

# **Victims of location: Health Implications on household living proximal to the Owhim solid waste dump in the Kumasi Metropolitan Area (KMA) of Ghana**

**<sup>1</sup>Ebenezer Owusu-Sekyere, <sup>2</sup>Rev Kpieta B. Alfred and <sup>2</sup>Abdul- Kadri Yahaya**

<sup>1</sup>Department of Development Studies, University for Development Studies, WA, Ghana.

<sup>2</sup>Department of Environment and Resource Studies, University for Development Studies, WA, Ghana.

\*Corresponding author E-mail: oseturbo@yahoo.com. Tel: 00233-649925.

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**The challenge of acquiring land for the final disposal of solid waste in urban areas of Ghana has become a critical issue in the urban planning process because of its enormous impact on the economy, ecology and environmental health. Waste dumps have been blamed for the upsurge in disease such as malaria, diarrhea, dermal infection, respiratory tract infection and typhoid among others in the communities they are located. This has therefore resulted in conflicts and demonstrations between city authorities and communities where waste dumps are located. The Owhim disposal site in the KMA which is generally sited based on access to tipping vehicles rather than hydrological or public health considerations does not conform to international environmental standards. Using both qualitative and quantitative approaches, the research reveals that residents of Owhim are continuously exposed to environmental health hazards from the waste dump and this has brought an upsurge of diseases such as malaria, diarrhea, respiratory tract infection and skin diseases since the inception of the solid waste dump. The paper concludes that the residents have just become victims of poor location decision which also reflects the much bigger policy context of spatial planning, in which land use, and development policies are shaped.**

**Key words:** Solid waste, health risk, pathway, leachate.

## **INTRODUCTION**

One of the major challenges facing many African Countries is the lack of acquisition of land for proper solid waste management. According to Tchobanoglous et al (1993), solid waste management may be defined as a discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations that are also responsive to public attitudes. The disposal of solid waste has always been an intractable problem in the KMA.

In the last few years, this problem has assumed increased prominence mostly owing to the fact that officialdom, as well as the general public is gradually awakening to the health and environmental threats that it provides. Solid waste generated in the Kumasi Metropolitan is routinely dumped in open spaces located in

ecologically or hydrological sensitive areas. This is due to the city's inability to invest huge sums of capital in modern waste treatment systems and machinery as seen in most developed economies. The Owhim solid waste dump is the second largest waste disposal facility in the metropolis after the Dompouse landfill (KMA 2010).

It is operated below the recommended standards of sanitary practice. The result is substandard and unsafe facilities which pose public health risks and nuisance to the citizens it is meant to serve, (Mensah 2005). All manner of solid waste is indiscriminately disposed of at the Owhim waste dump without any attempt to seclude. The infectious medical wastes from private hospitals, toxic industrial solid wastes and domestic wastes are disposed together. This poses a great challenge to the well-being of the residents, particularly those living proximal to the dump due to the potential of the waste to pollute water, food sources, land, air and vegetation.

Residents of Ohwim have on countless occasions threatened to forcefully close down the dump because of the poor maintenance of the facility to meet the standards required for safeguarding public health and environmental quality. The operation of the dump have come with very daunting challenges as residents and the general public have put up fierce resistance in an effort to protect their right to live in healthy and hazard-free environments.

Despite the surge in local recognition of the close link between the waste dump and human health and the plans defined for improvements, the conditions at the facility are very appalling thus increasing the burden of diseases. Available data from the ministry of health indicates that more than 60% of all morbidity and mortality cases in the waste dump communities are water and sanitation-related (MOH 2008). The Waste dump is said to contain toxic groundwater contaminants, including bacteria, dissolved salts, heavy metals, petroleum hydrocarbons, volatile organic compounds, and pesticides nitrate. Once these substances reach water sources, the contamination can be very damaging. Another major danger from the waste dump is the regular unpleasant odours which can pose problems by causing eye irritation or respiratory ailments.

