Household Environment and Infant Morbidity: A Situation Analysis of Slum Areas of Lagos State

Introduction

In Nigeria, most cities and towns are unsanitary due to inadequate facilities for excreta, liquid and solid waste disposal. Over the years, the quality of these services have deteriorated due to pressure of urbanization, rapid population growth, mounting costs, growing gap between the needs of these services and the resources of the government (Federal Government of Nigeria, 1991; NDHS, 2003). Communicable diseases continue to take a heavy toll, both in terms of morbidity and mortality as well as environmental related non-communicable diseases or illnesses in spite of the substantial progress made in the health sector (Evans, 1994; Otti, 1994; Yesufu, 2000).

Environment, which sustains human life, is also a profound source of ill health for many of the world's people (Mutunga 2004). In the least developed countries, one in five children do not live to see their fifth birthday, mostly because of preventable environmental threats to health. This translates into roughly 11 million avoidable childhood deaths each year (WRI, 1999). Hundreds of million of others, both children and adults, suffer ill health and disability that undermines their quality of life and hopes for the future. In Nigeria at the dawn of the twenty-first century, it is tragic to note that one in seven children die before his or her fifth birthday (Harrison, 1997; NDHS, 2003). A baby born is 30 times more likely to die before age five than one in an industrialized country (UNICEF, 2001). Infant and child mortality rates are exceedingly high and Nigeria ranks 15th highest with one million children dying annually from preventable diseases. Nigeria is one of the least successful African countries in achieving improvements in child survival in the past four decades, in spite of advances in universal immunization and oral re-hydration (ORT) for diarrhoea disease, and the wealth of Nigeria's human and natural resources (UNICEF, 2001).

Several individual and household factors have been identified as key determinants of infant and child survival. These include maternal education, child spacing, parental income or status of mother, malnutrition, and female literacy level. Mosley and Chen (1984) observed five categories of factors influencing infant mortality; these are maternal factors (age of the mother, parity and birth interval), environmental contamination (air, food, water, fingers, skin, soil, inanimate objects and insects), nutrient deficiency, injury and personal illness control.

Mutunga, (2004) also explained that poverty influences health because it largely determines an individual‘s environmental risks as well as access to resources to deal with those risks. He explains that more than 1 billion people in developing countries live without adequate shelter or in unacceptable housing; more than 1.4 billion lack access to safe water, and more than 2.9 billion people have no access to adequate sanitation, all of which are essential for good hygiene. There is a synergistic interrelationship between poverty, ignorance, poor health, malnutrition, and reduced child survival, which is worsened by social exclusion and political marginalisation. A child born to a financially deprived and less educated family is at risk of dying perinatally or within the first month of life, since the mother was probably poorly nourished during pregnancy, had little or no antenatal care and might not deliver at a place with appropriate medical facilities. The child may also be exposed to illness, such as malaria and diarrhoea, due to poor living conditions, limited access to safe water and inadequate sanitation, malnutrition or ignorance about good feeding practices.

Cultural factors can also influence infant mortality (Basu, 1997). Society’s beliefs about disease, for example, may result in taboos or ritualistic treatments, whose therapeutic effects are not supported by modern medicine. Cultural beliefs may also lead to breast feeding practices that are detrimental to the infant’s growth. The aforementioned factors are peculiar

to slum areas of Lagos metropolis. Efforts are therefore made in this paper to examine the relationship between of selected environmental factors on childhood diseases and the implication of these for infant mortality among people residing in the slum areas of Lagos state.

Methods and material

The survey was carried out in metropolitan Lagos, the most heterogeneous city, the most industrialised and the economic nerve centre of the country. Lagos State has a population of about 11,281,129, which represents over 6.2 percent of the national population of 130 million (2005 Population Projection Figure). At 9 percent per annum growth rate, approximately 300,000 persons per annum or 25,000 per month are added to the existing population. This has resulted in very high population density of the state. The state has a density of 1,300 persons per square kilometres. Its population density is over 15 times of the national average, which is 85 persons per square kilometres. Lagos State is the most urbanised in the country (Adedokun, 1999). This has resulted in settlements within the slum areas around the city.

