Assessment of Quality of Household Solid Waste Collection by Private Service Providers in Bujumbura City

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Abstract

Public provision of municipal solid waste collection services in developing countries is characterised by poor service delivery. This paper examines if privatisation has led to better quality of households' waste collection services in Bujumbura city, Burundi. The paper is based on 308 questionnaire survey of Bujumbura households' living in high, middle and low class residential facilities served by private service providers; coupled with interviews and document analysis. The quality of service is based on nine service quality indicators. About 28.8% of registered households for waste collection paid and serviced by private service providers. Waste collection is varied and mostly every two weeks, yet license stipulates once per week; whereas charges are varied and higher than the set rates. Ordinal probit regression analysis shows that out of 9 service quality indicators, 6 are significant at household level and 5 on the residential class. Households' living in high class residential expresses greater satisfaction with quality of service than those who live in middle and low class residential. The paper recommends regular monitoring and supervision of solid waste collection by private service providers for quality services delivery to households in Bujumbura city.

Keywords: Household waste services, collection frequency, charges, service quality

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Introduction

Solid waste management is a chain comprising of waste generation, storage, collection, transfer and transport, treatment and disposal in ways that do not impact negatively on the environment, aesthetics and human health (Aaniamenga, 2013; Jockey, 2016; Amobi & Emeka; 2017; Boateng *et al.*, 2016; Lagerkvist & Dahl, 2019). Waste collection includes gathering solid waste before moving the collection to where it is emptied (Malinauskaite et al., 2017; Bolaane & Isaac, 2015; Oduro-Kwarteng, 2013). Waste management is a challenge facing fast growing economies, urban areas, cities and developing countries (Magutu & Onsongo, 2010; Katusiimeh et al., 2012; Aaniamenga et al., 2013). Waste collection remains limited in many developing countries due to inadequate service, inappropriate collection vehicles, low budget, and growing hard to reach populations (Longe et al., 2009; Ejaz, 2010; Faccio et al., 2011). The cost implication of waste collection and disposal are high e.g. collection and transportation (74%), incineration (22%), and landfilling (4%) (Jin et al., 2006; Akaateba & Yakubu, 2013). Many cities and bigger municipalities' contract out collection and transport services to private sector with public utility agencies operating landfills and incineration plants because of the technology that requires specific expertise and significant up-front investment (Parthan, 2006; Nishimwe, 2016). Privatisation is premised that the participation of waste generators trough the payment of service fees make the service successful (World Bank, 2018).

The management of waste is a major challenge for the city of Bujumbura due to rapid population growth, coupled with an increase in the annual production of waste by 88.46% from 128,648 tonnes in 2014 to 242,455 tonnes by 2025 (CEPRODILIC, 2020). The budget used by the government in waste sector is often inadequate (World Bank, 2018). Bujumbura is characterized by irregular collection resulting in wild dumps in residential areas, around markets, and public spaces (Dusabe, 2014; Nzambimana et al., 2021). Household waste management in Bujumbura city has been left to the households (Nsavyimana, 2015) following privatisation and decentralisation. Bujumbura city is in the first stage of establishing waste collection and transportation (Mzambimana et al., 2021) of the four stages espoused by Yoshida (2012). Official statistics on solid waste typology, waste generation, and quality of waste collection service is not available for Bujumbura city (CEPRODILIC, 2020). Consequently, waste generation, characterisation and quality of service in Bujumbura city is contestable.

