INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN 2278 – 0211 (Online)

Factors Influencing Households' Choice of Waste Management Strategies in Lagos State, Nigeria

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Abstract:
The study examined the factors influencing Households' choice of waste management strategies in Lagos State, Nigeria. A multi-stage sampling procedure was used to select respondents for the study. In the first stage, two states (Lagos state and Ogun state) were purposively selected based on their well-organized waste management systems, relatively advanced waste management arrangements and close proximity. In the second stage, three LGAs were purposively selected from Lagos state, while three LGAs were selected in Ogun state considering well-organized waste management systems. In the third stage, a stratified sampling technique was used to select four communities from each LGA into two different strata, namely: high-income and low-income stratum. In the fourth stage, fifteen respondents were selected using a systematic sampling technique. In all, 360 respondents were used for the study.
Primary and secondary data collected from 360 respondents were analyzed using descriptive statistics, multidimensional poverty index, multinomial logit, regression model, contingent valuation and probit regression model. The average age of the household head was 47 years, which implies that the respondents were mostly middle-aged people who were still within their economically active age group. This is expected to positively influence the respondents' decision-making as they would be making sound decisions regarding waste management since they are likely to be more exposed to different health-related information. The result further proves that the majority (51.1%) of the household heads in Lagos and Ogun States were male. The higher percentage of male-headed households in the study area suggests that they were the breadwinners of their respective households. The Multinomial logistic regression result showed that years spent in school, household size, cost of waste disposal, membership of cooperative, biodegradable and transfer payment were the major factors that determine the acceptance of waste management strategies alternatives available in the study area.

Keywords: *Poverty, poverty status and fish farmers*

1. Introduction

Over the years, solid waste management has become the most pressing environmental challenge faced by urban and rural areas of Nigeria (Nwosu & Chukwueloka, 2020). With a population of about 200 million, Nigeria is one of the largest producers of solid waste in Africa (Bakare, 2020). Despite a host of policies and regulations, solid waste management remains challenging. More worrisome is the fact that the situation is assuming alarming proportions with each passing day (Nwosu & Chukwueloka, 2020).

In Nigeria today, illegal dumping of refuse, mostly in industrial and municipal areas, has become a major issue of concern to humans and the environment. Urbanization, overpopulation, and the industrial revolution have become major causes of waste generation and inappropriate disposal methods, especially in urban areas of Nigeria. Human exposure to this unlawful act has triggered more health risks to the populace, which advertently affects the entire livelihood and their major landscape (Ogunniran, 2019).

According to Ogwueleka (2009), solid waste management has emerged as one of the greatest challenges facing States', Local Governments' and Area Councils' Environmental Protection Agencies in Nigeria. Adewumi *et al.* (2005) reported that solid waste generation is an integral part of every human activity in Nigeria, generating 0.58kg of solid waste

per person per day. This enormous volume of generated waste has contributed significantly to hampering national waste management efforts (International Union for the Conservation of Nature 2004). In the best interest of wholesome national development, proper disposal and management have become a top priority for the government at all levels.

1.1. Problem Statement

The fact that successive governments in Nigeria have had to contend at one time or the other with the problem of heaps of un-cleared solid waste in the cities clearly indicates that an appropriate solution is yet to be proposed (Adeniji & Kunle, 1996). Since the populace cannot be stopped from generating waste, an important issue is how to manage the waste being generated so that it will not constitute a health hazard and also meet the aesthetic demand of a decent society (Onibokun, Adedipe & Sridhar, 2000). Various modalities have been adopted to manage the generated waste such that the management is shifted from the state to the local government, to independent management boards and then back to the state (Odewumi, 2002*).* Currently, the approach being experimented upon is Private Sector Participation (PSP), which essentially involves private business people in waste disposal.

An increase in population, income level and urbanization increases the amount of solid waste generation, and if not managed properly, it could create serious negative impacts on human health, the environment and also the economy (Hoornweg & Bhada, 2012). Greater economic prosperity and increases in consumption levels have intensified the problem of solid waste management (SWM) and are now a major challenge in urban areas of developing countries (Japan International Cooperation Agency (JICA), 2005). A significant portion of the municipal budget is spent on SWM in urban areas. However, a rapid increase in population, economic growth and improvement in living standards have resulted in a substantial increase in the amount of solid waste being generated, making SWM even more challenging (Asian Productivity Organization (APO), 2007).

