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Operations and Patronage of Private Waste Contractors Initiative of Solid Waste Collection in Ibadan Metropolis, Nigeria

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ABSTRACT: This study looked at the private waste operators' methods of operation, clientele, and difficulties in managing residential SW in Ibadan, Nigeria. In the three LGAs of the metropolis, a structured questionnaire was given to 21 private refuse operators and 250 homes. To interpret the gathered data, descriptive statistics was employed. The findings showed that the factors that affected residents and operators of SWC the most were educational attainment, monthly income, building types, and occupation (n = 213, 85.2%; 164, 65.6%). Of the houses who enrolled for waste collection, between 201-300 (47.6%) and 100-200 (42.9%) utilized PWOs. Undue financial backing from the LGAs, impassable areas, incompatible law, poor advertisement and awareness, political influence, exorbitant leachate treatment fees, and poor health were among the operational issues confronted the PWOs. The elements that affect the way the private sector of SWC operates and attracts customers were found to be as follows: non-cooperation of residents (n = 8, 38.1%), poor nearness to buildings (n = 9, 42.9%), and the lax enforcement of hygiene regulations (n = 4, 19.0%). The report suggests that in order to provide residents in Ibadan Metropolis with high-quality services, PWOs should regularly monitor and oversee the collection of solid waste.

KEYWORDS: Private waste operators; method of operations and patronage; dumpsite; problems; residential solid waste collection; Ibadan

1. Introduction

Solid waste collection is a cycle consisting of waste production, storage, picking, transfer and transport, handling and dumping in means that do not impact adversely on the ecosystem, human health, and socio-economic activities [1-4). Refuse collection involves accumulating solid waste prior to moving the gathering to place it is evacuated [5, 6]. Waste collection is an issue confronting rapid economic development, urban centres, municipalities, and growing

nations [2]. Refuse collection continues constrained in several growing nations owing to insufficient service, improper picking vehicles, poor budget, and increasing inaccessible populations [3]. The cost effect of waste picking and dumping are hike i.e., gathering and transportation (74%), burning (22%), and dumpsite (4%) [7]. Several municipalities and larger cities contract out picking and transport services to private firm with public utility departments running dumpsites and incineration firms due to the technology that entails defined expert and considerable initial funding [8]. Privatization is postulated that the involvement of refuse generators by the payment of service charges cause the service effective [9].

Due to the city of Ibadan's rapid population growth and the city's increased annual trash production—which will rise from 635,000 metric tonnes in 2012 to 2,411,145.78 metric tonnes by 2025—waste collection is becoming increasingly difficult [10]. The government's waste sector budget is frequently insufficient [9]. Ibadan is known for its erratic collection practices, which lead to wild dumps in neighborhoods, surrounding marketplaces, and in public locations [11]. After privatization and decentralization, residential waste collection in Ibadan Metropolis has been left to the families [12]. Of the four steps advocated by [11], Ibadan metropolis is now in the first stage of developing trash collection and transportation [10]. Ibadan municipality does not have official statistics on the types of solid waste generated, garbage generation, or the caliber of waste collection services [11]. As a result, there are issues with the way private trash contractors in Ibadan Metropolis generate, characterize, and handle waste.

Many studies on solid waste collection have been carried out in Ibadan Municipality; however, the majority of these studies have focused on public-private collaborations, informal refuse collectors, waste categorization, and disposal. According to studies that are frequently cited [10-13], the average amount of garbage produced per person in Ibadan city is 0.58 kg of solid waste per day. In accordance with [14], the particular waste generation in the well-developed LGAs of Ibadan South-West, Ibadan North, and Ibadan North-East is 0.53 kg/inhabitant/dm with a density of 0.58 t/m^3. In line with [15], an Ibadan resident produces roughly 0.6 kilogram per day on average. In relation to trash characterization studies conducted in Ibadan Metropolis, 68–88% of garbage is organic, while 12–32% is made up of inorganic waste [10, 11, 15, 16]. Despite the limited waste proportion classifications in 2016, the 2016 characterization remains the primary point of reference for Ibadan Municipality due to the lack of a common framework for trash characterization across the four investigations. Paper, textiles, plastics, glass, metal, ceramics, wood, and toxic wastes are examples of inorganic materials [11]. Batteries [15], hospital and pharmaceutical wastes [11], and industrial residues [17] make up the toxic waste. Unlike the other research, [16] categorization is relied on a household perception survey.

The public health is at risk due to the poor rate of garbage collection and disposal in Ibadan Metropolis [11], the fact that 77% of residents do not sort their waste [17], the lack of pre-treatment [18], the landfill's uncontrollable nature, the absence of waterproofing, and the presence of heavy metals in leachates that above the acceptable limit [19]. Additionally, trash has the potential to be a source of energy, value, and revenue [14]. The Oyo State Solid Waste Management Authority (OYSWMA) hired private waste operators (PWOs) to handle the expanding piles of solid garbage that are carelessly deposited throughout Ibadan due to the government's incapacity to handle them. In Ibadan Metropolitan, garbage collection services were first privatized from 1985 to 1991 and then again from 1997 to the present. However, it is unclear if privatization has improved the standard of home waste collection services [11].

Studies on the effects of privatization on service quality, particularly at the household level, are scarce. This is because private collectors decentralized garbage collection to local government units (LGUs), moving the collection of waste to residential areas and shifting the financial burden to people. Therefore, in order to develop effective and long-lasting methods for better operational efficiency, it is necessary to examine their style of operation, conduct, variables, and problems.