The purpose of this research is to investigate the extent to which the Ohwim community is exposed to environmental health risk factors from the waste dump and how it impacts negatively on their health and well being especially household living within two kilometers from the dump.

## METHODOLOGY

### Study area

The Ohwim waste dump lies on latitude 6.35o N and longitude 1.30oW. The waste dump which is located in the Bantama sub-metro is found in the Owabi forest reserve which protects the Barekese Dam. The moderate temperature and humidity and the double maxima rainfall regime (214.3mm in June and 165.2mm in September) have a direct effect on population growth and the environment. Few meters away from the dumpsite are two important rivers Pumpunase and Tabiri which are tributaries of the Owabi River. These rivers are used for domestic purpose. There is no clear boundary between the location of the dump and the residential facilities as the houses are located on the fringes.

### Data collection

The study reviewed extensive literature on the Ohwim project in particular and waste dump management in

Ghana in general. In-depth interviews, with officials from the Environmental Protection Agency (EPA) and Regional Coordinating Council (RCC), Kumasi Metropolitan Assembly (KMA) and the Waste Management Department (WMD) were conducted. The interviews covered themes on their role in general SWM as well as their detailed knowledge about the project. Secondly, we held three focus group discussions with residents close to the solid waste dumpsites, categorized into landowners, opinion leaders and ordinary citizens. This approach is deemed appropriate when the object of the research is to explore attitudes or reactions of a group or community in response to some commonly experienced aspects of their environment (Tsiboe, 2004).

Through such interactive discourses, participants were able to offer insights on the perspective of the community, revealing clues to the social contexts that shape their opinions (Saleh 2002). Each focus group had eight participants composed of men and women. Issues discussed during the FGDs included the question of land ownership, the knowledge and the extent of landowners' involvement in waste management, their perception about negative and possible health impacts of the dumpsite, affected persons of the community and recommendations for improvements.

All the proceedings, which were mainly in the local language, were recorded and later transcribed, analyzed and organized around the key themes. The Ohwim community has a population of 3279 living in 317 houses, (GSS, 2000). With this number of houses, 1 in every 3rd house was selected for the study. With this methodology, 107 houses, with some rounding up were selected for the study. For each house, the head of the household or any other person willing to give information was interviewed. In all, 101 interviewees took part in the research. Preference was however given to women as women are mostly seen at home taken care of the house keeping arrangement and thus bearing the greatest brunt of the health effects. In the third methodological approach, we conducted water quality test on rivers Pumpunase and Tabiri which serve as alternative water sources available to the community.

All tests were conducted at the Ashanti Regional Laboratory of Ghana Water Company Limited in Kumasi. Water samples were collected from the three sample sites on each of the rivers. Two of the sample sites were located downstream and one sample site was located upstream to aid comparative analysis. Microbiological and E. coli contamination was the priority because of the link to infectious diseases.

## RESULTS AND DISCUSSION

Environmental pollution affects the quality of life and well-being (Corvalan et al 1995). Environmental quality

refers to the overall quality of the human environment. The quality of the environment at any point reflects the combined effects of many processes along environmental pathways that are affected by human activity on all spatial scales (Songsore et al, 1993). The environment in which we live greatly affects our health. The environment poses risks to our health in a number of ways, from the poor quality of the air we breathe to the hazards we face as a result of the foods we eat and our hygiene practices.

This section examines some of these hazards –air pollution, pests (mosquitoes, house flies, cockroaches and mice), food and water contamination – and explores the linkages between these hazards and human health. The extent to which residents are exposed to these hazards is a function of the length of time one has stayed in the community and the housing conditions one lives in. figure 3.1 shows that with the exception 40% who had stayed in the community for less than five years, over 59% have stayed in the community for more than five years and have therefore been exposed to the hazards for a long time.