A number of studies have been conducted in Bujumbura city, but mainly on waste characterisation and disposal. Widely quoted study is (BTC, 2013), which notes that the average per capita wastes production in Bujumbura city is 0.52kg/day. Dusabe (2014) notes that the specific waste production in Kamenge, Kinama and Cibitoke zones, which are popular in development, is 0.47 Kg/inhabitant/dw with a density of 0.45 t/m^3. Mizero et al., (2015) notes that a resident of Bujumbura generates on average about 0.6 kg/day. Waste characterisation studies in Bujumbura city (Table 1) indicate that the largest fraction of waste is organic (57-87%), with inorganic waste fraction constituting 13-43% (CTB, 2013; Dusabe, 2014; Mizero et al., 2015; CEPRODILIC, 2020; Manirakiza et al., 2020). However, there is no consistent waste characterisation framework in Bujumbura city from the four studies, with the 2013 characterisation still forming the main reference point despite the few categorisations of waste fraction then. Inorganics generally are composed of paper, textiles, plastics, glass, metal, ceramics, wood, and hazardous wastes (Table 1). The hazardous waste is composed of industrial residues (Manirakiza et al., 2020), hospital and pharmaceutical wastes (Manirakiza et al., 2020; Mizero et al., 2015) and batteries (Dusabe, 2014). The characterisation of Manirakiza et al., (2020) is based on household perception survey unlike the other studies.

Table 1. Waste composition in Bujumbura city from past studies, 2013-2020

CTB, 2013		Dusabe, 2014		Manirakiza et al., 2020		Mizero et al., 2015	
Type of waste	%	Type of waste	%	Type of waste	%	Type	%
Organic matter	86	Organic & inert	87.3	Household wastes	73.8	Fermentable	57
Paper(board)	2	Plastic bags	4.7	Bags & plastic wastes	57.5	Bags	5
Textiles	3	Hard plastics	1.1	Broken glasses & bottles	22.5	Plastics	3
Plastic bags	4	Paper(board)	1.2	Textile & wood	8.8	Wood & charcoal	3
Hard plastics	2	Glasses	0.2	Metal objects	17.5	Textile & leather	4
Others	3	Textiles	2.6	Green wastes	22.5	Glass & ceramics	15
		Metals	0.3	Hospital & pharmaceutical wastes	11.3	Paper(board)	6
		Stones & wood	1	Industrial residues	3.8	Metal	5
		Couches	0.2	Paper(board)	28.7	Biomedical and hazardous wastes	2
		Batteries	0.1				
		Household garbage bags	1.2				

Waste collection and disposal in Bujumbura city poses a public health risk since it is characterised by low collection (25-46%) rate (Dusabe, 2014; Mizero et al., 2015), unsorted by about 76% of inhabitants (Manarikiza, 2020), lack pre-treatment (Dusabe, 2014), source of pollution load (Mizero et al., 2015), dumpsite is uncontrolled, lack of waterproofing, and leachates contain heavy metal contents that exceed the acceptable threshold (Dusabe, 2014; Manarikiza, 2020). The waste also is potential source of income-generation, valorisation and energy (Mizero et al., 2015).

Privatisation of waste collection services in Bujumbura city began in 2013, but little is known on whether privatisation has brought about better quality of household waste collection services. There are no studies on impact of privatisation on quality of service especially at household level following the decentralisation of waste collection to zones by private collectors, which shifts waste collection to residential areas and financing responsibility to households. Therefore, there is need to assess the quality of service, especially when contracted out to private service providers like household waste collection in Bujumbura city.

Literature Review

Solid waste management plays a critical role in ensuring public healthy, aesthetics and environmental protection (Phonchi-Tshekiso et al., 2020; Tilaye & van Dijk, 2016). Despite the critical role it plays, solid waste management in most African cities and towns is woefully inadequate and remains a major challenge (Phonchi-Tshekiso et al., 2020; Akaateba & Yakubu, 2013; UNEP, 2018). The drivers of waste generation in Africa are population growth, rapid urbanisation, growing middle class, changing consumption habits, economic development, and globalisation (UNEP, 2018). Many factors constraints solid waste

management: lack of appropriate planning, inadequate governance, resource constraint, ineffective management, insufficient collection, and improper disposal (Rotich et al., 2006; Hazra & Goel, 2009; Mohee & Simelane, 2015; Miezah et al., 2015; UNEP, 2018). One of the major impacts of solid waste management constraints is poor performance of waste management services (Chuen-Khee & Othman, 2010; Connell et al., 2019).