2. Materials and Methods

2.1. Depiction and suitableness of the sampling locations.

The assessment was carried out in Ibadan, the capital of Oyo State and the biggest indigenous city in sub-Saharan Africa. It lies between longitudes 7^0 20 ´to 7^0 40´E and latitudes 3^0 35´and 4^0 10´N. It is located 530 km to the southwest of Abuja, the federal capital, and 133 km ^{2} northeast of Lagos. Ibadan's development has been impacted by both colonial and traditional urban sprawl. Established in 1829, the city was populated by refugees who sought refuge from inter-tribal conflicts in Yoruba territory [11]. Ibadan has had tremendous population and geographic growth since its founding; as of 2011, its developed land area accounted for 463.33 km^2 [10]. Ibadan's population was estimated by the National Population Commission (NPC) to be roughly 3 million in 2006. The population of the city was expected to be 3,565,108 in 2018, with a current national population growth rate of 3.18% [20]. The rate of population growth in Ibadan has a big impact on the production of solid garbage. The challenge of managing urban solid trash has grown to be a significant urban environmental issue as the city's area and population are growing at a rapid pace. The eleven local government areas (LGAs) that make up Ibadan are as follows: Ibadan North-East, with its administrative centres at Iwo Road; Ibadan North, with its administrative centres at Agodi; Ibadan South-East with its administrative centres at Mapo; Ibadan South-West, with its administrative centres at Ring Road; Ibadan North-West, with its administrative centres at Onireke; Egbeda, with its administrative centres at Egbeda; Lagelu, with its administrative centres at Iyana-Offa; Ona-Ara, with its administrative centres at Akanran; Oluyole, with its administrative centres at Idi-Ayunre; Ido, with its administrative centres at Ido; and Akinyele, with its administrative centres at Moniya (Figure 1). Five of the eleven LGAs are municipal LGAs, with diverse number of districts, such as: Ibadan South-West–27 districts; Ibadan North-East–24 districts; Ibadan South-East–25 districts; Ibadan North-West–32 districts; and Ibadan North–22 districts (Figure 1) [21]. The private refuse operators and the families surveyed in this study are located in the LGAs of Ibadan North, Ibadan South-West, and Ibadan North-East, respectively.

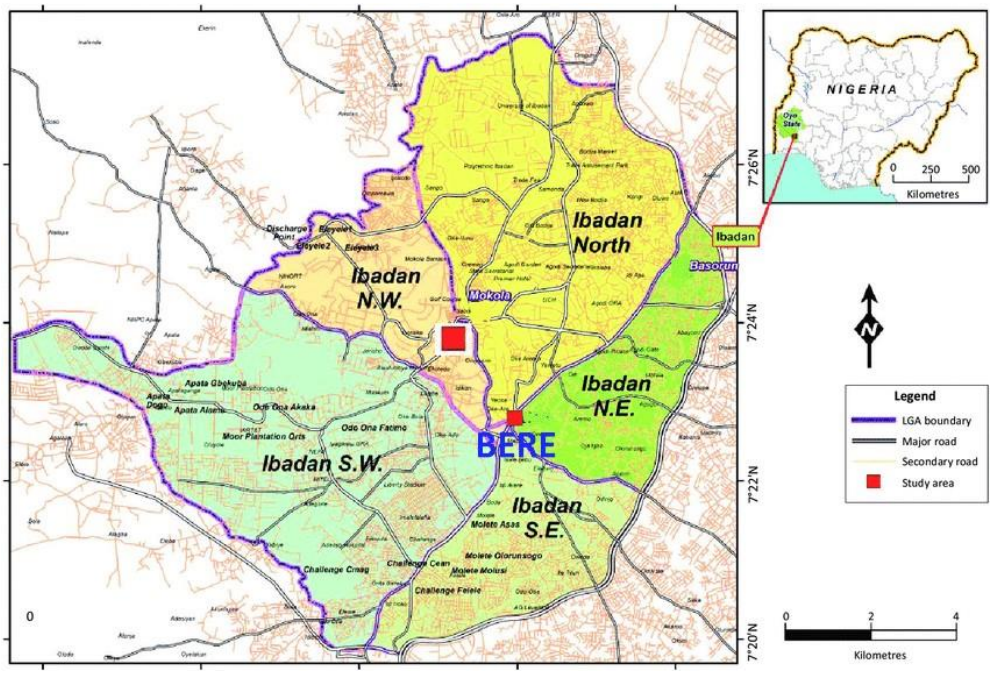

Figure 1. Map of the local governments in Ibadan showing study sites [22].

3.2. Methodology.

The study used a cross-sectional survey approach, and the main tools for gathering data were an interview guide and a questionnaire. Initial inquiries showed that Ibadan's three municipal LGAs—Ibadan South-West, Ibadan North, and Ibadan North-East LGAs—had a higher concentration of private refuse operators. The three LGAs were therefore chosen for the survey. Additionally, seven districts with the greatest number of private garbage collectors in each LGA were chosen for survey based on an initial count of the private waste contractors in every locality. Twenty-one (21) private garbage operators and 250 residents from each of the three LGAs were interviewed. They were then given a standardized questionnaire that had been pretested. The purpose of the questionnaire was to gather data on the following socioeconomic characteristics: religion, tribe, age, gender, level of education and occupation; waste collection, transportation and disposal; waste collection charges; and the way private waste collectors operate and the difficulties they face in operating their business and among others. These details were outlined in [7] list of waste collection service quality indices. Since the local government did not receive any replies from the families in Ibadan Metropolis, three indicators—the state of the dumpsite, the treatment of waste containers during transit, and public monitoring and sanctioning—were left out. Some of major informants by sector were: state sector (OYSWMA, Ibadan Metropolis Town Planning Personnel, and OYSMEnv Effluent Inspector), Private operators (Urban care Ltd, and JUTO Services Ltd), informal waste collectors (scavengers), and residents (Table 1). They were selected in this manuscript as they may be regarded major players in the SWC chain of the state, right from generation to final dumping. Six well-trained, graduate-level field assistants who could translate the questions into the native tongue of respondents who could not comprehend English were tasked with administering the English-prepared questionnaire. The survey was administered for eighteen days, from Saturday to Thursday, between the hours of eight in the morning and six in the evening. Every day, completed questionnaire copies. The administered questionnaire, totaling 250 and 21, was returned for analysis. Data from the fieldwork were presented using descriptive statistics, such

as frequency, mean, and simple percentages. The Statistical Package for Social Sciences (SPSS) 20.0 was used to assist with this. Regarding the study's objectives, the research instrument's contents, the respondents' right to privacy and the confidentiality of the data, as well as the acquisition of their informed consent and readiness to participate in the interview, and ethical considerations were duly taken into account.

Table 1. Recipient count by sector.