The data for this survey were derived from three selected Local Governments Areas (LGAs) of Lagos State – Surulere, Mushin and Ajeromi/Ifelodun. These are the LGAs with major slum areas. Both qualitative and quantitative methods were used to elicit information from 1500 women selected from the three LGAs. However, quantitative method preceded the qualitative in order that survey results could be interpreted and investigated in more depth using interviewing techniques. The infant mortality rate was used to calculate the sample size for this study. By setting Type 1 error at 0.05 and Type II at 0.10 (one sided), using the data from the National Immunization coverage (Federal Ministry of Health, 2003), in order to detect an absolute change of 10 percent in immunisation coverage. This yielded a sample of 500 for each LGA. In order to make the sample representative of the selected population,

multistage stratified random sampling technique was used to select women in reproductive age (15-49 years) that were involved in the study.

The data collected were subjected to basic demographic analytical techniques. In the statistical analysis of the data, a combination of univariate, bivariate, and multivariate analysis were employed. Information from focus group discussions were transcribed and organized under broad headings that depict different aspects of the discussions. The transcribed information were analyzed descriptively (qualitatively) and used to explain results of quantitative analysis where and when necessary.

Results

1. Socio-economic and demographic background of respondents

Table 1 shows that majority of the respondents were between ages 15-34 years (58.6 percent). In each of the LGAs, more than 90 percent of the respondents were married. Most of the respondents were adherent of Christianity (54.2 percent) and Islamic (45.0 percent) religion. Four out of every ten respondents interviewed in the three LGAs had secondary education. Mushin local government had the highest respondents with post secondary education (8.8 percent), while Ajeromi\Ifelodun had the highest respondents with no education (16.7 percent). Trading was the commonest occupation with more than half of the respondents engaged in petty trading in all the LGAs. About 60 percent of the respondents earned less than N10000.00 ($75) per month; this is an indication that majority of the respondents were living below poverty level. The study locations were predominantly dominated by the Yorubas, though other ethnic groups were found in small proportions.

Table 1 about here

2. Household Environment

Among the environmental problems in the study area were poor drainage, refuse dump, poor sewage system, and pollution (Table 2). Only few of the respondents had good

drainage system and good sewage system in their household and most of the streets were without good drainage system. The major means of refuse disposal was through vendor; others were inside gutter and by burning. This indicates that most respondents still engaged in unwholesome practice of disposing their wastes in an unhygienic way. Only few disposed their wastes through government agency – Lagos State Waste Management Agency (LAWMA). This is in spite of the fact that almost nine out of every ten respondents agreed that environment could influence their health and that of their children. Majority of participants in the focus group discussions also indicated that though they normally participate in environmental sanitation, they still acknowledged that they live in a dirty environment. For instance, an FGD participant in Ajeromi submitted that:

> *"We leave in dirty environment. Even if you, as an individual, are trying to keep your environments clean, what about your neighbours? This place is congested; it is not like other areas in the city. It is the area for the poor people and this is what is expected here".*

Another woman in Mushin also said:

> *"The menace of childhood illnesses would be reduced if our environment is clean. It is the dirty environment that brings about diseases not only to our children but also to the grown-ups".*

Table 2 about here

3. Childhood illness and treatment

As shown in Table 3, three out of every four women interviewed reported that their children had illness in the last one year. Surulere LGA had the highest number of children with illness in the last one year (81.6 percent) followed by Ajeromi\Ifelodun with 75.5 percent and Mushin LGA with 67.2 percent. Malaria was the commonest illness among the children under the age of five years in the three local governments, with Surulere having the highest number of cases (61.1 percent) followed by Mushin LGA with 58.3 percent. Other common illnesses are diarrhoea, cough and catarrh, and vomiting. These outcomes were corroborated with the responses got from focus group participants. For instance, a 45 years

old woman says: *"The common illness among our children is malaria followed by diarrhoea; there is hardly any house that has not visited hospital for malaria treatment in this area"*. Supporting this claim, another 36 years old woman in Mushin pointed out that "*Malaria is common in this area followed by cholera because of the kind of place we are residing. It is only God that is helping us"*. Also, as observed by a service provider in Ajeromi\Ifelodun LGA "*Malaria is the commonest disease in this area, followed by diarrhoeal, measles, cholera and typhoid"*. The study shows that majority of the childhood diseases mentioned by the respondents were those that were related to the environment which could be prevented. A medical doctor in Surulere laying credence to this finding said:

