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Private Waste Management Services Utilization among Households in the Kumasi Metropolis, Ghana

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Solid waste production from excessive consumption remains one of the most pressing global environmental challenges currently. Particularly for burgeoning cities of developing countries, rapid population growth tend to exacerbate the problem, with profound public health and environmental consequences. In Ghana, over 4.5 million tons of municipal solid waste is produced annually. Public waste management services are barely able to keep pace with the rate of solid waste production. Recently, private waste-management services have emerged as one possible solution, therefore opening a set of research questions among which being what factors influence households to utilize such services. Through a multi-stage random sample of 660 households, we explored household utilization of private solid-waste management services, specifically focusing on what socio-behavioural factors may help explain levels utilization. Descriptive statistics show that 68% of the respondents did not utilize private waste management services. Logistic regression analyses revealed gender (OR = 0.116, p = 0.003), perception of waste as a problem (OR= 0.234, p = 0.027), awareness of existing waste management options (OR = 5.561, p = 0.008), knowledge about waste management service providers (OR = 0.013, p = 0.001) and cost of waste management services (OR = 0.839, p < 0.001) as significant predictors of household waste management services utilization. We conclude with a discussion of the broader policy implications of our results in the context of addressing the growing menace of excessive solid waste production in the global south.

Key Words: Ghana, household waste, waste management, waste services utilization, socio-economic

Introduction

The production of large quantities of solid wastes is a growing problem in rapidly urbanizing cities of developing countries. How solid waste is produced, collected, and managed has direct public health implications, especially in cities because of overcrowding and intense human activity (Asase et al. 2009). Growing rates of solid waste generation from overconsumption, coupled with inadequate disposal facilities, makes the situation especially severe in Sub-Saharan Africa. For developing and rapidly urbanizing countries such as Ghana, as development occurs, the challenges regarding proper and efficient disposal of solid waste deepens. Failure to provide proper waste management systems has inevitable environmental and public health consequences. In Ghana, about 4.5 million tons of municipal solid waste was generated is generated annually, with about 90 percent of this not properly managed or disposed (Ofori-Boateng, Lee, and Mensah 2013). The environmental and health implications are profound. Further complicating the issue in Ghana is rapid population growth and urbanization. For example, according to the last census, the country's annual growth rate stands at 2.2% (GSS 2010). Increased solid waste production will remain a direct consequence not only of this soaring trends in population but also due to increasing levels of consumption.

Understanding the key factors associated with household utilization of solid waste is critical to curbing solid waste menace in any country including Ghana. In the Kumasi metropolis where the study was situated, like most cities in the developing world, several tonnes of solid waste are left uncollected on the streets each day, clogging drains, creating feeding ground for pests; the public health implications are obvious. Recognizing the centrality of behavior change, and acceptance of any interventions and reforms towards addressing the issue of excessive solid waste production in municipalities, as well as being cognizant of the important role private waste management operators may play, our study sought to understand how socio-economic and behavioral factors enable or inhibit household decisions to utilize private waste management services. In the ensuing sections, we outline a brief review of relevant literature, describe the methods used to

collect the data, present our results and discussion, and conclude.

The causes of excessive solid waste generation, and lack of proper management, stem from many factors although some scientists have noted that the problem persists largely due to inadequate service coverage, operational inefficiencies of services, and limited recycling (Asase et al. 2009). The concept of solid waste management is broad, and may range from—control of waste generation, storage, collection and transport practices—to public health, economic, financial, and administrative and legal dimensions (Omran et al. 2009). In recent times, the goal of solid waste management has evolved towards a more integrated approach to include environmental protection, human safety, and resource conservation (Asase et al. 2009). In spite of these multifaceted nature of waste management, behavior change remain central to any course or reform that aims at managing excessive waste production and containing the problem once the waste has been produced. Furthermore, behavior change is also predicated on different socio-economic factors and attitudes, which ultimately explain whether and how individuals at the household level adopt or reject proposed interventions.