Recipient	Number
State sector (operator)	
OYSWMA Dumpsite Engineer	3
Ibadan Metropolis Town Planning Officer	3
OYSMEnv Effluent Inspector	3
Private Operator (Formal)	
Manager, Urban care Ltd	3
Field Staffs of Urban care Ltd	3
Head of Operations, JUTO Services Ltd	3
Private Operator (Informal)	
Garbage scavengers at the dumpsite	3
Total	**21**
Residents	
Government Representative	
Director, UCODEA	4
Local Council I Chairman, Ibadan South-West	2
Local Council I Chairman, Ibadan North	2
Local Council I Chairman, Ibadan North-East	2
Communal members (Ibadan South-West)	80
Communal members (Ibadan North)	80
Communal members (Ibadan North-East)	80
Total	**250**

3. Results and Discussion

3.1. Summary of socio-economic characteristics of patrons and operators of private waste collectors initiation in Ibadan metropolis.

Total numbers of participants interviewed in the study were 250 and 21. Out of the 250 participants involved in this analysis, 63 (25.2%) of the patrons were female while 187 (74.8%) of the patrons were male with the mean gender of participants was 50.00±24.80. The average age of participants was 33.33±10.76 years. More than a half of the participants were aged 40 and above (47.2%), followed by those aged 31 to 40 years (36.4%), and 25 to 30 years (16.4%). The proportion of the study participants in terms of the study marital status was 40.4% for single and 25.2% for divorced/separated. The majority of the participants were single (40.4%). In relation to religious, 64 (24.4%) were Muslim and 189 (75.6%) were Christian. The most common ethnic group in the study was Yoruba 214 (85.6%). Most participants had a university certificate (85.2%), while another 14.8% reported having a Polytechnic/College certificate. This signified that B.Sc. was the least qualification requirement for employment and this meant that the socio-economic status were good. Greater number reported making a monthly income of between 0 and 50,000 Naira (65.6%), while another 34.4% stated a monthly income of 50,000-100,000 Naira.

Concerning the operators, of the 21 operators involved in this study, 57.1% were male while 42.9 were female. The age of the respondents ranged from 25 to 40 years with an average of 33.30±6.70 years. The most represented age group was 40 and beyond years old (38%). About marital status, 18 (85.7%) were married, while 2 (9.5%) were single. Thirty-five (16.7%) lived alone, while 175 (83.3%) were in a relationship. Among religion, Christians were

the most common form (80.9%) followed by Muslim (19.1%). The most common ethnic group in the study was Yoruba (100%). Thirteen (61.9%) operators had a level of education at least equal to B.Sc. level and 8 (38.1%) had Polytechnic/College certificate. In terms of income, 52.4% of operators had a mean monthly income of between 50,000 and 100,000 Naira. Details of the socio-demographic chart of the participants are shown in Table 2 below.

The nearness of the sampling site to Lake Eleyele and Asejire has governed the characteristics of undertakings being performed. Its aesthetic scenery causes it primarily residential with some educational institutions (University of Ibadan, Lead City University, Koladaisi University, Federal College of Agriculture, Moore Plantation, Federal College of Forestry, Jericho, Ibadan, and Polytechnic of Ibadan, among others), recreational, and hotel facilities. It is mostly peri-urban with its people involved in a mixture of commercial trade (with petty business prevailing), small–scale firms, urban agriculture, fish business, and small-scale service businesses.

According to the findings, the majority of the 118 patrons (47.2%) were in the age range of 40 and beyond. This is in harmony with the findings of [18], who stated that people in this age range typically participate in SWC activities. Regarding the gender basis, 187 (74.8%) of the patrons were male and 63 (25.2%) were female; these data show that the study accurately represented both genders and was free of gender bias. Regarding income, the findings indicated that 86 (34.4%) of the participants make more than 50,000 Naira per month, while 164 (65.6%) make less than 50,000 Naira.

When their academic standing was assessed, it was found that 213 (85.2%) of the customers had attended college. This indicated that the socioeconomic features were good and that a B.Sc. was the least qualification needed to participate. This is in agreement with the findings of [39], who found that the generation of solid waste in the research area is negatively and weakly linked with variables like gender, age, and family size. This suggests that the types of buildings, occupation, monthly income, and educational attainment all had a considerable impact on the kind and volume of garbage generated in the city of Ibadan. This is explained by the fact that when people's income levels increased, their jobs became better, and their education levels increased, their consumption patterns changed. As a result, they produced waste that reflected their new lifestyle [18].

Additionally, waste produced by various land uses reflects the activity on that property. For instance, the research region revealed that while public and educational institutions produced paper waste, nylon, and broken bottles, and containers, residential areas produced more plant matter. Furthermore, a variety of waste materials were generated by transportation, industry, and commerce, including nylon, polyethene, iron fragments, unwanted electronics, and more [2]. This is indicative of the quality work they are generating. An intriguing correlation between the socio-economic variables and solid waste storage at the sampling location was also shown by Tables 2-4. The ways in which residents keep their solid waste are adversely and weakly associated with factors including age, sex, and family size [2]. This is taken to mean that the type of equipment used to store trash in their home was not determined by criteria such as age, sex, or size of family.

However, there was a good and fair correlation found between the type of equipment used by the household to store garbage and other parameters such as educational status, occupation, monthly income, and building types [12]. This can be explained as follows: as a household becomes more knowledgeable about the negative effects of improperly managed

solid waste, they will value efficient waste collection and will select the best container to prevent the growth of organisms that spread disease [4].

The equipment a household chooses to store waste depends on the type of work they do. Furthermore, the capacity to manufacture odor-free equipment and prevent the spread of disease-carrying organisms is influenced by one's financial level [12]. Additionally, the type of land usage dictates the equipment selection for trash storage. For example, equipment free of odors is used in residential land uses to prevent the growth of organisms that spread diseases [4]. Tables 2-4 demonstrate that the selection of solid waste disposal technique is contingent upon family size and age. This suggests that as people get married, have kids, and have larger families, they produce more garbage, which they often are unable to manage well on their own. As a result, they look for more effective ways to get rid of it [18].

Table 2. Summary of socio-demographic status of patrons and operators of private firm SWC initiation in Ibadan municipality.

