SCIREA Journal of Economics

http://www.scirea.org/journal/Economics

April 25, 2017

Volume 2, Issue 2, April 2017

Socio-economics variables and solid waste generation and management in Port Harcourt Metropolis

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ABSTRACT

Some select socio–economic variables of solid waste generation and management were investigated in the entire 20 wards of Port Harcourt Metropolis, Rivers State, Nigeria. This was done in order to gauge the effects of socio-economic factors such as income, size of the family, employment status, educational qualification, packaging and disposal techniques on waste generation and management and to produce adequate information for waste planners. The 20 wards of Port Harcourt were grouped into three zones representative of building patterns, population density and preconceived social classifications. The zones are low (low density population), medium (medium density population) and high zone (highly populated areas). Questionnaires were distributed to 133 respondents in each of the classified zones; a total 399 questionnaires were distributed. Data were analysed using Analyses of Variance (ANOVA) and correlation analyses with the aid of SPSS software. Results showed that there were significant differences (p=0.05) between zones in parameters such as income, educational qualification, family size and employment status; the low zone had higher incomes, employment levels, educational status but lower family sizes than the middle and

high zones. Also Income was positively correlated with amount of waste generated (p=0.05. r=0.113), educational qualification was positively correlated with waste generated (p=0.05, r= 0.342) income was negatively correlated with size of family (p=0.01, r=0.327). The result also indicated that people in the high zone having low incomes are likely to deposit anywhere and anyhow. This study therefore accepts that solid waste generation and management is a function of income, educational attainment and household size. Based on the findings from this research, it can be concluded that the problem of waste generation and management is simply tied to the socio-economics of the populace in Port Harcourt. Therefore the management of waste lies in addressing socio-economic issues and inequalities.

Keywords: Socio –economics, solid waste, generation, management, Port Harcourt

1.0 Introduction

Port Harcourt the "garden city" is the capital city of Rivers State. It covers an area of about 478km^2 and has its physical setting within the Niger Delta up to the Bonny River in the south and a bluff of solid rising above the eastern brink of the River Niger with its vast hinterland in the North (Omoh, 1998). It is located at Longitude 7^0.15' and Latitude 4^0.45'. It shares common boundaries with Obio/Akpor Local Government Area in the North, Okriika Local Government Area in the south-East and Degema Local Government Area in the South-West of Rivers State (Akubo, 2000). It is remarkable to Nigeria in many regards, top of which is its status as the third most important city in Nigeria and its reputation as being the cleanest state capital (Garden city). It is also touted as the "oil city" in obvious reference to the fact that it has the highest amalgam of oil multinational companies doing business and residing there.

It has an estimated population of about Six Hundred and Eighteen Thousand Four Hundred and Fifty Six (618,456) people from Five Hundred and Sixty Three (563) settlements with a population density of over 40 persons per square kilometers, yet experiencing a rapid increase in its population due mainly to the presence of a sea port and myriads of multinational oil companies (Naluba, 2011). Population growth, rising standard of living, increased urbanization and industrialization have always contributed to increased solid waste generation in both industrialized and developing countries (Beede and Bloom, 1996).

Studies show that unmanaged waste disposal was considered the main cause of environmental and Health problems in Port Harcourt. Thus solid waste management is a growing issue in the context of urban environmental degradation of Port Harcourt. The rate of growth of population of Port Harcourt city is among the highest among the cities of Nigeria. Due to the rapid increase in population and increase in the consumption of packaged goods, the amount as well as the quantum of non-biodegradable waste is increasing over time. There is an acute environmental need therefore to look into issues bothering on socio-economic and attitudinal dynamics of waste generation and management in Port Harcourt. This study is therefore initiated to provide vital information for policy planners and waste management practitioners.

2.0 Method of Study

2.1 Area of Study

The study was carried out in Port Harcourt city in Rivers State, Nigeria. Port Harcourt metropolis is divided into 20 wards. Wards are not homogenous but heterogeneous in terms of population density and land use patterns.

2.2 Research Design.

For the purpose of this study, a quasi-experimental research method was employed. This entails a well-articulated survey technique. The survey research method was adopted to obtain fresh data from respondents. Two major sources in the collection of data were used in this research study.