### Housing locations and exposure to mosquitoes

Mosquitoes are the carriers of malaria parasites and other diseases such as yellow fever, encephalitis and certain forms of filariasis. They are also the causes of a lot of discomfort and annoyance by their bites and buzzing sounds at night.

While the mosquito population increases during the rainy season, mosquitoes are prevalent throughout the year. Poor solid waste disposal and blocked drains resulting in stagnant waters facilitate mosquito breeding. It is therefore not surprising that mosquitoes were found far more frequently in areas closer to the solid waste dumps than areas further away. Table 1 shows that the frequency of self reported mosquito bites by the respondents was significantly related to location of respondent's residence ( $p = 0.0$  at 95 per cent confidence interval).

Table 1 shows that while mosquitoes occur everywhere throughout the community, there were higher concentrations in areas proximal to the waste dump than their counterparts living far off. Houses located within 0 to 1km radius from the dumpsite experience high frequency of mosquito bite during the night than during the day time. This does not come as a surprise as majority of mosquito species operate and bite in darkness than when there is light. This is the reason why there was high frequency of self reported mosquito bites in the night than during the day. In almost all the sampled households, mosquito biting was prevalent throughout the year. However, the frequency of self reported mosquito bite were less pronounced in households further away from the dumpsite as indicated in Table 1.

In a focus group discussion, a thirty- eight year old mother of three recounted how the community was almost free of mosquitoes when she first came to settle in the community and lamented on how the situation has degenerated:

*“When we first came to stay here about ten years ago, you could sleep without covering yourself with cloth but since they started dumping refuse here about two years ago, my brother, you cannot walk about without covering the entire body. Look at my body, swollen from mosquito bites. The situation is even worse in the night”.*

This situation was corroborated by a forty-seven year old man who had this to say:

*“As for me, I have sent my wife and kids to my brother's house at Achiase to stay there for a while because the situation is just unbearable”.* The researcher's own experience was not different from the views expressed.

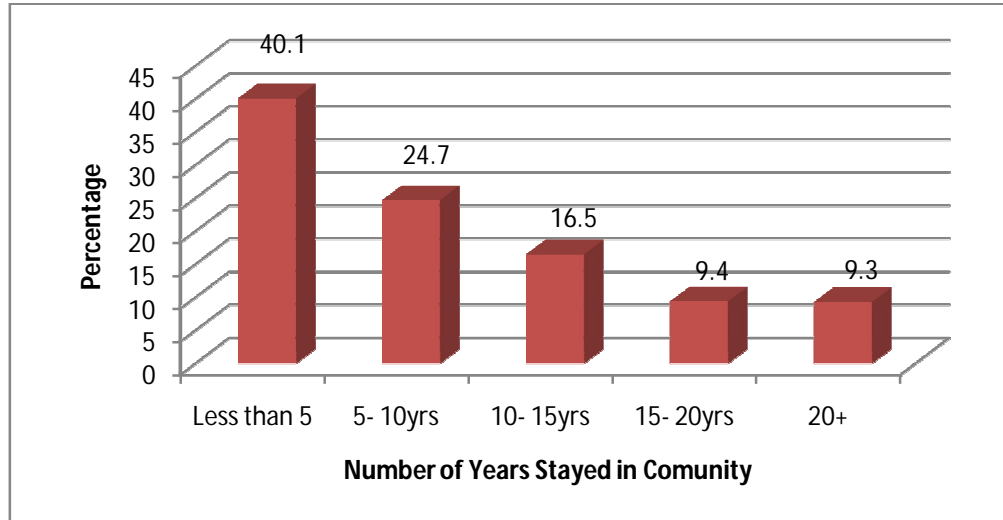
### Housing locations and exposure to flies

The presence of flies in the homes of respondents presented a risk of exposure to food and drink, the situation was a source of worry to the community members. When considering the presence of flies in the homes and the risk of exposure to food and drink, the situation is similar to that of mosquitoes. About 99 per cent of the households within 0 to 1km radius had flies in their homes especially, cooking areas compared to households further away see table 2. A fifty-four year old man could not hide his frustration and anger in a focus group discussion when he recounted how his entire house had been invaded by flies. *“The situation is worse when fresh deposits are made and at the same time the winds begin to blow. You may think the flies in the whole metropolis have been sent there, similar to that of mosquitoes”.* Expressing similar sentiments, a “wakye” seller recounted how she has had to lose majority of her customers because of flies' invasion.