PATRONS
The total number of participants=250

Variable		Frequency (n)	Percentage (%)
Gender	Female	63	25.2
	Male	187	74.8
	Total	**250**	**100**
Age	25-30	41	16.4
	31-40	91	36.4
	40 and above	118	47.2
	Total	**250**	**100**
Marital Status	Single	101	40.4
	Married	49	19.6
	Divorced/Separated	63	25.2
	Widow	37	14.8
	Total	**250**	**100**
Religion	Traditional	0	0.0
	Muslim	61	24.4
	Christian	189	75.6
	Total	**250**	**100**
Tribe	Yoruba	214	85.6
	Hausa	25	10.0
	Igbo	11	4.4
	Total	**250**	**100**
Educational Qualification	Primary	0	0.0
	SSCE	0	0.0
	Polytechnic/college	37	14.8
	university	213	85.2
	Total	**250**	**100**
Income	Less than 50,000	164	65.6
	50,000-100,000	86	34.4
	Total	**250**	**100**

OPERATORS
The total number of participants = 21

Variable		Frequency (n)	Percentage (%)
	Female	9	42.8
Gender	Male	11	57.1
	Total	**21**	**100**
	25-30	5	23.8
Age	31-40	8	38.0
	40 and above	8	38.0
	Total	**21**	**100**
	Single	2	9.5
Marital Status	Married	18	85.7
	Divorced/Separated	1	4.8
	Widow	0	0.0
	Total	**21**	**100**
Religion	Traditional	0	0.0

Variable		Frequency (n)	Percentage (%)
	Muslim	4	19.0
	Christian	17	80.9
	Total	**21**	**100**
	Yoruba	21	100.0
Tribe	Hausa	0	0.0
	Igbo	0	0.0
	Total	**21**	**100**
	Primary	0	0.0
	SSCE	0	0.0
Educational Qualification	Polytechnic/college	8	38.1
	university	13	61.9
	Total	**21**	**100**
Income	Less than 50,000	10	47.6
	50,000-100,000	11	52.4
	Total	**21**	**100**

3.2. Summary of method of operation of private waste collectors initiative in Ibadan municipality.

The Table 3 was on the method of operations that existed among the participants, this study revealed that 2 (9.5%) of the participants had been in jobs for two years, 8 (38.1%) had been in operations for three years, while 11 (52.4%) had been in enterprises for more than four years. Also from the Table 3, when inquired about what was their contract arrangement (duration) with the state government's consultant, 6 (28.6%) had an agreement of less than 3 years, 10 (47.6%) had a contract of 3-5 years, 4 (19.1%) had a deal of 6-8 years, while 1 (4.7%) had an agreement of 8-10 years. When requested if they register clients for commercial services, the total participants 21 (100%) ticked the yes bracket, likewise 3 (14.3%) of the respondents indicated that they had 50-100 residents in their register, 8 (38.1%) stated that they had 100-200 clients in their register, while 10 (47.6%) stated that they had 201-300 residents in their list, this implied that these private refuse collectors had a handful of residents in their register. In addition, when asked how many of the registered clients are actually patronizing their services**,** 8 (38.1%) of the operators stated that 50-100 residents patronized their service, 9 (42.9%) reported that 100-200 residents frequented their services, while 4 (19.0%) of the participants patronized their services.

When inquired how much they charge for their services, 10 (47.6%) revealed that they charged within 1,000-2,000, while 11 (52.4%) claimed that they charged within 2,000-3,000 for their services. Similarly, when requested whether they consult their clients before the charges were set, all the operators (participants) 21 (100%) said that they consulted the residents before those charges were sets and established. The participants were also asked if they advertised their services, 21 (100%) and they all responded positively to it, and based on the mode or medium of advertisement, 3 (14.3%) replied they utilized television, 8 (38.1%) utilized newspaper, while 10 (47.6%) employed social media to advertise their services (Figures 2-3). The participants also revealed that in order to register with the firm for their services the residents can either walk into their offices or visit their websites to book online. They likewise quipped that a lot of measures had been put in place which included education and awareness program for the residents, using online platform to collect the fees.

Moreover, when inquired how often the operators remove solid wastes from households, 10 (47.6%) of the operators said twice in a week, while 11 (52.4%) replied once in two weeks do they retrieve waste from residents. Similarly, the operators all agreed that they do give education and awareness to residents on SWC. When asked the kind of vehicles been

utilized to pick the waste or garbage, 3 (14.3%) confessed they used Volkswagen salon, 8 (38.1%) stated they utilized motorcycle, while 10 (47.6%) said they employed tricycle and wheelbarrow. In a nutshell, 8 (38.1%) of the private waste operators said two vehicles were in operations, 9 (42.9%) explained three vehicles were in operations, while 4 (19.0%) said four vehicles were in actions. In addition, 10 (47.6%) of the operators replied two of their vehicles had worn out, while 11 (52.4%) stated three of their vehicles had out of order and was not in actions at the moment. From the Table 3 and Figures 2-4, it could be deduced that the mode of operation of the SWC in Ibadan metropolis was fair.

After confirming their technical and financial capabilities as well as their professional expertise, the OYSWMA of Ibadan Metropolis grants refuse service providers permission to collect waste [10]. The scope of these service providers' interventions is also determined by this authorization. Following the acquisition of a collection permit, the businesses enter into agreements to dispose of their waste at the OYSWMA-managed dumpsite [21]. The charging payments per residents, which range from 2000 to 3000 Naira, are set forth in these contracts. Table 3 displays the contract structure; the percentage of serviced households ranges from 19 to 42%, and the number of registered households is greater than the number of regularly paying households. Private garbage collections are generally provided to 42% of houses, with distribution based on residential class. Three LGAs with a high registration rate of homes have been assigned to the service provider, but they also have one of the lowest collection efficiency rates. Table 3 demonstrates that the number of persons who pay on a regular basis and the number of households served increase with a decrease in the number of registered households and in reverse. Household awareness, the participation of the administrative authorities (State sector; private company, communal heads), and the cooperation between the administrative authorities and the private waste collection service providers all influence the number of subscribers [10]. The residents of the service providers' collection districts cannot be independently mobilized. There is no requirement for households to join a service provider; instead, subscriptions are made based on direct negotiations and at the convenience of each household. Since the agreements are month-to-month and either party may end them with one month's notice, they are not legally binding. There are no fines for noncompliant homeowners or service providers who fail to collect rubbish as stipulated in their agreements. As a result, clients don't really consider paying their payments on time. The distribution of service providers has not been equitable; some have benefited from many clients, while others have benefited from a small number. Those who might have been eager to invest in bettering the city's solid waste collection could become discouraged if the contract award process is opaque [7].

