the contamination of underground water.

Table 2. Sociodemographic data of respondents working on dumpsite (n=61)

	Frequency	Percentage (%)
Gender		
Male	53	86.9
Female	8	13.1
Age		
18-25	12	19.7
26-35	26	42.6
36-50	13	21.3
51 and above	10	16.4
Marital status		
Single	23	37.7
Married	38	62.3
Divorced	-	-
Widow	-	-
Job experience		
<5 years	32	22
5-10 years	18	49.3
>10 years	11	28.7
Educational qualification		
Primary	17	27.9
Secondary	24	39.3
Tertiary	14	23
No formal education	16	9.8
Employment status		
Employed	48	78.7
Self-employed	13	21.3
Unemployed	-	-

Table 4 shows the responses of the dumpsite workers at the Cronbach's alpha of 0.826, with 77% stating that they may contract diseases from the dumpsite. In addition, 72.1% believed that the perceived odor from the dumpsite could cause diseases, while 77% of the respondents rarely contracted diseases. Malaria was reported to be the most common disease experienced by the respondents, while 45.9% also reported musculoskeletal disorders.

Table 3. Perception of respondents on hazards of living near dumpsite

	Frequency	Percentage (%)
Do you know you could contact sickness from dumpsite		
Yes	149	99.3
No	1	0.7
Perceive any odor from the dumpsite		
Yes	148	98.7
No	2	1.3
Perceived odor can be classified as		
Bearable	9	6
Unbearable	141	94
Dumpsite odor has a negative impact on health		
Yes	146	97.3
No	4	2.7
Sickness experience living around here		
Malaria	147	98
Typhoid	101	67.3
Cholera & diarrhoea	6	4
Lassa fever	1	0.7
Skin infection	2	1.3
Insects and rodents from dumpsite can transmit diseases		
Yes	135	90
No	15	10

Research hypothesis testing and analysis
Testing of hypothesis one

H₀: There is no significant difference in the perception of the workers and residents that a dumpsite is a source of health-deteriorating agents.

In the present study, the Chi-square test of independence was performed to assess the correlation between the perception of the dumpsite workers and community dwellers on dumpsite as a source of health-deteriorating agents (Table 5). According to the findings, the

correlation between these variables was significant ($\chi^2 [1; n=211]=14.00; P=0.001$); therefore, H₁ was confirmed, and H₀ was rejected.

Table 4. Perception of respondents working on dumpsite on hazards

	Frequency	Percentage (%)
Do you know you could contact sickness from a dumpsite		
Yes	47	77
No	14	23
Perceived odor from dumpsite can cause sickness		
Yes	44	72.1
No	17	27.9
Frequency of sickness		
Always	-	-
Sometimes	9	14.8
Rarely	47	77
Never	5	8.2
Insects and rodents from dumpsite can transmit diseases		
Yes	45	73.8
No	16	26.2
Sickness experience living around here		
Malaria	49	80.3
Typhoid	10	16.4
Cholera & diarrhoea	1	1.6
Lassa fever	1	1.6
Skin infection	8	13.1
Musculo-skeletal issue	28	45.9
Burning on dumpsite can cause sickness		
Yes	37	60.7
No	24	39.3
Type of musculo-skeletal issue experienced		
Wound	19	31.1
Fracture	-	-
Contusion	-	-
Others	1	1.6
None	41	67.3

Table 5. Chi-square tests for hypothesis one

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.002 ^a	1	0.000		
Continuity Correction ^b	12.130	1	0.000		
Likelihood ratio	12.509	1	0.000		
Fisher's exact test				0.000	0.000
N of Valid cases	211				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.78.

b. Computed only for a 2x2 table.

Testing of hypothesis two

H₀: There are no significant differences in a dumpsite odor, insect and rodent infestation,

and burning activities in association with the ill health status of the dumpsite workers.

According to the multiple regression

analysis (Table 6), the odor of the dumpsite, insect and rodent infestation, and burning activities in the dumpsite could significantly explain the variance of ill health status ($F[3,57]=21.70$; $P<0.05$; $R^2=0.53$; $R^2_{Adjusted}=0.51$). Furthermore, the analysis shows that the odor of the dumpsite

significantly contributed to the model ($B=0.645$; $P<0.05$), while no such finding was observed in the case of insect and rodent infestation ($B=0.106$; $P=0.18$) and burning activities in the dumpsite ($B=-0.151$; $P=0.121$).