> "*Most of the childhood diseases in this area are environment-related. It is unfortunate that people don't know how to manage their environment. They leave in a very unhygienic environment not conducive for human habitation"*.

Some of the women who participated in the focus group discussion also agreed that there is no way anybody could stay in the kind of environment they were that such person or her child would not fall sick within six months.

> "*The environment we are living is congested and dirty. There is no way our children will not fall sick. There is no proper drainage system in this environment, no proper waste disposal, coupled with the fact that we cannot afford good accommodation in other areas. It is only God that would save us"*, says one middle-aged woman in Surulere.

Another Ibo woman in Mushin also stated that:

> *"Most of the diseases our children are having are waterborne; there is no good drinkable water in this area. We cannot even ascertain the purity of water we rely on and bought from people selling them"*.

Table 3 shows that majority of the respondents (97 percent) gave drugs as the first aid measure before taking their children for treatment. Relatively the percentage of respondents that rely on herbs and other native medicine was very low. Many of these respondents pointed at the failure of drugs giving to them at the health facility as their reason for relying

on herbs and other local medicine, while some believed that the drugs were too expensive and were not usually available. A discussant in Ajegunle noted:

> *"Sometimes when I complained that my children had malaria fever, my husband usually suggests that I should make herbal drinks for them instead of going to the hospital where treatment would cost more and the drugs would not be available".*

Table 3 about here

As shown in Table 4 the cost of treating childhood diseases was very high in the study area. More than half of the respondents explained that they spent an average of N2000 ($15) for the treatment of any particular childhood diseases. However, majority of the respondents explained that they could afford to attend government hospital since free health services were provided for children under the age of five in these hospitals. The perception was that when you have to pay for treatment, government health facilities were the cheapest and they provide quality service. However, some of them observed that health workers in most of the available health facilities do no have the right attitudes to patients. The non-availability of drugs in the hospitals was another factor mentioned that discourages parents in these localities from patronising government health facilities. For instance, an FGD participant in Mushin LGA pointed out that:

> *"It is true that government hospitals provide good and cheapest services, but the attitudes of the health workers have not been encouraging and these attitudes have been preventing many people from benefiting from services provided at these health facilities".*

Another discussant said:

> "*Most of the doctors would not attend to you; they may even direct you to their personal clinics".*

Table 4 shows that 3.1 percent of the respondents still believed in the treatment received from the traditional birth attendants and quacks.

Table 4 about here

4. Childhood Morbidity by Selected background characteristics

As shown in Table 5, mothers with no education recorded the highest number of child illness. This shows an inverse relationship between education of mothers and childhood diseases. This was in line with the previous findings. For instance, Cleland and Ginneken, (1988) explained that education of mothers is one of the strongest correlates of infant and child mortality because it provides women with decision-making power, making them more aware of their children's welfare, and increasing their knowledge about childhood disease and their ability to understand illness and provide timely treatment. Mothers working outside homes recorded greater number of child illness in the last four weeks preceding the survey (Surulere 84.3 percent, Mushin 81.7 percent, Ajeromi 78.6 percent). These categories of mothers might not have enough time to take care of their children because they would leave home very early and would not come back until late in the night. Invariably, such mothers would not know what happen to their wards during the day and they may be too tired to ascertain the health status of their children when they get back home. This assertion was also upheld by FGD participants in the three LGAs. For instance, one trader in Ajeromi LGA submitted that:

> *"Most of us don't have enough time for our children, especially those of us that are working outside this area. Before the day break some of us would have left home, because of traffic hold-up, and we will not come back until 8.p.m. in the night".*