The daunting challenges around solid waste management in African cities has seen change of strategy. Historically in Africa, public sector provided centralised solid waste management services in urban areas and cities (Liyali, 2011; Okoth-Okumu, 2012; Akaateba & Yakubu, 2013). Public provision was often constrained by lack of managerial and technical capacity, cumbersome procurement procedures and inadequate financial resources (Longe et al., 2009; Obirih-Opareh & Post, 2002; Akaateba & Yakubu, 2013). These constraints have resulted to a shift in solid waste management from centralised monopolistic public provision to decentralise multiple providers. This shift happened through privatisation of municipal waste services (Sukholthaman et al., 2017) and devolution of power (Post, 1999). Consequently, municipal waste management system are now characterised by three types of operations: public sector, private sector, and public-private partnership (Olukanni & Nwafo, 2019; Hettiarachchi1 et al., 2021). Waste management by the public is limited by lack of managerial, technical capacity, and insufficient financial resources (Akaateba & Yakubu., 2013), which have created opportunities for the private sector to participate in waste management (Hettiarachchi1 et al., 2021).

Private sector participation in solid waste management is to improve the quality of service delivery since they are reliable, efficient, and effective, saves costs and has high economic returns in service delivery (Akaateba & Yakubu, 2013; Anderson, 2011; Greve, 2017; Lartey et al., 2018; Bah & Artaria 2021). However, for private sector to delivery, appropriate safeguards should be in place (Cointreau-Levine, 1994; Awortwi, 2004; OtengAbabio, 2010; Akaateba & Yakubu, 2013; Bah & Artaria 2021). This is because privatisation is linked to environmental pollution, social inequality, low level of payment by the low income communities, low monitoring quality of operators, and can limit access to services if not profitable (Basha, 2007; Katusiimeh et al., 2011; Zafra-Gomez et al., 2012; Lartey et al., 2018; Niekerk & Weghmann, 2019; Bah & Artaria 2021). Some of the safeguards are capacity to monitor and enforce service contracts, sensitisation, timely prosecution of defaulters, functioning performance and complaint structures, and capacity building of performance monitoring and evaluation staff (Anderson, 2011).

The most important and difficult aspect of waste management in developing countries cities is the efficient collection and safe disposal (Harir et al., 2015). The cost of municipal waste collection and transportation accounts for 74% (Jin et al., 2006); yet the aim of privatization is to enhance quality of service by improving efficiency in waste collection (Joness and Pisa, 2000; Rakodi, 2003; Akaateba & Yakubu, 2013). Households are the major generators of solid wastes (Kaseva & Mbuligwe 2005; Kibwage 2002; Oberlin 2011; Okot-Okumu & Nyenje 2011; Okot-Okumu, 2012; Tilaye & van Dijk, 2014; Song et al., 2016). Household solid waste generation accounts for 71% of total wastes; with collection services accounting for 30-50% of solid waste management expenditure in developing countries cities (Cointreau-Levine, 1994; Akaateba & Yakubu, 2013). Augustine and Odhiambo (2009) cited in Khanom et al., (2015) notes that the main challenge in household solid waste management in city estates is primary collection; with Williams and Kelly (2003) positing that the collection is inter correlated with public health and environment. Municipal service reforms call for assessment of its implications especially in context of privatisation and decentralisation (Tilaye & van Dijk, 2014). Bujumbura city undertook municipal waste management reforms a decade ago following withdrawal of city council from waste collection services; yet there are no studies on waste management.

Quality of service is based on actual services rendered to customers based on indicators such as timeliness, reliability, thoroughness and effectiveness (Folz, 2004). Effectiveness of service is the level of result accomplished i.e., level of customer satisfaction with services, number of pick-up made, number of customers revenue gathered, and the number of customers served (Kasim & Ali, 2006; Khanom et al.,