Table 3 also shows that 52.4% of waste is collected once every two weeks, which is the most common frequency, followed by 47.6% of rubbish collected twice a week. The collection frequency varies amongst households in the same local government areas (LGAs) served by the same private waste contractor. These variations include once every week, twice a week, once every two weeks, once every month, and no schedule. The reason for this is the agreement that was worked out between the household and the provider. Waste collection is not consistent and is determined by districts and LGAs [10]. This is explained by the absence of performance goals, oversight procedures, and regulations governing the operation of private garbage collection [7]. Even though notebooks are signed each time waste is picked up, they are not being used for monitoring.

Table 3. Summary of method of operation of private refuse collectors' initiative in Ibadan municipality (The (number of participants= 21).

Variable	Frequency	Percentage
What is your contract arrangement (duration) with the state government's?		
Less than 3years	6	28.6
3-5	10	47.6
6-8	4	19.1
8-10	1	4.7
Total	**21**	**100**
Do you register client for commercial services?		
Yes	21	100
No	0	0.0
Total	**21**	**100**
What is the total number of residents in your register?		
50-100	3	14.3
100-200	8	38.1
201-300	10	47.6
Total	**21**	**100**
How many of the registered clients are actually patronizing your services?		
50-100	8	38.1
100-200	9	42.9
201-300	4	19.0
Total	**21**	**100**
How much do you charge for your services?		
1000-2000	10	47.6
2000-3000	11	52.4
Total	**21**	**100**
Do you consult your clients before the charges were set?		
Yes	21	100
No	0	0.0
Total	**21**	**100**
Do you advertise your service to the general public?		
Yes	21	100
No	0	0.0
Total	**21**	**100**
How regularly do you remove solid waste from the household?		
Once in one week	0	0.0
Twice a week	10	47.6
Once in two weeks	11	52.4
Once in a month	0	0.0
Total	**21**	**100**
Have you given any education to residents on solid waste collection?		
Yes	21	100
No	0	0.0
Total	**21**	**100**
How many of the vehicles are in operation?		
One	0	0.0
Two	8	38.1
Three	9	42.9
Four	4	19.0
Total	**21**	**100**
How many of the vehicles have broken down?		
One	0	0.0
Two	10	47.6
Three	11	52.4
Four	0	0.0
Total	**21**	**100**

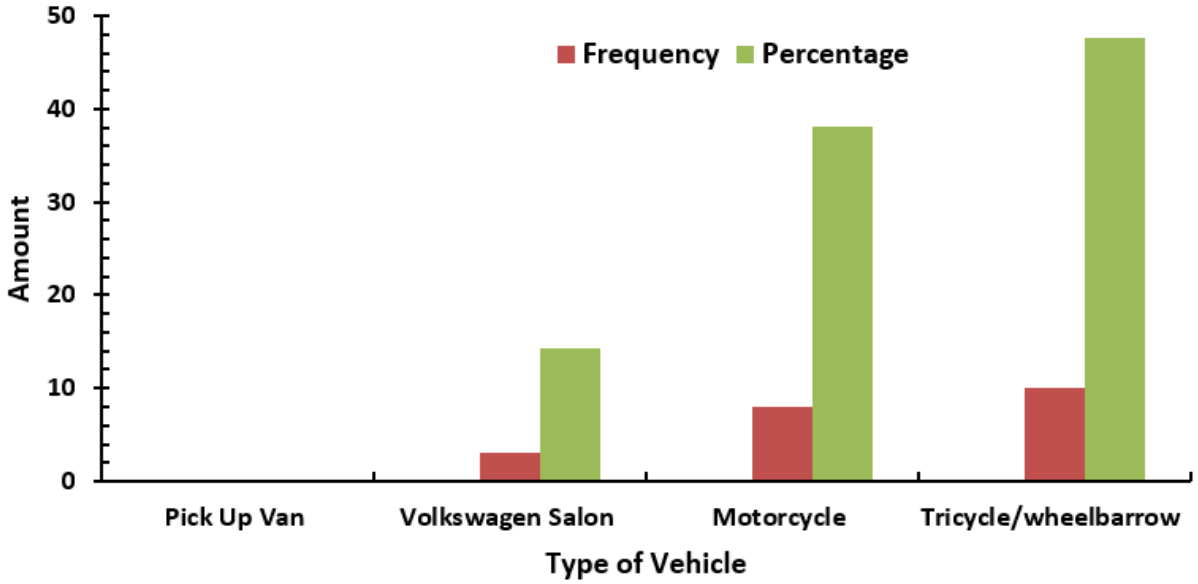

Figure 2. Methods used to collect the garbage.

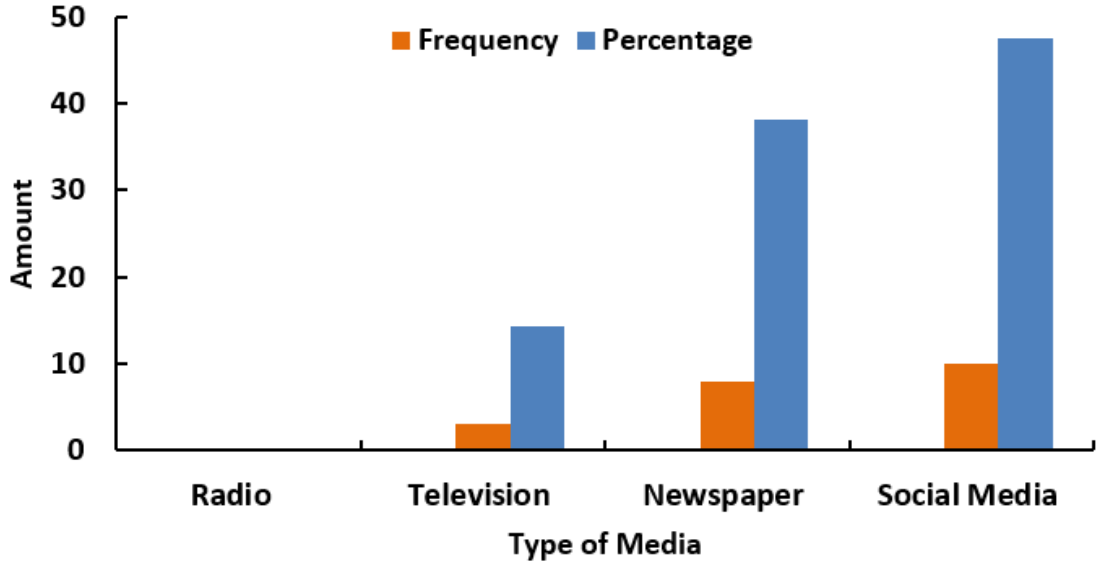

Figure 3. Advertising medium normally use.