The relationship between socio-economic factors and attitudes toward waste has received a lot of scholarly attention (Slagstad and Brattebø 2013, Dangi, Urynowicz, and Belbase 2013, Moh and Abd Manaf 2014). Most of the studies have shown that attitude, knowledge, demographic variables, and personality traits are significant determinants of household waste management adoption and practice (Schultz, Oskamp, and Mainieri 1995, Chu and Chiu 2003). Purcell and Magette (2010) found that education, household type, age, and other related socio-economic variables are significantly linked to household waste management decisions. Poverty, affordability, willingness to pay for services, age, and ethnicity have also been shown to significantly influence waste-recycling behavior (Bernstein 2004). While the results have been mixed, substantial evidence points to socio-economic status as an important predictor of household recycling behavior. While private waste management services continue to play an important role in waste management, usually helping supplement efforts by conventional public and government-based management sector, factors that tend to influence households to adopt private sector services have barely been a subject of any scholarly attention.

The conceptual framework for this study is based on the socio-behavioral model (SBM) (Taylor and Todd 1997, Anderson 1998, Tonglet, Phillips, and Read 2004). Originally developed to study the determinants of acute health care services, the SBM suggests that access to health services is a direct result of individual decisions which may further be influenced or constrained by other societal factors. In the original model, health care services and individual factors were the most influential on people's decision to access care. The SBM groups individual factors into three: need-based, enabling, and predisposing. Need-based factors include individuals' perceived and evaluated functional capacity, symptoms, and general state of health. Enabling factors encompass family and community resources and accessibility of those resources. Predisposing factors include age, sex, marital status, education, race, ethnicity, occupation, and beliefs (e.g., attitudes toward health services, knowledge about disease, and values) that influence particular health choices.

Drawing from the tenets of the socio-behavioral model, our study hypothesis was that household utilization of private waste management services will be a direct function of predisposing, enabling, and need factors (See Figure 1). In the context of our study, we considered, as predisposing factors: age, gender, religion, global health assessment, prior experiences with illness, formal education, attitudes towards health services, and knowledge about the illnesses. For enabling factors, we focused on availability of private waste management services, financial resources to patronize services, health insurance, and social network support. Finally, for need factors, our interests were perception of severity in terms of effects of improper waste disposal, treatment preference, total number of sick days for a reported illness, total number of days in bed, and number of lost days from work.