2015). Quality of service is also influenced by participation, demand, awareness, satisfaction level and cost recovery (Obirih & Post, 2002). Quality of service can be used as an indicator of reliability and effectiveness of solid waste operation (Obirih & Post, 2002). Akaateba and Yakubu (2013) enumerates indicators to measure service quality based on 12 indicators. Hassan et al., (2018) used the same indicators to measure beneficiary satisfaction to community solid waste management services in a village. One of the ways to measure quality of service is through customer satisfaction (Massoud et al., 2003; Kassim & Ali, 2006; Baud et al., 2001; Kasseva & Mbulingwe, 2005; Longe et al., 2009; Akaateba & Yakubu, 2013; Obirih & Post, 2002; Hassan et al., 2018; Nsiah-Asamoah, 2019). Customer satisfaction is a variable in measuring customer satisfaction because higher levels of quality of service often lead to higher levels of customer satisfaction and thus, (Giese & Cote, 2002; Khanom et al., 2015; Khanom et al., 2015; Hassan et al., 2018; Nsiah-Asamoah, 2019).

Methodology

The paper is based on questionnaire survey of 308 households serviced by private waste providers across three municipalities of Muha, Mukaza, Ntahangwa. Three zones in each municipality were sampled based on residential class strata - high, medium, and low (Table 2) where 100 households are from high class, 93 medium class and 115 low class. The sampled zones per municipality are Kinindo, Musaga and Kanyosha in Muha municipality; Rohero, Nyakabiga, and Bwiza in Mukaza municipality and Gihosha, Ngagara, and Kamenge in Ntahangwa municipality. Within the zones, a simple random sampling was used to administer a structured questionnaire, the first household was selected at random with a regular interval of 5 until the required number of households were gotten.

Household questionnaire was designed to obtain socio-economic characteristics of each household i.e., gender, age, level of education and occupation; waste collection, transportation and disposal; waste collection charges; and rating of waste collection service quality indicators (Table 2) as enumerated by Akaateba and Yakubu (2013). Three indicators were omitted i.e., condition of disposal site, handling of waste containers during transportation and public monitoring and sanctioning by local authority since they did not receive responses from the households in Bujumbura city. The questionnaire was piloted before data collection took place through a representative sample of 10 households administered in another zone other than those sampled for the survey. The 10 respondents neither participated in the main research nor used as part of the data for this paper. Piloting is often used to refine the questionnaire for more transparency, objectivity and consistency (Mugenda & Mugenda, 2003). Although the non-response from the three indicators were observed during the piloting, still the 12 indicators were used in the main survey. The service quality indicators are the dependent variables while socio-economic factors are the explanatory variables (Table 2). Quality of service is measured through household satisfaction rating of private waste collection services. The satisfaction rating is based on a five-point Likert-scale ranging from very poor to very good and scores calculated to determine the satisfaction. The mean of the scores is calculated to determine the satisfaction level where a mean range of 1-<2.5 is considered unsatisfied, 2.5-3.5 satisfied and >3.5 very satisfied. Table 2 shows that all the dependent variables are ordered variables (column 1) whereas columns 2, 3 and 4 contain the description, abbreviation, and codage of the variables.

Ordinal probit regression is used to analyse the factors influencing as well as determine the households' satisfaction level with the quality of service offered by private solid waste collection providers using SPSS 20.0. The model has a cumulative probability function capable of dealing with a dependent variable to evaluate the probability of an event occurring or not by predicting a binary dependent result from a set of independent variables (Starovoytova & Namango, 2018). Explanatory variable selected at each step is the variable that contributes mostly to the increased significance of the regression based on the maximum likelihood ratio until all explanatory variables that have significant influence on the dependent variable is selected (Hosmer & Lemeshow, 1989). The quality of service is calculated in relation to its influencing

factors as $Y^* = X\beta + \varepsilon, \varepsilon \sim N(0,\sigma)$ where X is the influencing factors, β is a parameter vector, and ε obeys a normal distribution with mean zero. Y is defined as follows:

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$$Y = \begin{cases} 1, \text{ if } Y \leq \delta_1 \\ 2, \text{ if } \delta_1 < Y \leq \delta_2 \\ 3, \text{ if } \delta_2 < Y \leq \delta_3 \\ 4, \text{ if } \delta_3 < Y \leq \delta_4 \\ 5, \text{ if } \delta_4 < Y \leq \delta_5 \end{cases}$$