A Civil Servant in Surulere also observed that:

> *"Those that are working either in the private sector or in government establishments need to resume latest by 8.00 am in the morning. If you are working in Sango and you are staying in Mushin (a distance of about 40 kilometre), for you not to be late to work, you must leave very early to avoid traffic hold-up. Our children are left with househelps who may not have adequate knowledge about children and if need be, may not know how to handle childhood diseases".*

The relationship between childhood diseases and occupation of mothers revealed that traders recorded the highest cases of child illness in the four weeks preceding the survey (Mushin 50.7%, Surulere 48.8%, Ajeromi 53.6%), while the least are those who are full time house wives. Young mothers between 15-34 years recorded more cases compared with older

mothers above 35 years. Surprisingly married mothers recorded the highest cases of child illness than the other categories of women in these LGAs. This may not be unconnected with the educational and occupational status of these mothers.

Studies have found that lack of access to safe drinking water is a major cause of ill health and loss of productivity (Mutunga, 2004; NDHS, 2003; Ojofeitimi *et al.*, 2003; Jelliffe and Jelliffe, 1978). It is perhaps the principal cause of life-threatening diseases among infants and children. Table 5 shows that majority of mothers that were using well as their main source of drinking water reported that their children fell sick in the last four weeks preceding the survey (Surulere 45.6 percent, Mushin 51.5 percent, Ajeromi 49.7 percent). This is an indication that most of the well in the area might have been contaminated and not well treated. That is perhaps one of the reasons for high cases of typhoid fever in the study area as observed by one service provider in Ajeromi:

> *"Most of the cases of child illnesses we recorded in this facility recently are those related to water borne diseases, especially typhoid. There is no good drinkable water in this area".*

Table 5 about here

Multivariate Analysis

Multivariate logistic regression was used to identify the relevant socio-demographic and environmental factors that influence infant morbidity in the slum areas of Lagos state. In the first regression model (Table 6), children of older mothers (age above 35 years) were less likely to fall sick than of younger mothers (odds ratio 0.88). The odds ratios show that there is a positive relationship between education and infant/child morbidity. Children whose mothers are civil servant are less likely to fall sick when compared with the reference category, which is the full house wife. Though, the traders and the artisans had elevated odds of child morbidity, but the results were insignificant (odds ratios, 2.3 and 3.7 respectively). Compared with those who have no education, respondents with primary of higher education

had significantly lower odds of childhood morbidity (odd ratios, 0.9 and 0.8 for respondents with primary and secondary or higher education respectively). The odds of working outside home environment and working for longer hours were greater than the reference category (1.8); these were also insignificant.

When some environmental variables, type of drainage, modes of refuse disposal and sewage were added (model 2), the association of age and education with childhood morbidity remained; however, the association with occupation, place and hours spent at work changed. The odds of childhood morbidity were significantly higher among respondents using stagnant gutter and open drainage (1.3 and 0.6 respectively), a finding that is consistent with previous findings (Ojofeitimi *et al.*, 2003; WHO, 1997). Modes of refuse dump and sewage disposal are also associated with childhood morbidity. Compared with water system, those who use pit latrine and without toilet facility were significantly more likely to experience childhood morbidity (4.3 and 1.1). Also, those who dump their refuse inside gutter were more likely to have similar experience.

In the final model, which controlled for all the study variables, childhood morbidity remained significantly associated with older age, being civil servant, using open drainage, pit latrine and living without any toilet facility. Table 6 further shows that those who bought water from vendors were 3.6 times likely to fall sick when compared with those who were using tap water.

