Environmental health and its implications in an urban community in Accra, Ghana: a community diagnosis.

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Abstract

Introduction: Due to the significance of environmental safety we seek to investigate the environmental conditions and self-reported health conditions of an underserved community in the Greater Accra Region, Ghana.

Methods: A descriptive, cross-sectional survey of heads of households or in their absence, an informed adult aged 18 years and above, was conducted using structured questionnaires. One eligible participant was recruited per household. Descriptive statistics were generated using SPSS, Microsoft Excel).

Results: One hundred and eight households were surveyed with a total population of 430, of which 192 (44.6%) were males. The average household size was 4 persons and the mean age ± standard deviation was 30 ± 1.88 years. The majority lived in compound houses (87%) with structural integrity (floors and walls). However, 66.7% of households had no ceiling. Only 21.3% of households had private toilets, but hand hygiene after use of a toilet was adequate. Common sources of noise were churches, schools, neighbours, funerals and parties. Household pests were predominantly insects and rodents. Malaria (42.6%), hypertension (19.2%) and urinary tract infections (8.5%) were the most self-reported specific disease categories.

Conclusion: from the study it was deduced that poor community planning, low standard of living and little knowledge on the need for clean and friendly environment attributed to poor system of living and associated hazard.

Keywords: Air pollution, food hygiene, housing facilities, noise pollution, urban community, pest control.

Introduction

A community diagnosis is aimed at identifying health problems in a specified or target community and the related facets which are helpful in understanding the context of the problems and its potential for solutions.[1,2] These include the history and demographic composition of its people, the leadership structure, community institutions, traditions, cultural values and norms, social network, its living environment, health services and lifestyles which are inherent to the community.[1,3] However, representatives of civil society and development partners whose activities are undertaken in the community are equally important as they contribute directly or indirectly

to the health of the community through their activities or may play a role in the solutions to the health problems identified by needs assessment, program implementation and evaluation, advocacy and lobbying among others.

Identifying health promoting and health demoting factors facilitates prioritization in health planning and can serve as a baseline survey against which future surveys can be compared. This paper presents the results of the environmental health aspect of a community diagnosis conducted in an underserved, urban community.[4]

Methods

This was a cross-sectional study carried out over two days in November 2017 at Lenshie Quarter, a community located at Teshie a suburb of Accra, Ghana. This is within the Ledzokuku-Krowor Municipal Assembly (LEKMA). According to the Ghana Population and Housing Census final results in 2010, the municipality has a total population of 227,932 comprising of 109, 185 males and 118,747 females. The total households in the municipality is 60,859 with total household population of 221,757 and a household size of 4. Heads of household or in their absence an adult aged 18 years and older who was well informed about the household was recruited for the study. The household head was a male or female defined as the person recognized by members of the family with the economic and social responsibility for the family. A household was defined as a person or group of persons, who lived together in the same house or compound and shared the same housekeeping arrangement. It consisted of the man, his wife, children and relatives and non-relatives like the house help. The relatives may be by blood or marriage.[5]

Only residents of the Lenshie Quarter community participated in the study. Cluster sampling was used to select the study participants and demonstrate in a practical way how this sampling method should be conducted. The community was divided into four clusters using the available roads, assigned numbers serially and a single cluster chosen by ballot. One hundred and eight 108 households with a population of 430 participated in the study. Each selected household answered structured questionnaires containing close-ended questions to collect data on demographic and environmental characteristics (house type and characteristics, drinking and domestic water usage, waste management, hand washing practices, food source and storage, air and noise pollution and pest and pest control). The data collected were analyzed using the Statistical Package for Social Science (SPSS) IBM Statistics 23.0 and Microsoft Excel version 2016. Approval for the study was sought from the chief and elders of the community and verbal consent was given by respondents prior to their recruitment.