*“Now nobody wants to buy from here because they say as you eat, you must drive away the flies with your left hand which creates a lot of inconvenience. In addition, the flies may enter your food and could make you sick”.*

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**Figure 1.** How long respondents have lived in current home.

**Table 1.** Proximity to dumpsite and frequency of mosquito bites (%).

Health Hazard	Location of Residence from Dumpsite (km)					Total
	0-0.4	0.4-0.8	0.8-1.2	1.2-1.6	1.6-2.0	
Freq. of Mosquito Bites (%)	41.0	30.0	14.0	8.0	7.0	100
<b>Chi-Square Tests</b>						
	Value	df	Asymp. Sig. (2-Sided)			
Pearson Chi-Square	60.837 <sup>a</sup>	12	.000			
Likelihood Ratio	62.585	12	.000			
Linear-by-Linear Association	10.304	1	.001			

Source: Based on questionnaire survey, January 2012.

**Table 2.** Self reported presence of flies in residence by location (%).

Health Hazard	Location of Residence from Dumpsite (km)					Total
	0-0.4	0.4-0.8	0.8-1.2	1.2-1.6	1.6-2.0	
Flies in Residence	41.0	30.0	14.0	8.0	7.0	100
<b>Chi-Square Tests</b>						
	Value	Df	Asymp. Sig. (2-Sided)			
Pearson Chi-Square	192.781 <sup>a</sup>	12	.000			
Likelihood Ratio	210.908	12	.000			
Linear-by-Linear Association	38.650	1	.000			

Source: Based on questionnaire survey, January 2012.

Flies constitute a health hazard as well as an annoyance. As they feed and breed in manure and garbage, these insects are likely to pick up disease-causing organisms. Such flies contaminate human food by crawling on the surface and depositing feces (dark spots) and regurgitated liquid (straw-colored spots). House flies have

been implicated in the spread of over 30 bacterial and protozoan diseases such as typhoid fever, tuberculosis, dysentery, polio, anthrax, diarrhea, yaws, cholera, conjunctivitis, trachoma, tapeworm, hookworm, and pinworm. Fortunately, house flies do not transmit many of these diseases with great frequency (World Health Organization 1993). Generally, insanitary environmental conditions are associated with having more flies in the

**Table 3.** Relationship between cooking place and the presence of flies (%).

Cooking place	Presence of flies			Total (%)
	None	Few	Many	
Separate Kitchen	21.2	32.2	46.6	100 (79)
Communal Room	4.3	33.2	62.5	100 (80)
Cooking Hut	0	17.9	82.1	100 (28)
Veranda	0	13.7	86.3	100 (38)
Open Air	0	8.9	91.1	100 (71)

Source: Questionnaire survey, January 2012.

neighborhoods. Households cooking in separate kitchens have fewer flies than households who do their cooking in verandas, open air, cooking huts and, worst of all, communal rooms.

### Housing locations and exposure to birds

When local birds feed at dumpsites, pathogens from diapers, honey buckets, household medical wastes and napkins among others can adhere to their feet and beaks, and then become dislodged onto surfaces of roofing, water bodies, and uncovered food among others (Scammell et al., 2009). Of particular concern to respondents was the significant number of households that use rain catchment roof systems to collect (untreated) drinking water. An additional exposure pathway to dump pathogens was thus realized via bird feet-to-roofs, roof-to-rain water, and water-to-mouth (and to-hand during container dipping). What was of greatest concern to the residents of Owhim was the colony of Vultures that were constantly present in the community because of the presence of the waste dump. The vulture population had an inverse relationship with distance from waste dump, table 4.