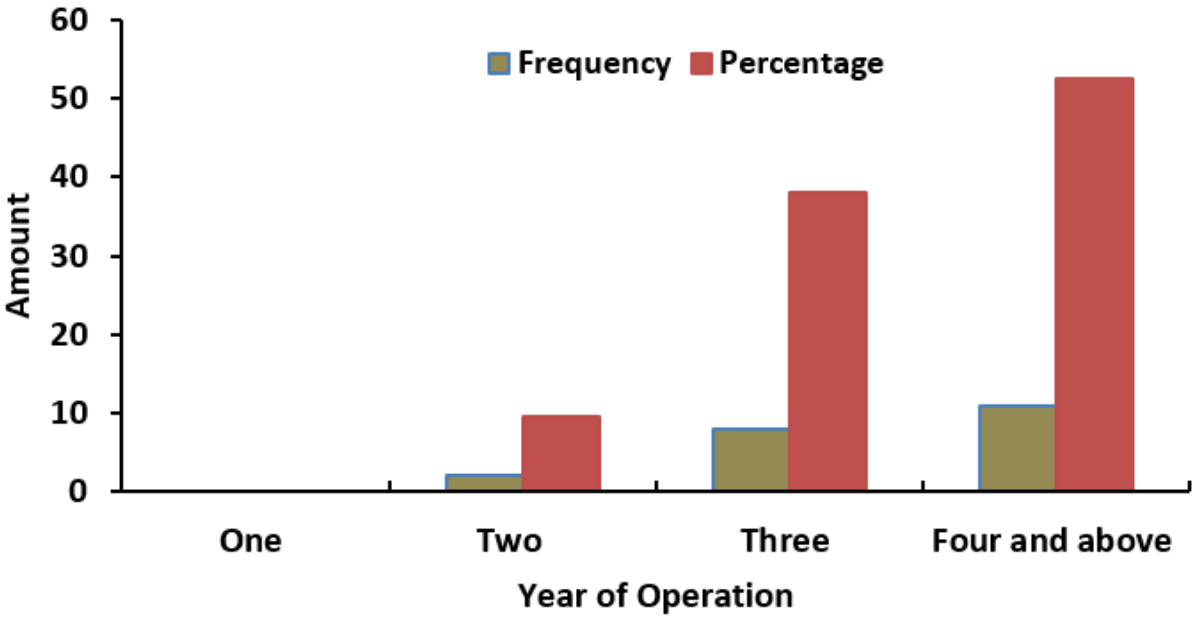

Figure 4. Years of Operation.

3.3 Summary of the various ways of improving the patronage and operation of private waste collectors in Ibadan municipality.

The Table 4 below was on the ways of improving the patronage and workings of private waste operators in Ibadan metropolis. It was revealed that 225 (90.0%) of the residents had heard about the private firm SWC initiative, while 25 (10.0%) of the residents had not gotten to know them. When inquired how did they get to know SWC initiative**,** 35 (14.0%) of the residents replied they had news of them from the television, 75 (30.0%) expressed that they gotten to know them from the newspaper, while 140 (56.0%) claimed that they had news of them from the social media channels. When asked if they have registered for the service, 225 (90.0%) said yes, while 25 (10.0%) had not yet registered for their services. When requested if they have satisfied with their services, 215 (86.0%) of the residents said they were satisfied with their services, while 35 (14.0%) stated they were not satisfied with their services they offered to them. When further quizzed on why they were satisfied with their services, 75 (30.0%) said because of their reliability, 100 (40.0%) indicated because of their proper collection, while 75 (30.0%) expressed its due to their good relationship (Table 4).

Moreover, when quizzed how much is their service charge, 10 (4.0%) of the residents replied they were below 2,000, 65 (26.0%) of the respondents opined they were within 2,000-4,000, 115 (46.0%) of the resident affirmed they were within 4,000-6,000, while 60 (24.0%) said they were from 6,000 and above. The residents were also inquired how they store their household waste before its being collected by the waste operators, 15 (6.0%) of the residents replied they used plastics bags, 55 (22.0%) residents utilized cardboard boxes, 150 (60.0%) employed rubbish bin/drum, while 30 (12.0%) of the residents directly dispose the wastes to dump (Fig. 3). Also, they were quizzed how they dispose their generated waste, 5 (2.0%) used nearby containers, 55 (22.0%) disposed at public space, 80 (32.0%) disposed waste at the adjacent stream, and 110 (44.0%) discarded waste close to their households.

In précis, the residents were inquired which wastes is more generated, 20 (8.0%) acknowledged kitchen waste was more generated, 120 (48.0%) stated it was plastic waste, while 110 (44.0%) confessed it was paper waste. When quizzed if they do segregate different waste at home, 90 (36.0%) confirmed positively to it, whilst 160 (64.0%) negatively responded to it. From (Table 4), it could be deduced that advertisement was a vehicle to improve the patronage and activity of private waste operators in Ibadan municipality, the level of satisfaction with their service, reasonable charge fee, and their availability. In all three LGAs, households store waste mostly in garbage bins or drums (60.0%), cardboard boxes (22.0%), direct disposal to middle dumps (12.0%), and plastic bags (6.0%), with the majority of containers being non-standard, reused plastic containers. The local council of Ibadan does not regulate or standardize trash storage facilities, and garbage pickup service providers do not supply labeled storage bags. For the authorized service providers, the most common modes of transportation in the various areas were motorcycles (38.1%), tricycles/wheelbarrows (47.6%), and Volkswagen salons (14.3%). Ibadan city's garbage collection and transportation situation is mediocre, with 19–42.9% of cars operating or in good condition and 47.6–52.4% of vehicles inoperative and between the ages of 2-4.