According to Ogwueleka (2009)**,** solid waste management has emerged as one of the greatest challenges facing State and Local Government Environmental Protection Agencies in Nigeria. The volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth. Solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal of solid waste.

Therefore, this study sets out to provide answers to the following research questions:

- What are the relevant socio-economic characteristics of the respondents?
- What is the effect of poverty status on the choice of waste management strategies?

1.2. Objectives of the Study

The specific objectives are to describe the socio-economic characteristics of the respondents (household heads) in the study area and ascertain the effect of poverty status on the choice of waste management strategies.

2. Literature Review

According to the United States Environmental Protection Agency (US-EPA) (2016), solid waste, commonly known as trash or garbage, refuse, or rubbish, is a waste type consisting of everyday items we consume and discard. It predominantly includes food wastes, yard wastes, containers and product packaging, and other miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Waste is solid substances generated as a result of human activities, and, being no longer of value for the respective economic, physiological, or technological process, are removed from it. Solid waste, in a broader sense, is understood as any household, industrial and agricultural materials that have been used up. Examples of organic waste are newspapers, clothing, food scrapes, boxes, disposable tableware, office and classroom paper, furniture, wood pallets, rubber tires, and canteen or cafeteria waste. Solid waste does not include industrial wastes, agricultural wastes, and sewage sludge (US-EPA, 2016 and Indian Council of Agricultural Research (ICAR) (2012)).

3. Methods and Methodology

3.1. The Study Area

The study area is Southwest Nigeria, comprising Lagos, Ogun, Oyo, Osun, Ondo and Ekiti states. It is also known as the Southwest geographical zone of Nigeria. The area lies between longitude 2°31' and 6°00' East and Latitude 6°21' and 8° 37'N (Agboola, 1979) with a total land area of 77,818 KM^2. The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea.

The climate of Southwest Nigeria is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21 and 34°C, while the annual rainfall ranges between 150 and 3000 mm. The wet season is associated with the Southwest monsoon wind from the Atlantic Ocean, while the dry season is associated with the northeast trade wind from the Sahara Desert.

3.2. Sampling Procedure/Sample Size

A multi-stage sampling procedure was used to select respondents for the study. In the first stage, two states (Lagos state and Ogun state) were purposively selected based on their well-organized waste management systems, relatively advanced waste management arrangements and close proximity. In the second stage, three LGAs were purposively selected from Lagos state, while three LGAs were selected in Ogun state considering well-organized waste management systems. In the third stage, a stratified sampling technique was used to select four communities from each

LGA into two different strata, namely: high-income and low-income stratum. In the fourth stage, fifteen respondents were selected using a systematic sampling technique. In all, 360 respondents were used for the study, but this paper article focuses mainly on respondents in Lagos State; hence, 180 respondents were sampled for this paper.

3.3. Source and Method of Data Collection

Primary and Secondary data were collected and used for this study. Primary data were collected through the administration of a well-structured questionnaire, which was administered to respondents in the study area. The questionnaire was used to obtain data on issues such as the socio-economic characteristics of the selected household heads such as age, gender, level of education, household size, marital status, occupation and income. Others are methods of past and present disposal, types of waste generated, and sorting of waste before disposal, among others.

3.4. Descriptive Statistics

Descriptive statistics such as frequency distribution, means and percentages were used to achieve objective one, which is to describe the socio-economic characteristics of the respondents (household heads) and the profile of the waste management strategies used in relation to the poverty status of respondents in the study area.

3.5. Multinomial Logit

Multinomial Logit Regression Model was used to analyze factors influencing households' choice of waste management strategies in Lagos state, Nigeria. Under the multinomial response model, if there are N categories, the probability that a resident will adopt a particular waste disposal strategy is specified thus:

$$P_{ij}= \frac{exp(ijX_i)}{\sum_{j=0}^{3}(\exp(ij\ X_i))} \quad \ldots\ldots (1)$$

P_{ij} = the probability that a resident will use a waste disposal strategy (1, 2, 3, 4)

Where j ranges from 1 to 4, for choice of waste disposal

X_i represents a vector of explanatory variables for the resident's i^{th} with j waste disposal strategy and

β the coefficient of the parameters.