2.3 Data collection method and sources

The two main sources utilized are primary sources of data and secondary sources of data

The primary data were obtained through the Data collected from personal interviews, Data collected from questionnaires administration, Data collected from observation and Information from households was collected using a structured questionnaire.

Majorly secondary data were gathered or obtained from Text books on waste management and waste business, Governmental records/ Institutional hand books, Newspapers, periodicals and papers, Journals articles/research papers and Research projects of other graduates etc.

Secondary information was collected from population census figures and the Independent National Electoral Commission (INEC) revealing the population distribution in the intended sampling areas.

2.4 Population of the Study

The population of the study is made of all the estimated 618,456 people in Port Harcourt, scattered all over 563 settlements that make up the 20 wards.

2.4.1 Determination of Sample Size

Sample size was determined by using Yaro Yamane sample size determination formula, which is stated below as follows;

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

Where: n = the sample size to be determined; N = the population of the study.

e = Limit of the error acceptable for the study = 5%; 1 = constant

Therefore from the above, the total estimated population of people in all 20 wards is Six Hundred and Eighteen Thousand Four Hundred and Fifty Six (618, 456).

The sample size of the study would be; n = 399.741 approximately = 400

Therefore 400 questionnaires were divided among the representatives of the entire 20 wards of Port Harcourt

2.4.2 Selection of Study Areas and Size of the Sample.

All the wards were categorized into three main zones i.e. Low, Middle and Upper depending on population density, settlement and land use pattern. 6 wards (30%) out of the 20 were selected for field study. To make the sample more representative, wards were selected in such a way that they cover all the zones i.e. Low, Middle and Upper. Thus, 2 wards from the Low, 2 from the middle and 2 from the Upper zone were selected. A total of 133 questionnaires were distributed in the low, 133 questionnaires in middle and 133 questionnaires in the upper group.

2.5 Data Collection Method

The name and number of the household head was collected from the final population census list of 2006 for the 6 selected wards. After preparing the list of the household heads, sample households were selected randomly using the Table of random numbers. The information

from the household was collected with the help of a structured questionnaire. The questions were on demographic characteristics of the households, information on waste generation by types, waste disposal practices (e.g. throwing in street, river, burning etc.), door-to-door collection systems, monthly fee, and Family income, sources of income, education level, and possession of domestic amenities were among the questions asked.

The households were visited twice to complete the questionnaire. On the first day socio-economic information was collected and households requested to deposit the wastes in different plastic bags. On the next day the wastes were weighed. Three research assistants (one from each zone) were employed for the work.

2.6 Data Analytical Method

The data was entered in the computer and analyzed using the Statistical Package for Social Sciences (SPSS®) statistical tools. Data was grouped for the Low, Middle and Upper zones. Analysis of variance (ANOVA) was conducted in order to determine difference or similarity of the respondents views of the variables between zones. Multiple Correlation analyses were conducted to determine the inter-relationship between measured variables (income, waste generation, employment status, family size, educational qualification etc).