There were several dumpsites owned by the city of Ibadan, including Ajakanga, Lapate, Awotan, and Abe-Eku [21]. These sites were saturated and no longer functional, yet trucks kept driving rubbish there. Waste generated disposal knowledge is 2.0% for containers nearby, 22.0% for open spaces, 32.0% for adjacent streams, and 44.0% for regions close to homes. This indicates that there is insufficient understanding and sensitization on the part of the council or service providers on the residents' duty for waste collection, particularly with regard to the ultimate disposal of garbage [26]. Waste collection services have historically been marked by inconsistent collection and insufficient disposal due to the restricted resources available to waste management authorities [11]. The dependent and explanatory variables' descriptive statistics were displayed in Tables 2 through 4. Client satisfaction with the caliber of waste removal by private service providers is the highest among all respondents. The Tables reveals that the respondents' gender ratio is low, that the majority of them are over 40, that their educational attainment is high, and that private companies prefer to operate in higher educated areas because the residents there are more aware of waste collection best practices and have the financial means to pay for private providers' waste collection services [10]. According to the results, 86% of the respondents were more satisfied with the quality of their services. According to [6, 11], householders are typically satisfied with private waste collection services. These findings are consistent with their findings. According to [23], the existing method of operation offered by private residential solid waste service providers appears to be satisfactory to 56% of customers in low-income areas and roughly 61% of users in high-income areas of Nigeria. These results run counter to those of [24, 25], who discovered that the majority of locals were unsatisfied with the solid waste collection services provided by the private contractors. The education variable's level is significantly positive at the p-0.05% level, meaning that respondents with higher education are less likely than those with lower education to be satisfied with the quality of the services. This suggests that respondents with higher education have higher expectations from service providers and are therefore more demanding than those with lower education [12]. The results contradict the findings of [26], who found no significant difference ($p>.05$) between householders' satisfaction with waste solid waste collection services and educational level. The agreement between the households and the

service provider governs waste collection services. The present results are consistent with those of [18], who found that households with higher incomes are generally more satisfied with rubbish collection services.

Table 4. Summary of the various means of improving the patronage and activity of private waste operators in Ibadan municipality (The number of participants=250).

Variables	Frequency	Percentage
Have you heard about the private sector SWC initiative?		
Yes	225	90.0
No	25	10.0
Total	**250**	**100**
If yes, how did you hear about it?		
Radio	0	0
Television	35	14.0
Newspaper	75	30.0
Social media	140	56.0
Total	**250**	**100**
Have you registered for the service?		
Yes	225	90
No	25	10
Total	**250**	**100**
If yes, are you satisfied with their services?		
Yes	215	86
No	35	14
Total	**250**	**100**
What is the main reason for your level of satisfaction?		
Affordability	0	0
Reliability	75	30
Proper collection	100	40
Good relationship	75	30
Total	**250**	**100**
How much do they charge per Day/week/month?		
Less than 2,000	10	4
2,000-4,000	65	26
4,000-6,000	115	46
6,000 and above	60	24
Total	**250**	**100**
Where do you store your household rubbish in? For each storage method write down the number of each used in a week		
Plastic bags	15	6
Cardboard boxes	55	22
Rubbish bin/drum	150	60
No storage	0	0
Direct disposal to dump	30	12
Total	**250**	**100**
Where do you dispose your generated waste?		
Nearby container	5	2
Open space	55	22
Nearby stream	80	32
Near home	110	44
Total	**250**	**100**
Can you roughly identify percentage composition of your generated waste?		
Kitchen waste	20	8
Plastic	120	48
Paper	110	44
Total	**250**	**100**
Do you separate different type of waste at your home?		
Yes	90	36
No	160	64
Total	**250**	**100**
If yes, would you do so if you are told by your collection service provider		
Yes	225	90
No	25	10
Total	**250**	**100**

3.4. Summary of the factors that influence the activity and patronage of the private waste collectors in Ibadan municipality.

From the results, it was noted that the challenges the operators faced in collecting charges from clients ranged between 4 and 9 with a mean of 25 and a standard deviation of 10.8. From Table 5 below, it was observed that the non-cooperation of residents were 8 (38.1%) of total number while the poor accessibility to buildings participants accounted for 9 (42.9%). The Table also indicated that 4 (19.0%) of the participants had a lack of enforcement of sanitation rules. Table 5 below indicates that close to half of the participants, 110 (44 %) picked improper gathering as the reason for their level of dissatisfaction, while 90 (36%) of them ticked unreliability, and 50 (20%) chose bad attitude from the collector. The study sought to estimate the main reason for their level of dissatisfaction in the service of the waste operators. This is an important measure because residents were dissatisfied with their method of operation because of high cost, unreliability, improper collection, and bad attitude from the waste operators [18].

The investigation endeavored to know the priority concern about waste in the area. This is significant because their opinion about waste in their area is of high priority to health risks if any. In terms of priority concern about waste in the area, the findings showed that, out of a total of 250 samples, 115 (46.0%) were at effect on the environment, 100 (40%) were at others, 30 (12.0%) were at effect on human health, while 5 (2.0%) were in littering and looks bad condition. The study attempted to know if the participants were aware of main challenges with the current SWC system. This awareness is crucial as it may influence the participant's knowledge, attitude, and perceptions of the health risks it poses. Main problems with the current SWC system are categorized into four groups: (i) waste lying around factors; (ii) odour factors; (iii) rodents; and (iv) flies factors (see Table 5). They are prioritized by frequency of inclusion in the studies. In summary, the most frequently identified factors for determining current SWC system problem were: rodents 140 (56%); flies 75 (30%); and odour 35 (14%).