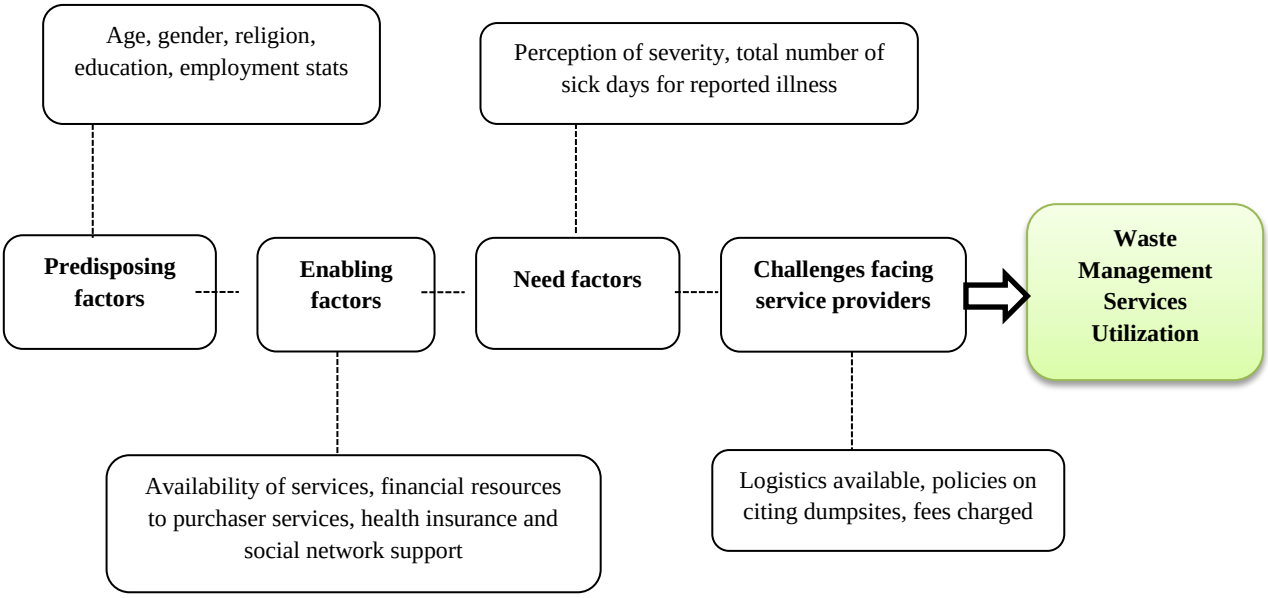

Figure 1: Socio-behavioral factors and waste management services utilization

Methods

The study involved a cross-sectional survey of 660 households using a structured questionnaire, and administered as face-to-face interviews. The study was conducted in Kumasi, the second largest city in Ghana, with an estimated population of 1,634,901 and an annual growth rate of 3.4%. Being a very busy and thriving city, the main livelihoods of the inhabitants are trading and to a much less extent, farming (Ghana Statistical Service, 2010). The city is often referred to as the major economic hub of Ghana. We selected three sub-metropolitan areas in the city (Asokwa, Manhyia North and Bantama) which are predominantly residential. Our choice of these cities is justified on the grounds that they are mostly residential, and known to utilize either house-to-house private individual waste collection services or private services.

The sample population comprised households with more than twelve months stay in the community. We assumed that households with more than twelve month stay in the community have adequate knowledge about the existing private waste management services, and well equipped to provide meaningful responses to our questions. Through a two-stage sampling technique, we first selected the three sub-metropolitan areas from the city, and then randomly selected 660 households based on a ratio of 40:36:24 corresponding proportionally with the sub-metropolitan populations. The structured questionnaires were pre-tested and necessary corrections made to improve the validity of questions. Broad topics in the questionnaire included socio-economic background of households, knowledge and awareness of existing waste management services, whether or not they patronize the services, and beliefs and motivations for patronizing private waste management services. Statistical analysis of the surveys was done with STATA software version 11. The dependent variable was *waste management services utilization (WMSU)* while the independent variables considered for analysis included availability of services, affordability of services, socio-cultural factors, educational levels, household size, and household socio-economic status. For the purposes of logistic regression analysis, the independent variables were dichotomized into (1's and 0's), corresponding to yes and no responses respectively.

Results and Discussion

The central question addressed in the study aimed at unearthing the socio-behavioral factors that influence household decision to utilize private waste management services. Based on the 660 household surveys conducted, we present in this section the results and a cautious interpretation of what their broader meanings are, and how they relate to a broader context of solid waste management. The

descriptive statistics, presented in Table 1, shows that the average age of respondents was 35.9 years (SD = 13.9). The largest proportion of respondents (36.4%) was between 20 and 30 years old. Out of the total respondents, majority (77%) turned out to be women. This was due the fact that in the communities where we administered the questionnaires, women usually take care of household activities related to waste disposal. In addition to this, during the interview hours, most men were absent as they mostly travel to the inner city to work making women the most accessible group in the households. Also, (39.8%) had at least a junior high school education and (53.6%) of the respondents were married.

Table 1 Socio-Demographic Composition of Sample Population (N=660)

Variable	Frequency	Percentage
Age group		
10 - 19	40	6.1
20 – 29	240	36.4
30 – 39	147	22.3
40 – 49	107	16.2
50 – 59	74	11.2
60 and above	52	7.9
		22.9
	151	77.1
Sex	509	
Female		
Male		
Marital status		
Married	354	53.6
Not married	306	46.4
Household size		
< 5	224	33.9
5 and above	436	66.1
Educational level		
None	40	6.1
Primary	84	12.7
Junior High School	263	39.8
Senior High School	135	20.5
Technical School	46	7.0
Tertiary	92	14.0
Wealth Status		
Very rich	7	1.1
Rich	107	16.2
Moderately rich	477	72.3
Poor	56	8.5
Very poor	13	2.0

Waste Management Services Utilization (WMSU)

This section situates waste management utilization within the three factors outlined in our conceptual model—need, enabling, and predisposing. Overall, 32% of residents patronized the services of private waste management companies whereas 68% did not. As will be explained later, household utilization of waste management services were low for two main reasons: households could not afford the cost of services or were unaware of existing companies offering such services. Almost all the respondents (99.4%) saw the need to dispose waste, citing disease prevention and health related reasons.