Table 5 about here

Discussion and conclusion

Evidences from the survey have shown that there is high morbidity in the selected communities. Averagely three out of every four women reported that at least one of their children had been ill in the last one year. The common illnesses were malaria and other environmental related illnesses like diarrhoea, cough\catarrh, and vomiting. The prevalence

of malaria was also very high in the area. Two of every four children of women interviewed had malaria in the last six months preceding the survey. With the evidence from the study, it showed that there was high prevalence of childhood disease in the area which could contribute to infant mortality. Most of the respondents agreed that the high infant morbidity in the area could be linked with the household environment. It was also discovered that occupation of the mothers influences the morbidity level in the areas. Often, treatment received were home based. This is consistent with findings in previous studies. For instance, Reerink and Sauerborn, (1996) reported that much of the health care for infants and toddlers was provided by the family. He observed that a high degree of non-utilization for infants and an extreme under utilization for toddlers existed with regards to community health services. The home based treatments include the use of herbal treatment, which are usually prepared by the mothers or purchase of drugs over-the-counter. Janzen, (1987), however, noted that the use of home based care though common for almost all types of illnesses both in children and adults, does not discourage the use of modern medical care. This was confirmed in the study where some of the respondents combined the use of both medicines obtained from health facilities and local herbs.

In tropical and sub-tropical regions of the world, it has been observed that there is a close link between the presence of excess water (due to lack of adequate drainage) and the transmission of water related vector-borne diseases. Malaria, *schistosomiasis* (*bilharziasis*) and lymphatic *filariasis* are important water related vector-borne diseases (Martin, 1997). Despite control programmes, health services and available treatments, these diseases today represent a growing health problem. The survey revealed that majority of those who reported that their children fell sick in the last four weeks preceding the survey, were those who did not have good drainage system. This shows that there is positive relationship between drainage system and childhood diseases. All the same, waste disposal system among the

respondents showed that those who disposed their waste properly through the government agency (LAWMA) had the least cases of childhood diseases. This implies that improper waste disposal could lead to environmental illness. It also confirmed the previous studies on the waste disposal and morbidity (WHO/UNICEF, 2001).

Poverty was identified as one of the factors that fuel infant morbidity in the area. Most of the respondents were living below N50, 000 per annum which is below the UN standard of 1$ dollar per day. Some of them could not afford to take their siblings to the health facility; rather, they relied on herbs. This was corroborated by this FGD discussant:

> *"The level of poverty in this area is one of the reasons for high infant morbidity; most of us cannot even afford to leave in a good place not to talk of eating good foods. If peradventure our children fall sick, we cannot afford the hospital bills. A typical example was what happened to our neighbour last week, she eventually lost her baby.*

Our findings revealed that some of the respondents did not have much believe in the prescribed drugs due to the resistance of some of the causative agents of these illnesses. The type of treatment sought would depend on the expectation of cure for the particular type of illness. Stock (1983) observed that a high rate of utilization of western health services exists for diseases with high expectation of cure from western medicine.

Finally, the study showed that there was strong likelihood between the household environment and infant morbidity. Those with good household environment were less likely to fall sick. The study therefore reiterates the need for appropriate information, education and communication strategies to enlighten people living in this kind of environment about the importance of good environment on their health and their children. Efforts should also be made to provide free health services for infants in slum and other similar environment whose parents could not afford the prohibitive hospital bills.

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Table 1: Percentage distribution of respondents by socio-economic and characteristics

	Local governments			
Variables	**Surulere (N=500)**	**Mushin (N=500)**	**Ajeromi (N=500)**	**Total (N=1500)**
Age				
15-24	15.2	13.7	16.1	15.0
25-34	40.8	46.9	43.2	43.6
35-44	24.8	19.3	18.5	20.9
45 & above	19.2	20.1	22.2	20.5
Level education				
Primary	30.4	33.5	31.5	31.8
Secondary	47.3	49.5	44.8	47.2
Post secondary	8.8	7.6	7.0	7.8
None	13.5	9.4	16.7	13.2
Marital status				
Single	6.2	1.2	3.8	3.4
Married	90.8	96.2	93.6	93.6
Divorced	1.2	1.4	0.6	1.1
Widow/widower	0.6	1.2	1.0	0.9
Others	1.2	1.2	1.0	1.0
Ethnic group				
Yoruba	70.4	73.9	69.3	71.2
Igbo	21.3	18.2	23.1	20.9
Hausa/Fulani	3.1	3.8	1.5	2.8
Others	5.2	4.1	6.1	5.1
Religion				
Christianity	54.7	54.0	53.6	54.1
Islam	43.5	45.5	44.3	44.4
Others	1.8	0.5	2.1	1.5
Occupation				
Farmer	2.4	1.7	1.4	1.8
Trader	54.8	57.2	60.6	57.5
Artisan	14.3	11.5	13.9	13.2
Civil servant	11.5	10.1	9.4	10.3
Professional	9.7	11.0	8.4	9.7
Full house wife	7.3	8.5	6.3	7.5
Income				
Less than ₦10,000	58.6	60.8	54.1	57.8
₦10,001- ₦20,000	21.9	23.4	29.0	24.8
₦20,001-₦30,000	13.9	8.6	12.5	11.7
₦30,001 and above	5.6	7.2	4.4	5.7
Total	100.0	100.0	100.0	100.0