For each explanatory variable, the negative of the sum of its parameters for groups 1 and 2 is the parameter for the reference group. The explicit form of the functions is specified as follows:

$$Pij = \beta_0 + \beta_1 EDU + \beta_2 INC + \beta_3 AGE + \beta_4 POV + \beta_5 GD + \beta_6 SG + \beta_7 HHS + \beta_8 Cost + \beta_9 Freq + \beta_{10} Vol + \beta_{11} Nat + \mu \quad \ldots\ldots (2)$$

Where:

P_{ij}= Choice of waste disposal, which is the dependent variable for the MNL (1, 2, 3, 4). The choices are: 1 = Burying; 2 = Road side; 3 = Cart pusher; and 4 = PSP.

X_i = Vector of factors affecting choice of waste disposal where

X_1 = Poverty headcount (1 = poor and 0, otherwise)

X_2 = Age (in years);

X_3 = Gender (1 = male and 0 = female);

X_4 = Educational Status (years spent in school);

X_5 = Household size (Actual number);

X_6 = Marital Status (Married = 1, otherwise = 0);

X_7 = Cost of waste disposal (Naira);

X_8 = Membership of cooperatives (1 = member and 0 = otherwise);

X_9 = Frequency of disposal (numbers);

X_{10} = Nature of waste generated 1 = biodegradable and 0, otherwise); and)

X_{11} = Transfer pay (Naira)

β_i = Vector of unknown parameters

μ_i = error term

The results that will be obtained from the multinomial logit analysis will ascertain the effect of poverty status on the choice of waste management strategies. It is worth noting that the model would be replaced for the Pool, Lagos and Ogun States data.

4. Results and Discussions

4.1. Socio-economic Characteristics of the Respondents

The result of table 1 revealed that the age of the household head varied between a minimum of 25 years and a maximum of 75 years. The youngest household head was 25 years old, while the oldest was 75 years old. Also, the majority (40.3%) of the household heads were between 41 and 50 years old. The average age of the household head was 47 years, which implies that the respondents were mostly middle-aged people who were still within their economically active age group. Further results indicate that there were more male-headed households (51.1%) than female-headed households (48.9%) in the study area. The distribution of respondents based on gender shows that they are evenly distributed between the two genders, though the male gender dominated the sample. The result further proves that the majority (51.1%) of the household heads in Lagos and Ogun States were male. The higher percentage of male-headed households in the study area suggests that they were the breadwinners of their respective households.

Sex	Frequency	Percentage
Male	148	67.3
Female	72	32.7
Total	220	100.0
Gender	**Frequency**	**Percentage**
Male	92	51.1
Female	88	48.9
Total	180	100.0

Table 1: Distribution of Respondents by Selected Socio-Economic Characteristics
Source: Field Data, 2023

4.2. Factors Influencing Households' Choice of Waste Management Strategies in Lagos State

Multinomial logistic regression result in table 2 showed that the model was statistically significant. The model had a chi-square value of 96.54 and a log-likelihood of -164.8. The possibility that the variations in the dependent variable are not by chance is significant at $P<0.01$, confirming the appropriateness of the specified model.

The poverty status of the respondents only showed a significant effect with the choice of cart pusher and PSP at a probability of 10% levels apiece. This can be interpreted that being poor will increase the probability of choosing a cart pusher and PSP by 9.3% and 10%, respectively. This is expected because most of the poor households might not be able to afford the PSP and the monthly charges, thereby resulting in alternative options that would not cost them. The cart pusher also charges a certain amount, and those poor households that cannot afford it would still consider roadside disposal and burying as their best alternative option. It can be deduced that in Lagos State, especially in underdeveloped areas, people will prefer other alternatives such as burying and roadside disposal to the PSP due to the cost and other challenges faced in the areas.

According to the result, the cost of waste disposal and membership of cooperation increases the likelihood of burying waste in Lagos State. It was revealed that those who experience a high cost of waste disposal are more likely to choose burying as their choice of waste management strategy. Also, respondents who belonged to cooperative organizations were more likely to choose the burying method over any other waste management strategies in Lagos State. Furthermore, household size was the only significant variable that influenced the choice of roadside waste disposal. The marginal effect shows that family size increases the likelihood of cart pushers by 2.2%, implying that those with a large number of households in Lagos State are more likely to choose roadside waste disposal as their choice of waste management strategy. This is because large household sizes will increase waste in the household and also increase the frequency of waste disposal, making the household less likely to pay for waste disposal and opt for the illegal method, which is free.