In the bivariate logistic regression analysis, none of the predisposing factors significantly explained variations in household utilization of waste management services. As evident from Table 2, age (p=0.485), gender (p=0.140), household size (p=0.717), and number of household residents with a sanitation-related illness in the past 6 months (p=0.095) were not significant predictors of

household waste management services utilization. The likelihood to patronize waste management services was influenced by household awareness of available services. We observed that knowledge of available service providers increased the odds of utilization by 3.541 (OR = 3.541, p = 0.015). Higher cost of waste management services significantly reduced household patronage (OR = 0.848, p < 0.0001). The fear that one could die from sanitation related diseases such as diarrhoea had a 2.449 fold increase in the likelihood of use of services of waste management companies (OR = 2.449; p<0.0001). Apart from the respondent's fear of death from sanitation related diseases, all the other need factors we tested did not significantly influence the odds of utilizing private waste management services.

Table 2 Multivariate Logistic Regression of determinants of WMS utilization

Variable	Odds ratio	[95% C.I]	P-value
Predisposing factors			
Age	0.996	[0.984, 1.008]	0.485
Gender	0.746	[0.506, 1.101]	0.140
Household size	1.065	[0.757, 1.499]	0.717
Sick dependant	0.888	[0.772, 1.021]	0.095
Presented sanitation related disease	0.693	[0.466, 1.031]	0.071
Enabling factors			
Know service provider	3.541	[1.277, 9.816]	0.015
Knowledge of services provided	0.037	[0.005, 0.265]	0.001
Distance from dumpsite	1.036	[0.988, 1.086]	0.140
Amount	0.848	[0.788, 0.913]	0.000
Dumping rate	0.765	[0.570, 1.026]	0.073
Free dump of waste	0.521	[0.157, 1.728]	0.286
Register with WMS provider	0.250	[0.045, 1.394]	0.114
Amount affordable	0.916	[0.819, 1.024]	0.124
Alternate forms of payment	0.149	[0.025, 0.909]	0.039
Need factors			
Services of WMS needed	0.597	[0.233, 1.528]	0.282
Improper waste disposal cause illness	0.493	[0.137, 1.775]	0.279
Cause death	2.449	[1.595, 3.759]	0.000
Sanitation related sickness	0.831	[0.586, 1.177]	0.297

Outcome Variable = WMS utilization

In table 3, we present the results of the multivariate logistic regression analysis that tested the strength of association between predisposing, enabling, and the need factors on the utilization of waste management services. In model 1, we tested for the combined effect of all predisposing factors while controlling for enabling and need factors. None of the predisposing-factor variables had a statistically significant relationship with the utilization of waste management services. However, in model 2, when we tested for the association of predisposing and enabling factors while holding need factors constant, gender differences significantly influenced the utilization of waste management services. Females were less likely to utilize waste management services (OR=0.4). This was particularly surprising as other studies have showed that women are more prone to engage in waste management than men. For example, in Sweden, Bartelings and Sterner (1999) found that women were more likely to invest money or pay for waste management compared to men. However, an alternative explanation for this counter intuitive finding could be that females, despite their appreciation of the importance of proper waste management and hygiene, may resort to other ways of disposing waste where they do not have adequate financial capacity to utilize private operators. When all variables were kept constant, as in model 2, the enabling factors that significantly influenced waste management services utilization were services needed, knowledge of waste management services, and the affordability of service fee. As expected, having no knowledge of existing waste management services strongly decreased the likelihood of utilizing waste management services (OR = 0.02). In model 3 where the combined effect of all three main factors

were tested, perception that sanitation related illness causes death positively influenced utilization of waste management services (OR=3.0). This is consistent with what Barr, Ford, and Gilg (2003) noted in an earlier study, that environmental values, situational characteristics and psychological factors play a significant role in the prediction of individual and household waste management behaviour.