3.0 Result

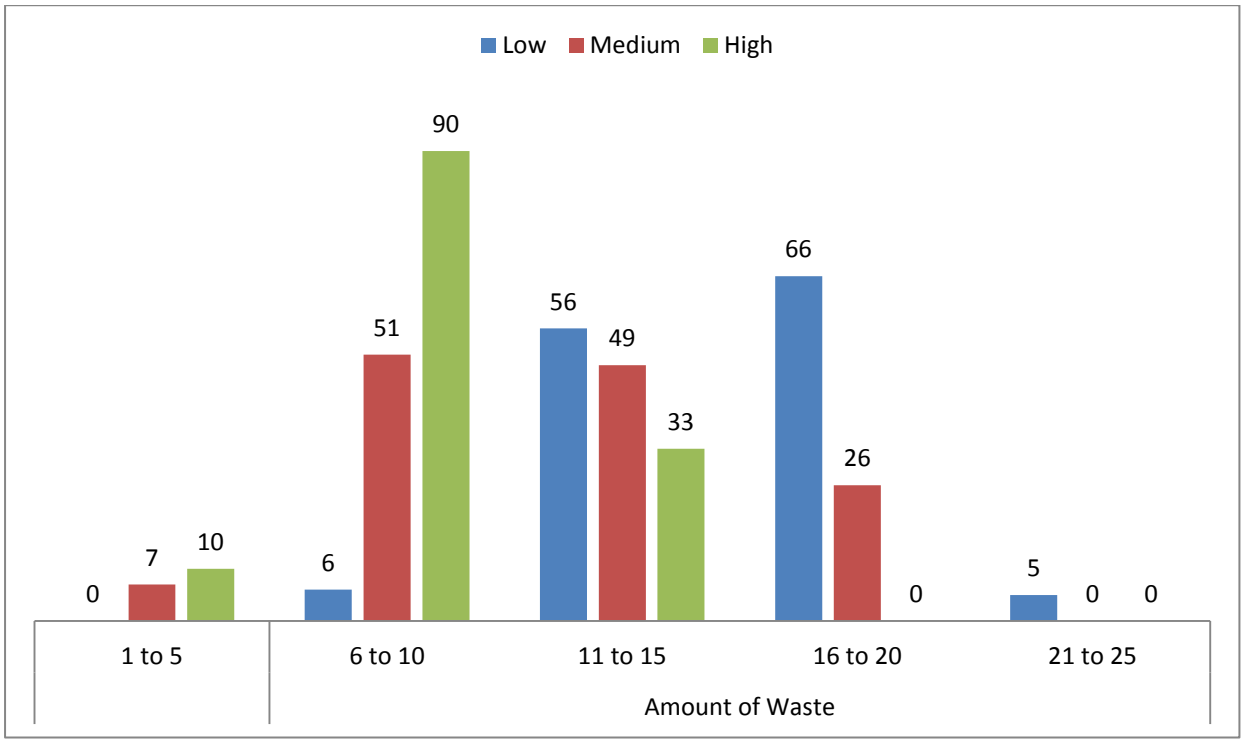

Figure 3.1: Bar chart of amount of waste produced by respondents in all zones

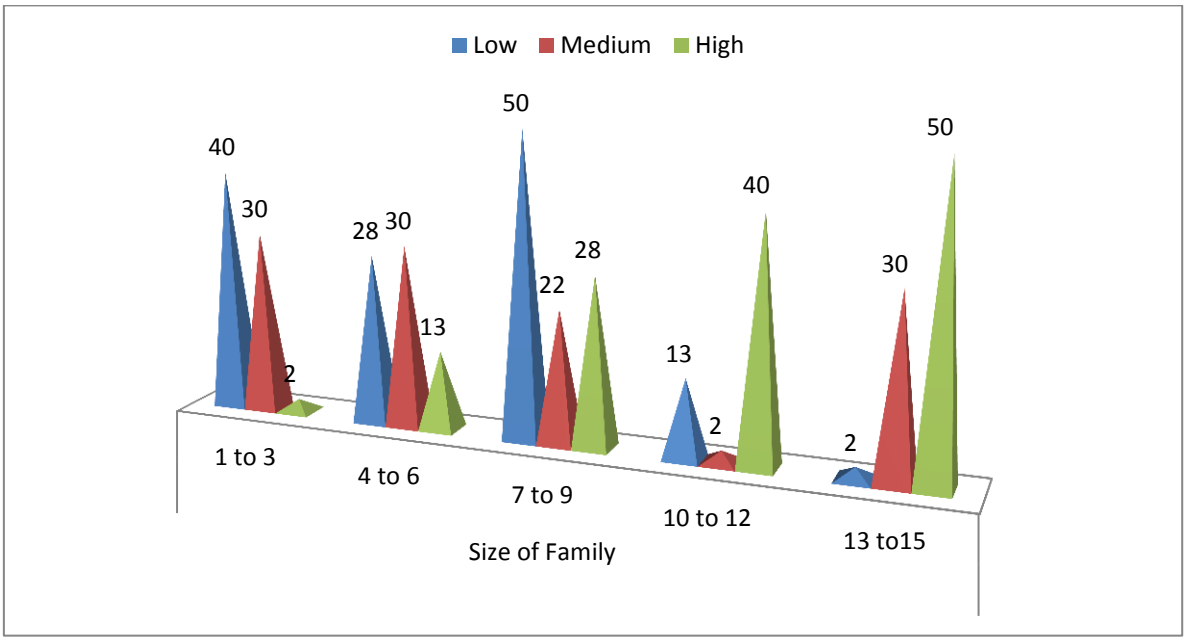