Where Y = 1, 2, …, 5 represent the responses Very poor, Poor, Fair, Good, and Very good, respectively, and d1, d2, d3, d4 and d5 are critical points. For the logit distribution hypothesis, the random variable is expressed as $\Pr(Y^* < x) = \Lambda(x) = 1/(1 + exp\ (-x)$. For the standard normal distribution (probit) hypothesis, $\Pr(Y^* < x) = \Phi(x) = \int 0x\ (1/2\pi)\ \exp\ (-x2/2)\ dx$

Table 2. Definitions and illustrations of variables

Dependent Variables	Description	Abbreviation	Codage
1. Frequency of waste collection	Number of times waste is collected in the household	FWC	
2. Reliability of waste collection	Respect of the timetable of waste collection schedules	RWC	1= Very poor 2= Poor
3 Prompt response to user complains	Period it takes to resolve or handle a problem	PRC	3= Fair 4= Good
Cleanliness of service area	How the zone is clean comparatively to others	CSA	5= Very good
5 Overall service delivery	How the household perceive the service from the provider in general	OSD	
6. Condition of vehicles/equipment	If they are *in good working condition and serviceable*	CV	
7. Wearing of protective clothing	Use of protective *equipment i.e.,* latex, rubber gloves, boots, aprons	WPC	
8 Collection crew behaviour/attitude	Behaviour/attitude during collection i.e., polite, courteous, customer care	CCB	
9. Education on waste management	Raising the household awareness through training, sensitization, awareness	HEWM	
Explanatory Variables			
Gender	1=Man; 0=Woman		
Age	1=<35 years; 2=35-60 years; 3=>60 years		
Education	1=No formal education; 2=Primary; 3=Secondary; 4=University		
Residential class	1= High; 2= Middle; 3=Low		

Result and Discussion

Household Waste Collection Contracts in Bujumbura City

The Mayor of Bujumbura city authorizes waste service providers to collect waste after verifying their professional experience and the technical and financial means at their disposal. This authorization also determines the area of intervention for these service providers. After obtaining a collection permit, the companies sign contracts for dumping the waste in the dumpsite managed by the Office Burundais de l'Urbanisme, de l'Habitat et de la construction (OBUHA)**.** These contracts determine the dumping fees per cubic metre, which is 2000FBU. Table 3 shows waste collection is organised at zone level, the number of registered households is bigger than the number of households that pay regularly, and the percentage of households that are serviced ranges between 10-88%. Generally, 28.8% of households are serviced by private waste collections distributed by residential class, 38.8% in the high, 50.3% in the middle, and 17.8% in the low.

Table 3. Status of households serviced by private service providers in Bujumbura city

Residential class	Service provider	Households registered	Households who pay regularly	Households serviced (%)
High Residential Class				
Rohero	Bujumbura Cleaning Company	6000	838	14
Kinindo	Abagwaneza Kinindo	956	800	84
Gihosha	Runa Business Company	2300	1950	85
Middle Residential Class				
Nyakabiga	Bujumbura Cleaning Company	5000	2200	44
Ngagara	Omega solution	2,000	1000	50
Musaga	Gira Isuku Company	1357	1200	88
Low Residential Class				
Bwiza	Bujumbura Cleaning Company	6,500	1,400	22
Kanyosha	Iniclaf Group	4986	1700	34
Kamenge	Usafi Kwetu Kamenge	13 288	1311	10

The service provider given three zones has been allocated zones with high registered households; yet registering one of the lowest collection efficiency. Usafi Kwetu Kamenge has the highest number of registered households, lowest paying households and lowest collection efficiency. Table 3 shows that the smaller the number of registered households the higher the number of people who pay regularly and the higher the households serviced and vice versa. The number of subscribers depends on the awareness of households, the involvement of the administrative authorities (zone chiefs, quarter chiefs, and cellular chiefs) and the collaboration between the private waste collection service providers and the administrative authorities. The service providers are not able to mobilize the inhabitants in their collection zones on their own. Households are under no obligation to join a service provider but subscribe according to the convenience of each household and based on direct negotiations. The contracts signed between the two parties are not secured, since they are on monthly basis and either party can discontinue within a month's notice. There are no neither penalties for households that do not pay nor service providers who do not collect waste as their contracts require of them. Consequently, customers do not take the payment of bills on time seriously. Service providers have not been allocated equitably, with some being beneficiaries from many clients while others have a few. Lack of transparency in contract award has the potential to demoralize those who might have been willing to invest in improving the city's solid waste management (Katusiimeh & Burger, 2012).