The respondents from three LGAs showed parallels in their level of awareness of the risks associated with inadequate solid waste collection, despite their differing attitudes about solid wastes in general (Table 5). They generally submitted the following: *Wastes attract flies and rodents, which in turn spread human diseases such as pneumonia, dysentery, cholera, diarrhea, tetanus, worm infestation, malaria, and typhoid. *The smoke from burning waste causes cancer, coughing and catarrh, increases greenhouse gas emissions, and pollutes the environmental spheres (air, soil, and water). The leachate from rotting solid wastes contaminates sources of drinking water (surface and ground waters). When asked how they learned about this knowledge, the respondents said it came from the local council leadership (local council chairmen, communal heads), who frequently arranged seminars and education campaigns to raise awareness of the same topic in partnership with OYSWMA and Urban Care Limited. In reality, residents of the LGAs of Ibadan South-West, Ibadan North, and Ibadan North-East participated in monthly voluntary rubbish cleanup operations as a means of averting such risks. Dredging water wells and drainage ditches are part of these drills. The local leadership's extensive mobilization and sensitization is what makes these exercises successful. They accomplish this by posting signs on all LGA public notice boards and going house to house to remind residents. The active participation of OYSWMA and Urban Care Limited, whose collection staff removes and delivers the dredged waste to the landfill for disposal, is credited with the exercise's continued success. These submissions suggest that the individuals are aware of and actively participating in community projects. At the home level, though, things

are different in the low-income areas of the LGAs. These folks had a "I don't care" attitude, but they appeared to know what was expected of them. Why?

Table 5. Summary of the factors that influence the activities and patronage of the private waste collectors in Ibadan municipality (The number of participants=21 and 250).

Variables	Frequency	Percentage
What are the challenges you faced in collecting charges from clients? You can pick more than one option		
Competition from state waste management agency	0	0.0
Non-cooperation of residents	8	38.1
Poor accessibility to buildings	9	42.9
Lack of enforcement of sanitation rules	4	19.0
Total	21	100
What is the main reason for your level of dissatisfaction?		
High Cost	0	0.0
Unreliability	90	36
Improper collection	110	44
Bad attitude from the collector	50	20
Total	250	100
In your opinion which of these is a priority concern about waste in the area?		
Littering and looks bad	5	2.0
Effect on human health	30	12.0
Effect on the environment	115	46.0
Others	100	40.0
Total	250	100.0
Please identify some of the main problems with the current solid waste collection system?		
Waste lying around	0	0.0
Odour	35	14
Rodents	140	56
Flies	75	30
Total	250	100

3.5. Operational issues private waste operators confront.

Firstly, the contractual duties of the OYSWMA Ibadan Metropolis Local Authorities to provide financial backing to the private contractors are not met in a timely manner. As was previously said, this causes financial issues for the private waste collector. Also, even though they've come up with ways to get to most of the areas regardless of the state of the roads, the amount of waste that needs to be collected by the waste collectors over a specific working period and the time lost can make this a serious issue. You can find narrow, frequently poorly maintained roadways throughout the majority of the Ibadan Metropolis [10]. Furthermore, the Director of Urban Care Limited identified the other issues affecting their operations as being the unclear and inconsistent laws. He notably cited section No 28 of the OYSWMA Edict of 2009, stating that some of their potential clients frequently utilize it to hire other collectors since they don't want to be constrained by a contract with Urban Care Ltd [21]. Thirdly, it was very difficult for the private enterprise to compel compliance from the inhabitants in both socio-economic areas because of the low advertisement and lack of awareness from the state sector at the beginning of the project. But with time, this has become a significant issue in low-income communities rather than just a problem in middle-to high-income ones [10]. More so, one significant issue that Urban Care Limited as a business faces has been identified as political patronage and influence. Because they were disadvantaged by the firm throughout the privatization process, several local council members in these areas provide misleading information about their operations. This is a blatant example of how politics is getting in the way of the private-public collaboration running smoothly, even if no specific case was mentioned and so no verification

was done [8]. Lastly, leachate treatment operators at Ajakanga, Lapate, Awotan, and Abe-Eku dumpsites face challenges when mixed inorganic and organic solid waste is dumped at the same location. This is due to the fact that the waste's inorganic components contain hazardous materials that need to be thoroughly treated before being released into a wetland to undergo additional purification [8]. This is expensive since a lot more chemical reagents are needed than if they were just organic solid wastes. A particular volume of leachate was intended to be handled by the leachate treatment plant. But because of the rainy season, there is an abundance of leachate generated from the decaying garbage [1]. In order for the treated leachate to fulfill the environmental standards established by the Federal Ministry of Environment and NESREA, additional time must be spent on treatment and retention [4].

4. Conclusion

The privatization of trash services in Ibadan Metropolis has resulted in a restructuring of residential waste collection services, with the public maintaining the landfill site, the private contractor handling waste collection, and people covering the service costs. Although the privatization process has increased coverage, decentralized collection into the districts, and transferred the cost of garbage collection from the public to citizens, the collection rates remain low. Inadequate measures put in place to ensure a smooth waste service delivery system under the privatization regime are the reason for low collection rates. Although all of the generated indicators are comprehensive and can be used to measure service quality through satisfaction surveys, not all of the indices have substantial use in households. In order to identify the indicators that are reliable for gauging patronage and mode of operation through satisfaction surveys for a range of service users and urban scales, it is necessary to analyze the indicators and conduct more research. The majority of residents in residential areas are happy with the level of waste collection services provided by private waste collectors in Ibadan Metropolis, according to the research findings. Households in the three LGA regions, however, were more satisfied with the level of service. The report makes the recommendation that, in order to improve service delivery, the performance of private garbage businesses' style of operation should be evaluated in the wake of privatization changes. Customer satisfaction surveys are one approach to quickly inform customers and service providers about areas they have done well or need to improve on, but they shouldn't be the sole instrument used to determine the level of business and operational style provided by private garbage suppliers. This work has provided background data on the manner of operations and patronage of private waste contractor and community health status of the sampling location. It has given data on the appropriateness and health implications of household SWC at the studied site. The work has also added to the baseline information on SWC studies in our environment.

Abbreviations: OYSWMA: Oyo State Solid Waste Management Authority; PWOs: private waste operators; SWC: Solid Waste Collection; LGAs: local government areas; kg/inhabitant/dm: kilogram/dry matter; UCODEA: Urban Communal in Development Association.

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Conflict of Interests

The authors have not declared any conflict of interests.

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