Figure 3.2: Prismatic bar chart of family size in the different zones

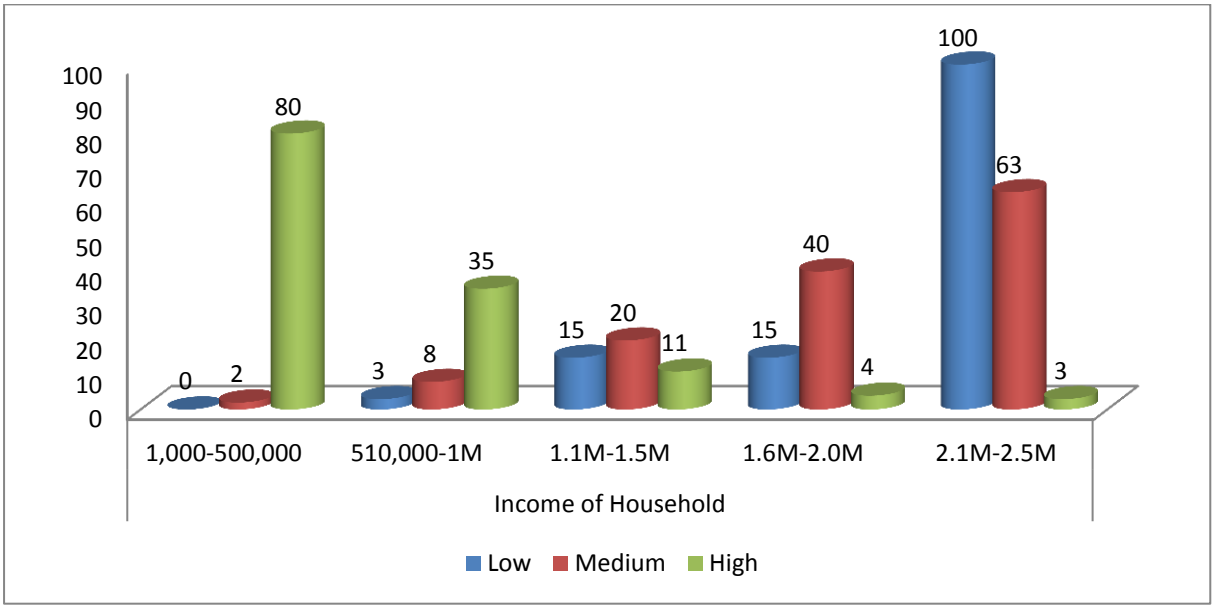

Figure 3.3: Cylindrical bar chart of income levels of respondents in the study zones