Frequency of Household Waste Collection in Bujumbura City

The dominant waste collection frequency is every two weeks with a collection frequency range of 45.2-55.7% followed by weekly (27-28%), monthly with13.9-24.7% and lastly twice a week with 2.27% (Table 4). Within the same residential class served by the same private service provider, the collection frequency is different within households of the same zone i.e., once a week, twice a week, once a month and no timetable. This is due to the negotiated contract between the household and the provider.

Table 4. Frequency of household waste collection by private providers in Bujumbura city

Residential Class	Frequency of Collection by Private			
	Weekly	Twice a Week	Every 2 weeks	Monthly
	%	%	%	%
High	27	7	52	14
Medium	28	2.2	45.2	24.7
Low	27.8	2.6	55.7	13.9

Waste collection is not regular and defined per zone and quarters. This can be attributed to the lack of regulation that governs the operation of private waste collection, the absence of performance targets and monitoring mechanism. Although there are notebooks signed every time waste is collected, it is not being used for monitoring.

Household Waste Storage, Transportation and Disposal in Bujumbura City

Households in all residential class store waste mostly in sacks (32.3 %) in high, 30.90% in middle and 36.80% in low, with both containers being non-standardised reused plastics containers. Waste storage facilities in Bujumbura city are not regulated or standardised by the council, neither do the waste collection service providers give labelled storage bags.

The mode of transportation in the different areas is by tipping trucks for the authorised service providers. The status of waste collection and transportation in Bujumbura is poor, with 83% of vehicles being hired per month being over 10 years old, which break down often; 17% are relatively in good condition and aged between 2-3 years; whereas 10% are purchased and owned by one company.

Table 5. Household Waste Storage, Transportation and Disposal in Bujumbura

Residential Class	Storage				Mode of Transportation				Knowledge of Final Disposal			
	Closed Container		Open Container		Sack		Trucks		Dumpsite		Unknown	
	n	%	n	%	n	%	n	%	n	%	n	%
High	6	60	2	15.4	92	32.3	100	56	56	56	44	44
Medium	1	10	4	30.8	88	30.9	93	46.7	43	46.7	49	533
Low	3	30	7	53.8	105	36.8	115	57.4	66	57.4	49	42.6

Mubone is the only dumpsite that the city of Bujumbura possesses, which is now inoperable and saturated, but trucks continue to unload waste to it. The knowledge of final disposal is 56% for high, 47.7% for medium and 57.7% for low-income residential areas. This means that the level of awareness and sensitisation by the council or service providers about the responsibility of the inhabitants in waste management especially on final disposal of waste is inadequate. Because of the limited resources available to waste management authorities, waste management services have traditionally been characterized by unreliable collection and inadequate disposal (Kgathi & Bolaane, 2001; Bolaane, 2004).

Household Waste Collection Charges in Bujumbura City

Waste charges are negotiated in reference to prices set by the city council for residential quarters or zones. The different prices observed within the same zone is explained by the subdivision of Bujumbura city into zones, with each zone further classified into residential quarters of high, middle and low class. The classification is done considering the type of buildings in the area and not necessarily on income level. There are no zones operating strictly within the set price range since prices are flexible and negotiable. In areas where prices are high compared to the amount set by the city council as shown in Table 6, the difference is explained by the frequency of collection that the provider makes in that household and negotiated amount as espoused by the contract in place between the provider and the client. Mohammad et al., (2016) note that a desirable charging system for solid waste management systems is that which will generate sufficient revenue while providing incentives for citizens to reduce their waste generation. Such fee system, therefore, will be attractive to the formal private sector that is motivated by profits to play significant role in the provision of waste collection services (Bolaane & Isaac, 2015).