Table 6. Multiple regression analysis of hypothesis twos

Model	Coefficients	Standard Error	F (3,57)	T-Statics	Significance	R	R-Square	Adjusted R-Square
Constant	0.439	0.196	21.695	2.241	0.029	0.730	0.533	0.509
Odor	0.645	0.085		7.558	0.000			
Insects and rodents	0.106	0.078		1.346	0.183			
Burning	-0.151	0.096		-1.574	0.121			

The results of the regression analysis also indicated that the model explained 53.3% of the variance and was a significant predictor of ill health status ($F[3,57]=21.70$; $P=0.000$). On the other hand, the odor of the dumpsite significantly contributed to the model ($B=0.645$; $P<0.05$), while no such finding was denoted in the case of insect and rodent infestation ($B=0.106$; $P=0.18$) and burning activities in the dumpsite ($B=-0.151$; $P=0.121$). The final predictive model also demonstrated ill health status ($0.439 + [0.645*\text{odor of dumpsite}] + [0.106*\text{insect and rodent infestation}] + [-0.151*\text{burning activities in the dumpsite}]$; $F[3,57]=21.70$; $P<0.05$). As a result, H_1 , which stated that there are significant differences in the dumpsite odor, insect and rodent infestation, and burning activities in regards to the ill health status of the dumpsite workers, was confirmed, while H_0 was rejected.

In a research in this regard, Ohwo¹⁷ stated that the waste left unattended to for a long time caused severe hazards and produced offensive odor, which could lead to significant health challenges to those living near the site. In the present study, 97.3% of the respondents believed that the odor had adversely affected their health, and 59.3% believed this impact to be high. In the studies conducted by Babs-Shomoye and Kabir,⁷ 10.1% of the respondents shared the same view regarding the fact that the negative impact of odor is highly severe. In addition, Palmiotto *et al.*⁹

reported that the residents living near a landfill experienced intense odor annoyance and were concerned about the landfill impacts on their health and environment.

Dumpsite is a means through which disease may be contracted, and 99.3% of the respondents living near the dumpsite in the current research held the same opinion in this regard, while 77% of the dumpsite workers believed in this issue. On the other hand, 98% of the residents and 80.3% of the workers contracted malaria, and 67.3% of the residents and 16.4% of the workers were of the opinion that coupled with malaria, they also experienced typhoid while working in the dumpsite. Furthermore, 13.1% of the respondents working in the dumpsite claimed that they experienced skin infection, and musculoskeletal disorders were reported by 45.9% of the dumpsite workers.

In the current research, 80.3% of the respondents were not bothered by working in a dumpsite, and 77 % stated that they had rarely become sick since they had started working in dumpsite, while 14.8% claimed that they occasionally became ill. In a study by Krajewski *et al.*,¹⁸ workers did not claim any occupation-related illnesses or symptoms.

In the study by Abdou,¹⁹ the major four health problems reported by landfill workers included respiratory infections and/or allergies, eye infections, gastrointestinal tract infections, and musculoskeletal injuries. In addition, a study conducted in Karachi

(Pakistan) indicated the reported ailments to be tuberculosis, gastric problems, respiratory problems, skin infections, and boils.²⁰ In another study, landfill workers had significantly higher prevalence of upper and lower respiratory symptoms and experienced diarrhea, fungal infection, skin ulceration, burning sensation in the extremities, tingling/numbness, transient loss of memory, and depression more frequently.²¹ Another study in Delhi (India) demonstrated that workers of transfer stations, landfills, and incineration plants might be at the higher risk of pulmonary disorders and gastrointestinal problems.²² In the present study, 31.1% of the workers reported wounds as a musculoskeletal problem while working in the dumpsite. In this regard, Abdou¹⁹ ascertained that falling from vehicles was the main cause in 60% of the musculoskeletal problem cases in his study.

According to the results of the present study, the dumpsite odor, insect and rodent infestation, and burning activities had significant correlations with the ill health status of the dumpsite workers and the final predictive model ill health status = $0.439 + (0.645 \times \text{odor from dumpsite}) + (0.106 \times \text{insect and rodent infestation}) + (-0.151 \times \text{burning activities in the dumpsite})$.

Conclusion

Wastes that are not properly managed adversely affect health and the environment. Proper waste management could be a proper employment opportunity and serve as a source of energy generation. According to the results of this study, the human settlements in the vicinity of the dumpsite were discontented with the dumpsite. The reported adverse health effects ranged from malaria to typhoid and skin infection, which were associated with the effluent emanating from the dumpsite. Nevertheless, the dumpsite workers were not bothered by working in the dumpsites; although the majority had worked there for more than five years, they rarely became ill, which could be attributed to the boosting of their immune system over time. They only reported wounds caused by their activities in

the dumpsite.

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Ethical issues

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies were completely observed by the authors.

Authors' Contributions

J. OLU performed the study design, literature review, structuring and development of the questionnaire, data analysis and interpretation, manuscript preparation and edition;

A. IYERE was involved in the study design, questionnaire preparation and administration, and data input.

Conflicts of interest

None declared.

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