Table 4 indicates that the population of birds existed everywhere in the communities but was more congregated closer to the waste dump than further away. In a focus group discussion, a 45 year old woman had this to say:

*“if you are cooking and you do not cover it the vultures will drop their faeces in the food”.* According to the chief of Dompase:

*“.....the vulture situation needs to be looked at as an emergency because their presence is a source of worry. They drop all sorts of particles in our storage containers and in the process pollute the water. Sometimes, they even drop their faeces in the eaten bowls when they are left uncovered. Their presence is a real source of worry to us”.*

Many residents believed the waste dump attracts pests,

specifically rodents, insects and birds. As one community member described *“my concern with the refuse dump is the increase in rodents, because there are already a lot around the swamp. And the increase in birds and bird droppings and what may be associated with diseases.”* The worry that the birds would bring disease to the area was a common perception among residents, particularly since the Avian Flu was a topic in the media during this time. As one resident stated, *“I’m also concerned about the seagulls and bird flu.”* This is a true reflection of what the 2009 Wildlife Division said about the role of birds in the spread of disease in Ghana (MLGRD 2004).

### Exposure to air pollution

The airborne emissions from solid waste dumps originate from dump gases, dust emitted from the operations of the waste dumps, diesel emissions from trucks hauling waste, and emissions from the equipment used to move waste at the waste dumps (World Bank, 2000). The gases are released at waste disposal facilities due to the three processes: anaerobic decomposition of organic matter, volatilization and chemical reactions occurring in the waste (Valent et al., 2004).

Due to their large amounts of organic matter, municipal solid waste dumps produce the largest amount of landfill gases. The amount and type of gases emitted are affected by the characteristics of the waste dump such as the composition and moisture content of the waste, and the, oxygen level and temperature in the waste dump (Goldberg, 2008).

The most commonly emitted gasses from landfills are methane (40 to 60%) and carbon dioxide. Smaller concentrations of nitrogen, oxygen, hydrogen sulfide, water vapor, ammonia, and a variety of non-methane organic compounds (benzene, vinyl chloride, and trichloroethylene) are also found in solid waste dump gases. The gases of vinyl chloride, ethyl benzene, toluene, benzene and ammonia produce odors (WHO 2006). The gases may migrate from the waste dump both above and below the ground. In the air, the wind affects the exposure level of residents. Underground, gases can migrate through the soil and rock and enter homes, or be

**Table 4.** Presence of birds in residential neighbourhoods by location (%).

Health Hazard	Location of Residence from Dumpsite (km)					Total
	0-0.4	0.4-0.8	0.8-1.2	1.2-1.6	1.6-2.0	
Birds in Neighbourhood	40.0	21.0	15.0	14.0	10.0	100

**Chi-Square Tests**

	Value	Df	Asymp. Sig. (2-Sided)
Pearson Chi-Square	182.771	11	.000
Likelihood Ratio	220.807	11	.000
Linear-by-Linear Association	37.650	1	.000

Source: Based on Questionnaire Survey, January 2012.

released upwards into the air. The airborne emissions coming from waste dumps may affect human health through physiological responses to chemical and physical agents, such as irritation, inflammation, or mutation. Psycho-physiologic responses to the odor from the waste dumps can also affect health. In addition to the nuisance of odor, the mental and physical health effects of odor have been examined by public health researchers (Goldberg, 2008).