Table 6. Amount paid for household waste collection per month in Bujumbura city

	Amount (FBU)								
Residential class	<5000		5000 -<10000		10000 –>15000		>15000		Set Charges
	n	%	n	%	n	%	n	%	
High	47	34.8	49	36.3	14	10.4	2	1.5	2000-15000
Middle	57	49.6	38	28.1	11	8.1	2	1.5	2000-7000
Low	58	43.0	49	36.3	17	12.6	2	1.5	2000-3000

Household Satisfaction to Quality of Service by Private Providers in Bujumbura City

Table 6 shows the descriptive statistics for the dependent and explanatory variables. Among all respondents, the clients are most satisfied with the quality of waste collection by private service providers. The table shows that the gender ratio of the respondents is low, most of the respondents are between 35-60 years, educational level is high and the private companies prefer serving in areas with a higher educational background because the inhabitants have a better understanding of waste management practices and can pay for waste collection services provided by a private providers (Katusiimeh et al., 2012).

Table 7. Descriptive statistics of variables in the regression logistic model

Variables	Observations	Mean	SD	Min	Max
1. FWC	308	4.18	.868	1	5
2. RWC	308	4.09	.933	1	5
3. PRC	308	4.11	.897	1	5
4. CSA	308	4.30	.704	1	5
5. OSD	308	4.18	.795	1	5
6. CV	308	3.76	.909	1	5
7. WPC	308	4.21	.823	1	5
8. CCB	308	3.32	.901	1	5
9. HEWM	308	3.14	1.051	1	5
Gender	308	1.40	.491	1	2
Age	308	2.94	1.365		
Occupation	308	3.87	2.725	1	8
Residential class	308	2.049	.835	1	3
Education	308	3.06	.960	1	4

The correlation coefficients between the dependent variables are observed in Table 8, which indicate that there is no strong correlation between the nine indicators of quality of service, which allows the regression. Table 8 shows that out of 9 indicators of service quality, 6 are significant except RWC, WPC, CCB where $p>0.05$. Gender does not have significant relationship with the degree of satisfaction in service quality whereas residential class has a statistically significant, $p<0.05$, in all the variables at the 10% level except CV and HEWM where the level of significance is 1%. This shows that the respondents who live in high residential class expressed greater satisfaction with their service quality than those who lived in middle and low residential class. The findings are in line with those of Akaateba and Yakubu (2013) and Katusiimeh et al., (2012) who concluded that householders are generally satisfied with private waste collection services. Anestina et al., (2014) found that 56% of users in low-income areas and around 61% of users in high-income areas in Nigeria appear to be satisfied with the current quality of service provided by private domestic solid waste service providers.

These findings contradict those of Awortwi (2004), Ezebilo and Animasaun (2011), and Longe et al., (2009), who found that most residents were dissatisfied with private sector solid waste management services. The coefficient of the education variable is significantly positive at the 5% level, indicating that the respondents with higher education are less likely to be satisfied with the service quality than the lower education, which means that the higher the educational level the higher the expectations from service provider and thus are more exigent than the lower education. The findings are not in tandem with Hassan et al., (2018), who established that there is no significant difference ($p>.05$) between educational level and householders satisfaction across all quality variables of waste solid waste management service.

Table 8. Pearson correlation coefficient matrix between dependent variables

	1. FWC	2. RWC	3. PRC	4. CSA	5. OSD	6. CV	7. WPC	8. CCB	8. HEWM
FWC	1								
2. RWC	.771**	1							
3.. PRC	.556**	.589**	1						
4. CSA	.580**	.557**	.547**	1					
5. OSD	.679**	.628**	.614**	.619**	1				
6. CV	.293**	.329**	.278**	.197**	.382**	1			
7. WPC	.328**	.326**	.396**	.421**	.365**	.299**	1		
8. CCB	.215**	.261**	.236**	.183**	.256**	.531**	.278**	1	**
9. HEWM	.486**	.477**	.475**	.491**	.542**	.491**	.402**	.471**	1