Table 3 Multivariate Logistic Regression of determinants of WMS utilization

Variable	Model 1 OR [95% C.I]	Model 2 OR [95% C.I]	Model 3 OR [95% C.I]
Predisposing factors			
Age	1.0 (0.9 -1.1)	1.0 (0.9 -1.0)	1.0 (0.9 -1.0)
Gender (male = ref)	0.7 (0.5 – 1.1)	0.4 (0.2, 0.9)*	0.4 (0.2, 0.9)*
Household size	0.9 (0.6, 1.3)	0.9 (0.2, 0.9)	1.0 (0.5, 1.9)
Daily expenditure	1.0 (0.9, 1.0)	1.0 (0.9, 1.1)	1.0 (0.9, 1.0)
Enabling factors			
Know provider (yes=ref)		3.4 (1.7, 6.7)**	4.0 (1.8, 8.7)**
Know services provided (yes=ref)		0.02 (0.0, 0.1)**	0.01 (0.00, 0.1)**
Dumping rate		1.1 (0.9, 1.2)	1.1 (0.9, 1.3)
Free dump of waste		0.6 (0.3, 1.2)	0.5 (0.2, 1.1)
Registered with WMS provider (yes= ref)		0.003 (0.0, 0.01) **	0.003 (0.0, 0.02) **
Amount affordable (yes = ref)		0.79 (0.7, 0.8)**	0.8 (0.75, 0.9)**
Alternate forms of payment		0.9 (0.4, 2.3)	0.9 (0.3, 2.4)
Need factors			
Services of WMS needed			0.5 (0.1, 2.4)
Improper disposal cause illness			0.3 (0.1, 1.7)
Improper disposal cause death			3.0 (1.3, 6.9)*
Sanitation related sickness			1.6 (0.8, 3.5)
N	624	432	416
Log likelihood	-381.33	-132.35	-124.02
Prob> chi square	0.105	0.000	0.000

Main Variable = WMS utilization (*) = p< 0.05 (**) = p< 0.01

Conclusion

Our study has relevance for a growing and worrying phenomenon particularly for developing countries—the production of large amounts of solid waste with limited capacity for management. At a local level, the case study has demonstrated that some socio-behavioral factors can predict household utilization of waste management services. For the Kumasi metropolis where the study was conducted, the most important factor was awareness of existing waste management services. Knowing that WMS providers were available significantly increased the odds of utilizing the services. Factors such as waste disposal being a problem and cost of waste disposal were also significant factors of whether or not households utilize available waste management services. The significant factors identified in the study are important considerations for effective waste management planning. Given that knowledge of service providers was an important predictor of utilization, policy efforts towards household waste management should incorporate education of households and marketing of available services. Respondents who felt WMS was needed were about 4 times more likely to patronize WMS. This indicates that creating awareness about waste management services, and ensuring the households register with WMS providers, remain critical steps towards solid waste management campaigns. Respondents who had not registered with a waste service provider were significantly less likely to patronise services.

Furthermore, our study shows that affordability of services provided is an important consideration for households. While we recommend education and awareness creation, it is also important for the Kumasi Metropolitan Assembly and other municipal authorities to have a pricing policy for private waste services companies so that poor households can equally afford. Pro-poor waste management pricing policies will give incentives to residents to participate in waste management. Finally, practical implications and lessons for other developing countries, especially for rapidly burgeoning cities of Sub-Saharan Africa

where solid waste remain a huge problem. In attempting to address the problem, consideration need not only be targeted at celebrating the proliferation of private waste management companies without adequate sensitization of municipalities and households to thoroughly utilize those services.

Answers provided in this study is of practical importance; it does provide an avenue to think about lasting solutions to the ever growing solid waste problem in many cities, especially ones in Sub-Saharan Africa on the verge of becoming mega cities. Part of the answers we have provided can facilitate reforms that target municipal settlements. Our results have drawn attention to the fact that humans, for that matter behavioral change, is central to any initiative towards addressing solid waste menace, and that not only does solutions lie in technological advances such as recycling, but also in initiatives that seeks to understand the reasoning behind household choices. Above all, our paper has touched on a very relevant subject such as solid waste management, and through the results, opened avenues for further research. Some of the questions that lie beyond the scope of our paper but for which adequate understanding can help advance solutions include incentives for this emerging private waste management market. For example, what are the motivations behind this emerging market, what are their incentives for participating in the business? Moreover, our understanding of the institutional arrangements surrounding such a small scale industry could well contribute to sustainable solutions. Ultimately, the policies, reforms, and institutional landscapes within which such small scale industries are embedded could either hinder their growth or enhance their operations in a positive way.

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