In this study, one phenomenon that everybody complained about was the strong odour that emanates from the dumpsite. The strong stench could be felt almost 4km away from the dumpsites. However apart from the general discomfort that it represents, no health outcome could be traced to the offensive odour. The influence of odors on the health and comfort of individuals is difficult to evaluate. Unpleasant odors can result in social and behavioral changes, such as diminishing one's sense of well being, enjoyment of daily activities, and ability to perform various tasks. However, odor perception is subjective, and different individuals may react differently to the same type and intensity of odor. A Doctor at County Hospital, a private hospital located at Owchim said in an interview *"Just because something smells bad doesn't mean that it is harmful to inhale (for example, rotten eggs). On the other hand, some very dangerous chemicals have either a mild odor (gasoline) or no odor (carbon monoxide). In fact, many of the most toxic substances in the air do not have any odor"*.

With most exposures, whether it is harmful or not depends on how much of the substance one is exposed to, and for how long. However, this is not the case with foul odors. Even a small amount of a bad odor can make individuals feel ill immediately and reduce their quality of life. Usually these effects are not permanent.

### Access to Water Supply in the Owchim Community

This section examines the extent to which how the households living near the dump are exposed to water contamination through drinking, consuming fish from contaminated water, or inhaling volatilized compounds

through bathing in contaminated water. Whilst access to water is a basic necessity of life, the nature of that access and how water is handled can have profound effects on health. Figure 2 shows households relative access to water supply in the community. Figure 2 shows that in all, less than 40% have access to pipe-borne water. The rest of the households supplement their limited potable water utilization with non-potable sources. These include Borehole, Streams, Rain Water and Water from Vendors. Rain water harvesting appears to be popular even though it is the traditional source of water for many Ghanaians. The unsanitary nature of the roofing materials experienced in the area and also the poor quality of rain water may have dire consequences on human health. Lack of portable water may in some cases cause water contamination which causes diarrhea. Similar findings exist in other parts of Ghana. For example, in the Accra Metropolitan Area, Boadi and Kuitunen (2005) found the incidence of diarrhea in children under 6 to be higher for households getting water from vendors.

### Quality of water sources in Owchim

The results of the water quality test for microbial analysis are shown in table 5. Fecal coliform and Escherichia coliform (E. coli) contamination were wide spread. The study showed that the two Rivers, Pumpunase and Tabiri which served as alternate source of water for the community showed high fecal coliforms levels at the different sample sites selected for the study. All the sample sites of the rivers showed higher count of fecal and Escherichia coliforms that were higher than WHO recommended limits of zero (0), table 5. However, sample sites at the up-streams of the rivers showed very much lower fecal and E. coli counts. Example R. Punpunase showed fecal coliform count of 6.8 and 4.5 respectively at the downstream whiles the sample location at the upstream showed faecal coliform count of 1.2. Again, the fore mentioned rivers showed E.coli levels of 1.1 and 1.4 respectively at the downstream whiles the sample location at the upstream showed faecal coliform count of 0.3 see detail results in table 5. Over all, R.

**Table 5.** Results of water quality tests.

Water Sources	Fecal coliform	E. coliform
<b>R.Pumpunase</b>		
L 1	6.8	1.1
2	4.5	1.4
3**	1.2	0.3
<b>R.Tabiri</b>		
L 1	18.9	7.1
2	16.7	5.6
3**	2.1	0.9
<b>WHO Guideline Value mg/l</b>	0/100 (3/100-epidemics)	0/100

All Tests were conducted at GWCL Regional Laboratory, 2012

\*Unaffected community

\*\* Upstream

L= location

Tabiri showed the highest count of faecal coliforms and E.coli concentration and this is because of its closeness to the waste dump. Faecal coliform, which are indicators of faecal contamination and measured in terms of colony forming units (cfu) per 100ml by membrane filter technique on chromo cult, have shown values above the WHO guidelines. The high level of fecal coliforms and E.coli does not make the water suitable for domestic use without treatment.