**. Correlation is significant at the 0.01 level (2-tailed)

Table 10 shows the mean of the answers on the 9 indicators for each respondent to know if they are satisfied or not. The satisfaction among the high, medium and low residential class are high in the mean category of 2.5-3.5 where the percentages are 48%, 64.5% and 72.2% respectively. This observation shows that the high number of the respondents in all residential class are satisfied. This is explained by the different charges observed within the residential class (Table 5). Waste collection services are based on the contract between the households and the service provider. The current findings are in line with those of Ezebilo and Animasaun (2011), who reported that higher income householders have relatively higher levels of satisfaction with waste collection services.

Table 9. Estimation results of the ordinal probit regression model

Variables	Modality	FWC	PRC	CSA	OSD	CV	HEWM
Gender	Man	0.189	0.391	0.139	-0.010	- 0.335	- 0.181
	Woman	Reference					
Age (Years)	<35	0.578	0.845	0.700**	1.088	-.412	0.160
	35-60	0.545	.906**	0.613**	0.760	-0.301	1.006**
	>60	Reference					
Level of Education	No formal education	0.127	1.030**	0.562	0.072	0.290	0.999**
	Primary school	0.154	0.551	0.205	0.760	0.306	0.271
	Secondary school	-0.073	0.630**	0.131	0.046	-0.176	0.557
	College/university	Reference					
Residential Class	High	0.571**	0.753**	0.731	0.860**	0.960***	1.063***
	Middle	-0.060	0.349	0.149	0.121	-0.220	0.320
	Low	Reference					
N		308	308	308	308	308	308
Pseudo R2		0.013	0.031	0.018	0.036	0.031	0.043
P-value		0.003	0.002	0.032	0.001	0.002	0.000
-2 Log Likelihood		362.526	375.008	284.296	336,518	376.455	345 .178
X^2		10.418	24.569	11.764	26.373	25.090	30.411
Pearson		278.507	290.576	254.449	249.474	258.293	231.122
Deviance		214.562	230.594	158.825	198.461	231.880	216.044

Key: X^2 Chi-Square; * significance at 10%; ** significance at 5%; *** significance at 1% level.

Table 10. Households' satisfaction to quality of service by private providers in Bujumbura

	Mean					
Residential	Unsatisfied [1-2.5]		Satisfied [2.5-3.5]		Very satisfied (>3.5)	
Class	n	%	n	%	n	%
High	19	19.0%	48	48.0%	33	33.0%
Medium	25	26.9%	60	64.5%	8	8.6%
Low	26	22.6%	83	72.2%	6	5.2%

Conclusion

Privatization of waste services in Bujumbura city has led to reorganization of municipal waste management services where the private sectors are responsible for waste collection, citizens pay for the service and public managing the dumpsite. The privatisation has resulted in a shift of the burden of waste collection from public to citizens, decentralised collection to the zones, and expanded the coverage; but the collection rates are still low. Low collection rates are attributed to inadequate safeguards in place for a well-functioning waste service delivery under the privatisation regime.

The developed indicators used in measuring service quality through satisfaction survey (Akaateba and Yakubu, 2013) are comprehensive, but not all indicators are applicable at the households neither are all indicators applicable at households significant. There is need, therefore, to review the indicators and subject to further research to determine the indicators that are robust for measuring quality of service through satisfaction survey for various service beneficiaries and urban scales.

The research findings show that majority of inhabitants in residential areas are satisfied with quality of waste collection services by private providers in Bujumbura city. However, households' living in high class residential areas expressed greater satisfaction with the quality of service than those who live in middle and low class; a finding, which is supported by the literature. The paper recommends that there is need to assess the quality of service provided by private companies following privatisation reforms to monitor its performance for improved service delivery. Customer satisfaction survey should not be the only tool for measuring service quality offered by private providers but is one way of giving rapid feedback to clients and service providers about areas they need to improve or have done well.

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