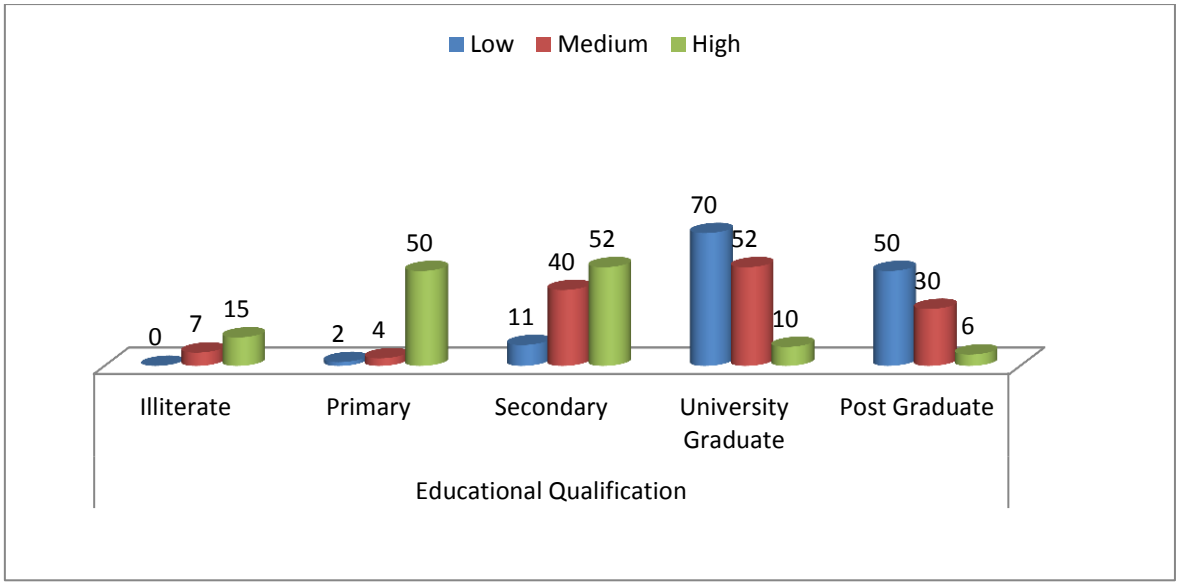

Figure 3.4: Cylindrical bar chart of educational qualification in study zones

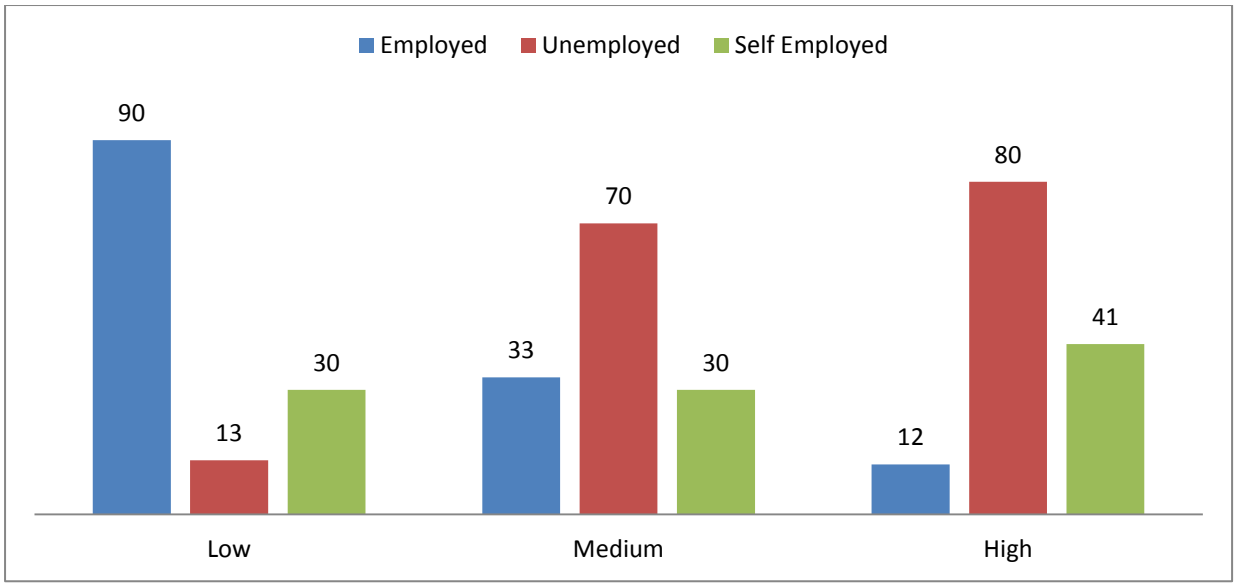

Figure 3.5: Bar chart of employment status of different zones

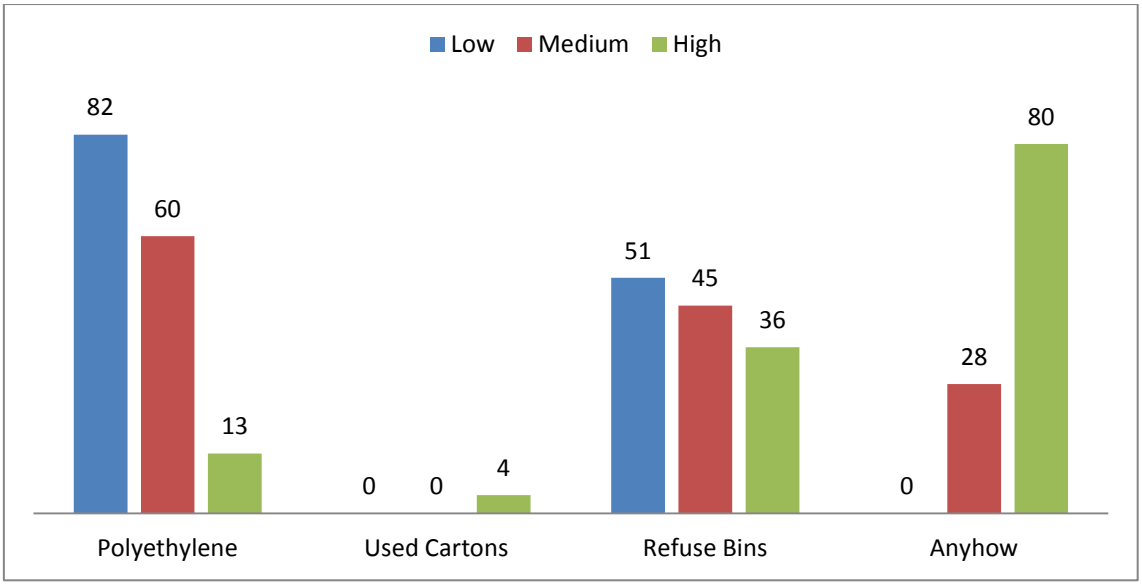

Figure 3.6: Bar chart of receptacle types in different zones

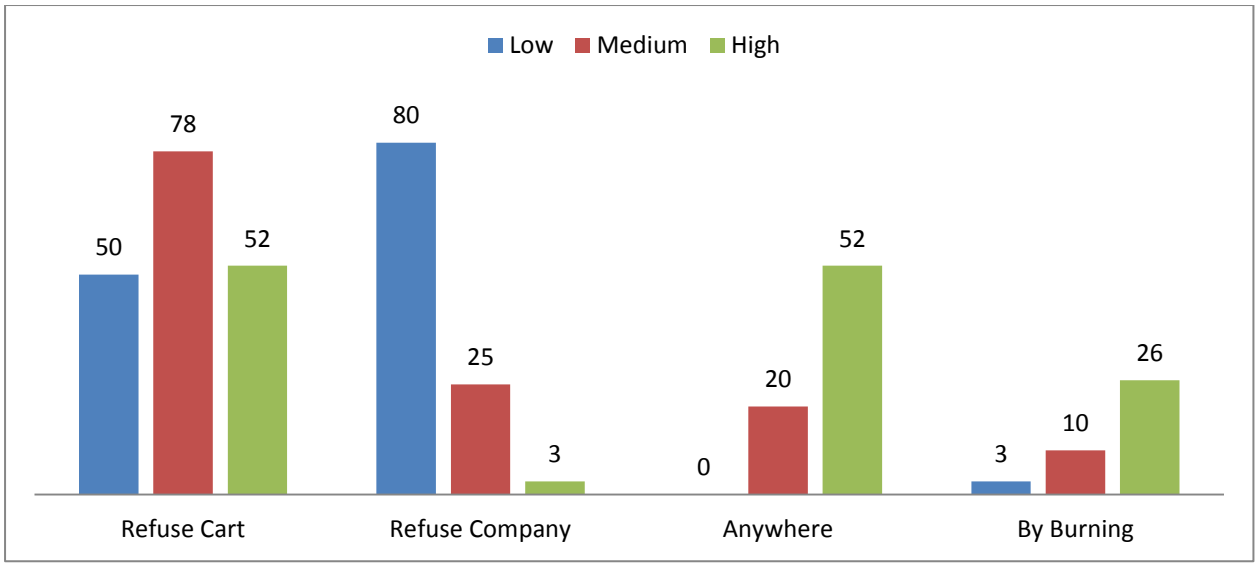

Figure 3.7: Bar chart of disposal techniques in the different zones

4.0 Discussion of Results

The result from this study show zonal variations in all the measured parameters such as amount of waste deposited, family size, income of households, educational qualification, employment status, receptacle type and disposal technique used (Figures 3.1 – 3.7, Appendix II). The result from the study of the multiple correlations (Appendix III) between all the measured variables will be discussed under the following subheads vis-a-vis:

4.1 Income and amount of waste generated, receptacle use and disposal technique.

Respondents from the low zone had higher amount of income than those in the middle zone and lastly, from those in the high zone. This may be due to the fact that land use patterns are always a reflection of income and class standings. Thus those in the low zone (sparsely populated areas) displayed higher incomes than those in the middle and high zone (medium and densely populated areas). It is however instructive to recognise that in interpreting data relating to family income, data could have been contaminated by people's natural reluctance to declare actual income and insufficient knowledge of respondents about actual income earned.

Also respondents in the low zone produced more waste than respondents in the middle and high zones (Figure 3.1). This may be attributable to the fact that wealthy people tend to consume more than the poor people. This is as a result of higher income and a greater purchasing power. Correlation Analyses reveal that there is a positive correlation between amount of waste generated and income ($r=0.113$, $P=0.05$) as rich individuals are apt to consume more, especially packaged goods which may not only increase the quantity but also the volume of waste generated. Other scholars such as Hong and Adams (1999) and Kinnaman and Fullerton (1999) found a positive relationship between income and waste generation, although the relationship was not statistically significant. Also, Afroz et al, (2010) observed a similar positive correlation between income and waste generation in a survey conducted in Dhaka city, Bangladesh.

It was also observed that respondents in the low zone took better concern about disposal receptacles and employed either disposal contractors or hand driven carts as compared to those from the middle and high zones that cared less about waste packaging and proper disposal techniques (Figures 3.6 and 3.7). This is because, at higher income levels people seemed to be more concerned with waste issues.

4.2 Family size and waste generation, receptacle use and waste disposal technique.

This study observed that the low zone exhibited lower amounts of family sizes when compared to the middle and upper zones. This may be as result of the fact that people with higher incomes and educational qualification tend to have fewer children and dependents. Thus family size was negatively correlated with income ($r= -0.327$; $P=0.01$) and negatively correlated with educational qualification ($r= -0.192$; $P=0.01$). In addition, family size is positively correlated with receptacle type ($r= 0.489$; $P=0.01$) and disposal technique ($r= 0.218$;

P=0.01). This implies that people with high family sizes were more susceptible to bagging their waste anyhow and disposing it anywhere. Also, the size of the family was negatively correlated with the amount of waste generation (r= 0.098). Although domestic per capita waste generation rate is influenced by the number of residents per household (Pfeffer, 1992), studies conducted even in the USA to assess domestic waste generation rates indicated a fall in per capita values from 1.25kg/day for two residents to 0.4 kg/day for ten residents. The increase in waste is therefore not in proportion to the increase in the number of residents. The relationship according to Pfeffer (1992) and UNESCO (1996) showed that the rate of reduction was most rapid between two and five residents, after which the rate decreased and was virtually independent of the number of residents when the number exceeded ten. This is in disagreement with the findings of this study that did not find any positive correlation between family size and waste disposal amounts.

Also, the finding of this study is in disagreement with that of Sankoh et al (2012) who found the amount of waste to be positively correlated with family sizes in Freetown, Sierra Leone.

4.3 Educational qualification

Respondents in the low zone had higher educational qualification than those in the middle zone followed by the high zone (Figure 3.4). One reason for this finding may be as a result of the fact that people with higher educational qualifications tend to be more successful and reside in exclusive and reserved environments. Like most developing communities which are ravaged by poverty, most families in the high zone cannot afford the high costs of education, hence the higher percentage of individuals with low education levels was found. An unexpected finding was the relatively high percentage of respondents with tertiary education in the middle zone (middle socio-economic status) comparable to the low zone (high socio-economic status). This outcome was interpreted as showing that the determinant for residing in an affluent society is not necessarily education, but that wealth could be the main reason.

This result is consistent with those of Shasha (1993) who observed high numbers of households with low level education in Ngangelizwe a low socioeconomic area in South Africa. Also confirming this position, correlation analyses reveal that educational qualification of the respondents is positively correlated with income (r =0.327; P=0.01).