Table 2: Percentage distribution of respondents by their household environment

Variables	Local governments			
	Surulere (N=500)	Mushin (N=500)	Ajeromi/Ifelodun (N=500)	Total (N=1500)
***Environmental problems**				
Poor drainage	66.2	57.9	71.9	65.3
Refuse problem	55.5	46.4	57.6	63.2
Poor sewage	53.7	42.8	57.2	61.2
Pollution	51.1	31.5	61.8	48.1
Type of drainage				
No drainage	19.6	7.7	16.7	14.7
Flowing drainage	20.4	23.1	15.5	19.7
Stagnant gutter	42.2	60.9	52.6	51.9
Open drainage	6.9	6.9	13.1	11.9
Closed drainage	0.4	0.8	0.9	0.7
Others	1.6	0.6	1.2	1.1
Ways of disposing refuse				
Through vendor	79.4	75.5	78.3	77.8
Burning	1.2	0.2	1.2	0.9
Refuse dump	1.6	8.1	5.4	5.0
Inside gutter	3.7	0.8	0.2	1.6
LAWMA	13.8	15.4	14.9	14.7
Ways of dispose sewage				
Pit latrine	36.4	22.2	33.6	30.7
Water system	28.5	23.0	27.5	26.2
Inside canals	12.5	15.4	11.2	13.1
Others	22.9	39.4	27.7	30.0

*Multiple responses are allowed

Table 3: Percentage Distribution of Childhood Illness in Under –Five Children

	Local government			
Children with illness in the last one year	**Surulere (N=500)**	**Mushin (N=500)**	**Ajeromi\ifelodun (N=500)**	**Total (N=1500)**
	81.6	67.2	75.5	74.8
***Type of illness**				
Fever	61.1	58.3	52.6	57.3
Diarrhoea	35.5	31.4	38.1	35.0
Weakness	11.3	14.0	13.3	12.9
Joint pain	10.7	11.1	15.8	12.5
Headache	31.3	13.6	23.2	22.7
Cough\cattar	27.5	28.4	29.5	28.5
Vomiting	24.8	15.9	28.8	23.2
Others	7.3	6.3	4.9	6.2
First aid measures given				
Giving drugs	63.7	70.7	65.1	66.5
Native concussion	23.1	17.9	19.3	20.1
Others	13.2	11.4	15.6	13.4
***Symptoms seen before action was taken**				
Repeated watery stools	45.8	29.4	23.7	33.0
Repeated vomiting	42.4	41.1	43.0	42.2
Cough	61.6	76.7	77.7	72.0
Fever	62.0	60.3	66.5	63.0
Not getting better	23.4	25.0	21.1	23.2

* Multiple responses are allowed

Table 4: Percentage distribution of respondents by cost and facilities used

Variable	Local government			Total
	Surulere	Mushin	Ajeromi/Ifelodun	
Cost of treating childhood diseases				
Less than n1000	31.3	33.7	31.5	32.2
N1000-n2000	55.1	51.1	58.7	55.0
N2000+	13.6	15.2	9.8	12.8
Facilities they can afford				
Government hospital\clinic	57.6	54.3	54.2	55.4
Private hospital\clinic	23.1	21.4	23.8	22.8
Medicine store	10.6	11.2	13.4	11.7
Traditional birth attendant	8.7	13.1	8.6	10.1