Cart pusher waste method is influenced by membership of cooperation, poverty headcount and the biodegradable nature of the waste. All these variables will increase the likelihood of choosing the cart pusher waste method by 3.4%, 9.3% and 10%, respectively. The result implies that respondents who are members of the cooperative will choose a cart pusher. Likewise, respondents who are poor will consider cart pushers over any other waste management strategies because of the fair price. In the same vein, those with biodegradable waste will be more likely to choose the cart pusher waste disposal method.

Lastly, years spent in school, membership of cooperation and poverty headcount will increase the likelihood of PSP waste disposal compared to any other waste disposal method in Lagos State. Years spent in school were statistically significant and positive at a 5% to the probability of choosing PSP as a waste management strategy in the study area. The result indicates that an additional year to the household's years of education will increase the likelihood of choosing PSP waste management by a magnitude of 1.5%. The probable reason for the result is that Lagos State is more urbanized and civilized, leading to the sensitization of households in Lagos State. Also, educated households are more knowledgeable about the advantages of PSP waste management strategy. This is similar to the result of Ayuba *et al*. (2013), who argued that level of education is one of the major factors that stimulate the choice of PSP as a waste management strategy.

The coefficient of the biodegradable nature of the waste was a positive and significant factor in the household's choice of using a cart pusher. This implies that households that generate biodegradable waste will more likely patronize cart pushers over other waste management strategies. This could be due to the need to quickly evacuate the waste before it starts decomposing, thereby generating a foul odour. The table also revealed that transfer payment is a significant determinant of the household's choice as regards the subscription to PSP services. This means that the higher the transfer payment, the less likely it will be for the household to subscribe to PSP services.

Choice	Burying		Road Side Disposal		Cart Pusher		PSP	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Poverty Head Count	0.125	0.154	0.492	0.474	0.093*	0.067	0.100*	0.057
Age	-0.004	0.448	-0.002	0.714	-0.003	0.289	-0.003	0.316
Gender	-0.118	0.191	-0.099	0.141	-0.063	0.206	-0.068	0.233
Years spent in School	0.023	0.315	0.021	0.229	0.004	0.742	0.015**	0.027
Household size	0.020	0.624	0.022**	0.044	0.010	0.661	0.008	0.757
Marital status	0.167	0.209	0.116	0.250	0.089	0.209	0.111	0.172
Cost of Waste Disposal	0.001**	0.031	0.001	0.401	-0.001	0.362	-0.001	0.310
Membership of cooperative	0.009*	0.073	0.003	0.119	0.034*	0.082	0.004*	0.061
Frequency of Disposal	-0.088	0.654	-0.077	0.604	-0.103	0.200	-0.032	0.791
Biodegradable	0.133	0.237	0.562	0.523	0.143**	0.022	0.092	0.179
Transfer Payment	-0.001	0.189	-0.020	0.497	-0.001	0.073	-0.001*	0.091
Chi^2:96.54								
Log Likelihood: -164.786								
Pseudo R^2; 0.23								
Prob>chi^2: 0.000								

Table 2: Marginal Effect of Multinomial Logistic Regression Model of Effect of Poverty Status on the Choice of Waste Management Strategies in Lagos State
, ** and * Means Significant at 10%, 5% and 1% Levels, Respectively*

5. Conclusions and Policy Issues

The study showed that the average age of the household head was 47 years, which implies that the respondents were mostly middle-aged people who were still within their economically active age group. This is expected to positively influence the respondents' decision-making as they would be making sound decisions regarding waste management since they are likely to be more exposed to different health-related information. The result further proves that the majority (51.1%) of the household heads in Lagos and Ogun States were male. The higher percentage of male-headed households in the study area suggests that they were the breadwinners of their respective households. The Multinomial logistic regression result showed that years spent in school, household size, cost of waste disposal, membership of cooperative, biodegradable and transfer payment were the major factors that determine the acceptance of waste management strategies alternatives available in the study area. Waste management policy, a proper waste management policy, should be formulated and implemented. This policy should promote new healthy waste disposal methods, like PSP, while phasing out the old and unhealthy methods like open dumping and burning, which still predominate in the study area and most developing countries.

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