The development trends in the society have shown that individuals from the middle class acquire higher education in order to improve their well-being and to be better positioned in their jobs, with the ultimate aim of sustaining their livelihood (Raman and Narayanan, 2008).

Thus the low and middle zones had relatively higher educational qualification that the high zone (populated zone).

The analysis of educational profile of the zones is of paramount importance for two reasons. First, is that knowledge about educational status of the zone is vital in assisting the service providers in developing strategies or programmes to enhance environmental education taking into account the low overall education levels of some sectors of the population. Second, is that level of education relates to attitudes towards solid waste service programmes.

The patronage for waste services varied between low, middle and high zones. This may be because people residing in higher income areas traditionally patronized waste services and would therefore be more likely to complain about environmental problems, while people from lower income areas, would tend not to register complaints and would regard other issues such as employment and housing as problems to be concerned about (Viljoen and Staden, 1987). It is however clear from the results of this study that the overall education levels were low in areas with low socio-economic status and that a high level of inequality between different social status population groups existed.

Judging from the results of this study, there is enough evidence to suggest that there is a link between the distribution of income, unemployment, education and the socioeconomic status of a residential area. Such a link was attributed to the observations that the lower income households were concentrated in areas with low socio-economic status, a high rate of unemployment, and poor education records.

The result from this study has further substantiated documented evidence that the quality of solid waste services in a particular area is influenced by both the specific conditions that prevail in the area and the socio-economic status of the community receiving the services (UNESCO, 1996).

5.0 Conclusion

The result from the study indicate that there were significant differences in the different zones in socio-economic variables of income, educational qualification, employment status, disposal techniques and how waste is packaged for disposal. People with higher incomes, education and employment status, residing in low density neighborhoods generated more waste than those in crowded areas. They also had better packaging of waste and disposal

techniques. There was a direct positive correlation between higher incomes, educational qualification and waste generation. Also poverty was a defining factor for improper disposal and packaging of waste. Based on this result, it can be concluded that the twin devils of poverty and illiteracy are the most crucial factors affecting proper waste management in Port Harcourt.

It is recommended that greater effort by Government be concentrated on waste collection in poor neighbourhoods as they are more likely to contribute more to the pollution menace. Government should also increase awareness of the populace in Port Harcourt as to the need for proper waste packaging and disposal techniques as people with lower levels of education tend not to package their waste properly. Finally, there should be appropriate legislation that stipulates fines/punishment for indiscriminate disposal of waste. This will discourage improper packaging and indiscriminate disposal of waste.

Appendices

Appendix I: Distribution of wards into zones

ZONES	WARDS	DESCRIPTION OF WARDS
Low	4	D/Line and Old GRA
Low	5	Harbour Road, Reclamation and parts of Old GRA
Middle	19	Rumuokalagbo
Middle	20	Aboloma, Femie & Environs
High	12	Diobu
High	7	Borikiri

Appendix II: ANOVA for all socio-economic variables in Port Harcourt.

ANOVA for Amount of waste in the zones

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	123.614	2	61.807	130.367	.000
Within Groups	187.744	396	.474		
Total	311.358	398			

ANOVA for household Size of different zones

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	175.298	2	87.649	59.395	.000
Within Groups	584.376	396	1.476		
Total	759.674	398			

ANOVA for income of households in the different zones

			Sum of Squares	Df	Mean Square	F	Sig.
Income of Household * Zones	Between Groups	(Combined)	691.464	2	345.732	423.308	.000
	Within Groups		323.429	396	.817		
	Total		1014.892	398			

ANOVA for Educational Qualification in the different zones

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	199.639	2	99.820	125.067	.000
Within Groups	316.060	396	.798		
Total	515.699	398			

ANOVA for Employment Status

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	30.561	2	15.281	29.876	.000
Within Groups	202.541	396	.511		
Total	233.103	398			

ANOVA for Disposal Techniques used in different zones

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	43.489	2	21.744	23.770	.000
Within Groups	362.256	396	.915		
Total	405.744	398			

ANOVA for Receptacles used for Waste Disposal

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	178.306	2	89.153	78.921	.000
Within Groups	447.338	396	1.130		
Total	625.644	398			

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