Table 5: Percentage Distribution of Respondents by Childhood Morbidity and selected background characteristics

Characteristics	Childhood Morbidity			
	Surulere	Mushin	Ajeromi/Ifelodun	Total
Age				
15-34	72.8	74.6	70.6	72.7
35 & above	27.2	25.4	29.4	27.3
Education				
None	13.5	4.6	13.8	10.6
Primary	21.7	20.6	18.6	20.3
Secondary	61.3	62.1	61.5	61.6
Post Secondary	3.5	12.7	6.1	7.4
Occupation				
Full house wife	14.8	13.6	11.6	13.3
Artisan	17.3	18.4	21.4	19.1
Trading	48.8	50.7	53.6	51.0
Civil servant	19.1	17.3	13.4	16.6
Marital status				
Married	70.3	68.4	64.2	67.6
Divorced	12.3	14.2	13.4	13.3
Separated	6.9	7.8	11.7	8.8
Widow	10.5	9.6	10.7	10.3
Place of work				
At home	15.7	18.3	21.4	18.5
Away from home	84.3	81.7	78.6	81.5
Number of hours spent at work				
< 8 hours	34.6	32.6	39.5	35.6
8 hours+	65.4	67.4	60.5	64.4
Type of drainage				
No drainage	48.9	32.6	37.6	39.7
Flowing drainage	6.3	8.7	6.8	7.3
Stagnant gutter	35.7	51.9	45.6	44.4
Open drainage	7.3	5.4	8.3	7.0
Closed drainage	0.3	0.6	0.8	0.6
Ways of disposing refuse				
Through vendor	17.3	18.4	18.9	18.2
Burning	13.8	7.6	8.8	10.1
Refuse dump	37.5	30.2	30.7	32.8
Inside gutter	22.3	36.5	31.4	30.1
LAWMA	9.1	7.3	10.2	8.9
Ways of disposing sewage				
Pit latrine	27.5	34.2	23.4	28.4
Water system	28.9	27.8	21.7	26.1
Inside canals	10.5	9.6	27.7	15.9
Others	33.1	28.4	27.2	29.6
Total	100.0	100.0	100.0	100.0

Table 6: Odds ratios from logistic regression analyses examining association between selected characteristics and childhood morbidity

Characteristic	Model 1	Model 2	Model 3
Age			
15-34 (RC)	1.00	1.00	1.00
35 and above	0.88***	0.77***	0.83***
Levels of Education			
None (RC)	1.00	1.00	1.00
Primary	0.92	1.05	1.04
Secondary or higher	0.82*	0.74*	0.89*
Occupation			
Full housewife (RC)	1.00	1.00	1.00
Artisan	3.67	1.65	1.59
Trading	2.34	1.53	1.49
Civil servant	0.44**	0.23*	0.51**
Place of Work			
At Home (RC)	1.00	1.00	1.00
Away from home	1.79	1.62	1.83
Number of hours spent at work			
<8 hours (RC)	1.00	1.00	1.00
>8 hours	2.97	1.58	1.27
Type of drainage			
None (RC)	na	1.00	1.00
Flowing drainage	na	2.29	2.18
Stagnant gutter	na	2.98	2.49
Open drainage	na	1.28**	1.37*
Underground drainage	na	0.61***	0.52***
System closed drainage	na	1.05	1.26
Ways of disposing refuse			
Through LAWMA (RC)	na	1.00	1.00
Through vendor	na	1.16	1.09
Burning refuse	na	1.27	1.32
Dump inside gutter	na	1.66	1.31
Ways of disposing sewage			
Water System (RC)	na	1.00	1.00
Pit Latrine	na	4.32*	3.99*
Inside canal/no toilet	na	1.14**	1.25**
Sources of drinking water			
Tap water (RC)	na	na	1.00
Well	na	na	1.62
Vendor	na	na	3.61
-2 Log-likelihood (df)	1,152 (11)	1,087 (24)	1,073 (28)

*p<.05, **p<.01, ***p<.001, Note: na= not applicable