For agriculture purposes, vegetables watered with these streams may also be contaminated. The high faecal coliforms counts in the streams are signs of biological contamination of the streams by pathogens. Again, the high faecal coliforms observed make the streams unsuitable for swimming, boating and fishing (WHO, 2004). It also indicates significant health risk to humans and other aquatic animals. Furthermore, the high E. coli counts detected in the streams indicated heavy pollution. The results further suggest the general sanitary qualities of the water in the catchment area as indicated by the faecal coliform and E. coli counts, are unacceptable. For water to be considered as no risk to human health, the faecal coliform and E. coli counts/100mL should be zero (WHO 2004). The poor microbial quality might be due to contamination caused by human activities and the livestock the graze on the banks of the rivers.

The higher level of coliforms and E.coli in Wells located in the study area can be attributed to the absence of natural soil protection and filtration functions and the possibly short distances between the input of contamination and water extraction. Especially, in the case of heavy rainfalls the microbial load of running waters may suddenly increase substantially and reach wells quickly. Most catchment areas of these waters are heavily contaminated due to their closeness to waste dumps. Again the catchment areas have forest cover and are heavily affected by agriculture and settlements, providing ideal conditions for contamination, particularly

during heavy rainfall. Human faecal pollution in the study area can largely be attributed to outdoor defecation and this may constitute the greatest public health threat because humans are reservoirs for human pathogens including bacterial, protozoa and viruses (Toranzos and McFeters, 1997). Animal faecal waste is also a serious health concern as they may contain pathogens.

Although the streams have an appreciable self-purification capacity, the capacity is strained by persistent pollution overloads. The pollution plight of the streams is because they are flanked by expanding human settlements, institutional and socio-economic activities and poor solid waste management activities.

### Frequently occurring diseases in the study area

This stage of the research considered the most frequently occurring diseases in the study area as reported by respondents. They were asked to mention the disease they had suffered within the two weeks preceding the survey. In instances where respondents could not mention the name of the disease, they gave the symptoms for further interpretation by a medical doctor. In the case of malaria for example, increase in body temperature and occasional headache was accepted as the general symptom.

Figure 3 shows the top ten (10) diseases in the community. Malaria, Diarrhea and Upper Respiratory Tract Infection (URTI) continue to be the leading causes of ill-health in the community. The high level of illiteracy and poverty as well as limited access to safe drinking water and poor sanitation have combined to expose many people to health hazards which account for the low standard of living. The prevalence of diseases such as malaria, diarrhea, upper respiratory infections (URI), eye irritation, skin diseases, and intestinal infection as well as outbreak of epidemics such as cholera can be traced to the above factors. The research showed that malaria

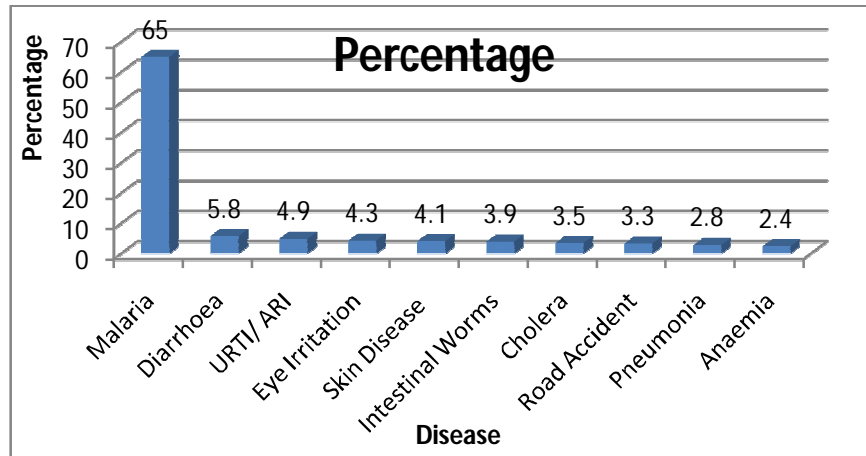


Figure 3. Top 10 diseases as reported by respondents.

continuous to be the leading cause of sickness - 65.5%. This might not come as a surprise as The World Health Organization estimates that about 90 per cent of all clinical cases and deaths from malaria occur in tropical Africa, where it accounts for 10 per cent to 30 per cent of all hospital admissions and is responsible for 15 per cent to 20 per cent of all deaths of children under the age of five (WHO, 2000).

The issue here is the persistency in the occurrence of the disease as middle age woman confirmed *“hardly would a week pass by without taken one malaria drug or another. I have tried almost all the malaria drugs, from chloroquine to ACT but none seem to cure the disease effectively”*. The research, on the contrary found that it was not the issue of ineffectiveness of the malaria drugs but rather the continuous presence of the anopheles mosquito in the area. The mosquitoes breed from the stagnant water bodies at the dumpsite as well as the wetness of the solid waste. A 65 year old native in an interview had this to say,

*“I was born and have lived here throughout my life and I can say that until the recent dumping of refuse in this community, one could hardly experience persistent malaria as it is the case today. Infarct during those days, persistent malaria was attributed to curses from the gods. The solid waste is killing us and the earlier they stopped, the better it will be for all of us.”*

The other diseases such as Acute Respiratory Infections (ARI, 4.9%), Eye irritation (4.3%) may be due to dust particles during the tipping process or when there are strong winds preceding rainfall and the particulates from incomplete combustion of fuel source of burning refuse. According to Woodward (1997), exposure to smoke particles can reduce the ability to breathe, and reduce resistance to diseases; also existing respiratory

conditions may be aggravated. Those with greater pulmonary sensitivity may show a much greater reduction in lung function than the others. Also according to Brash (1996), most of the respiratory diseases are attributed to exposure to smoke and dust. Low atmospheric concentration of formaldehyde causes eye irritation, coughing and irritation of the lungs. Discomfort increases rapidly with increase exposure and asthmatic symptom may occur due to development of allergic sensitivity.

Poor hygienic practices such as washing of hands before eating or after visiting or attending to natures call could be a reason for the prevalence of intestinal infestation (3.9%), cholera (3.5%), and diarrhoea (5.8%), though the waste dumpsite could have provided the opportune grounds for the growth of the disease causing organism. Traffic and transport accidents form another major component of disease burden in the community. This situation is not strange because of the geographical location of the waste dumps in relation to the residential facilities and the number of trucks that are involved in the haulage of the waste.

Many of such injuries occurred in young adults, with significant loss of life. A high proportion of road traffic injuries occur among vulnerable users – pedestrians, bicyclists, motor cyclists and other non-motorized traffic – and among passengers of buses and trucks. As with many other risk factors, exposures to road traffic accidents have complex interactions with other factors, including the lost of opportunity for physical activity and the economic effects of transport and traffic.

## CONCLUSION AND POLICY DIRECTION

Managing Solid waste dumps is becoming an increasingly complex matter in the KMA because of the threat it poses to public health. The problem is



aggravated by the shortage of space for the construction of solid waste management facilities, especially, landfills as it is the most preferred choice. The populations at risk are those living proximal to the dumpsite. The households living in close proximity to the Owhim waste dump have thus become victims of circumstance they have not created. This is the reason for the persistent conflicts between the public and the metropolitan authorities, thus re-igniting the debate on location decisions in the urban governance structure. This paper is of the view that a lower middle-income country like Ghana cannot allow majority of its citizens to wallow in filth laden cities and suffer the health consequences. It is therefore imperative that if the country wants to halve the spread of malaria and other diseases of the environment, and also, ensure environmental sustainability as prescribed in the Millennium Development Goals five (5) and seven (7) respectively, then there is the need to:

- a. Comply with the international guidelines for the establishment of landfills/dumpsites and
- b. Conduct broad stakeholder consultations including the members of the community in which the projected will be sited.

It is only when these are done that the health and social implications associated with solid waste dumps could be minimized considerably.

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