Results

Socio-demographic characteristics of the respondents

One hundred and eight households were surveyed with a total population of 430, of which 192 (44.6%) were males. Environmental characteristics were provided for the 108 households, while demographic characteristics were provided for 430 residents in these households. The average household size was 4 persons. Majority of the respondents had either basic or secondary education (75.5) Fewer respondents attained tertiary education (8. 4%). Most respondents (70%) were never married, widowed or divorced Predominant ethnic groups were: Ga/Adangbe (61.2%), and nearly nine in ten respondents (89.1%) were Christians. Among respondents with an occupation, majority (27%) were traders (Table 1)

Table 1 Sociodemographic characteristics of surveyed population.

Demographic characteristics	Frequency (percentage)
Total population	430 (100)
Males	192 (44.7)
Sex ratio	81 males per 100 females
Total surveyed households	108
Average household size	4
Age (years) mean (s. d.)	30 (± 1.88) years
Marital status	
Never Married	228 (53.0)
Married	114 (33.5)
Co-habiting	15 (3.5)
Widowed	26 (6.0)
Divorced	11 (2.6)
Separated	6 (1.4)
Total	430 (100)
Ethnicity	
Ga/Ga-Adangbe	263 (61.2)
Akan	81 (18.8)
Northern tribes	53 (12.3)
Ewe	17 (4.0)
Others	16 (3.7)
Total	430 (100)
Highest level of Education	
No formal education	66 (15.3)
Basic education	102 (23.7)
Junior High School	112 (26.0)
Senior High School	111 (25.8)
Tertiary education	36 (8.4)
Vocational School	3 (0.7)
Total	430 (100)
Occupation	
Traders	116 (27.0)
Artisans	39 (9.1)
Professionals	32 (7.4)
Civil servants	11 (2.6)
Retired	15 (3.5)
Students	125 (29.1)
Unemployed	79 (18.4)
Others	13 (3.0)
Total	430 (100)
Religion	
Christianity	383 (89.1)
Islam	34 (7.0)
Traditional	4 (1.0)
Others	9 (2.0)
Total	**430 (100)**

Environmental conditions in the community's Type of dwelling

Eighty-seven percent of all dwelling units were compound houses. Semi-detached houses constituted 6.7 %, and 3.7% had lived in improvised shelters like a kiosk or a metal container.

Building Materials

The inner walls (96.2%) and floors (90.7%) of most houses were made from cement, the outer wall of dwellings in the present study were made from cement blocks (91.9%). Roofs were made from slate/asbestos (88.8%) (Table 2).

Table 2 Building materials used in Lenshie Quarter

Material/ Area	Wall	Floor	Roof	Ceiling
Cement	102 (96.2)	98 (90.7)	0	0
Wood	3 (2.8)	2 (1.9)	1 (0.9)	8 (12.1)
Mud brick/ Earth	0	0	8 (7.5)	0
Tiles	0	4 (3.7)	0	0
Terrazzo	0	4 (3.7)	0	0
Slate/Asbestos	0	0	95 (88.8)	0
Plaster of Paris	0	0	0	2 (3.0)
Others	1(1)	0	3 (2.8)	12 (18.2)
None	0	0	0	44 (66.7)
Total	**106 (100)**	**108 (100)**	**107 (100)**	**66 (100)**

Data is presented as frequency and percentages

Netting and frequency of opening of windows in homes

Nearly a quarter of the surveyed population lived in houses with one (24.3%) or four windows (24.3%). On observation, it was noted that 87.9% households had windows with nets and of those that had nets,

84.2% were intact without any defective holes. Also when respondents were asked how often they opened their windows, 47.5% of respondents either always or sometimes opened their windows to allow ventilation of rooms,

Sources of and storage of drinking and domestic water.

The most common source of drinking water was from bottle or sachet water (80.6%), followed by pipe-born water (16.7%), with the least source being obtained from borehole (1.9%). Regarding sources of water for domestic use, the most patronized source was pipe-borne water (90.3%), followed by wells (4.4%) and borehole (1.8%). Among the 87 households that sourced their drinking water from public standpipes, boreholes and wells, some used covered (62%) or open containers (5%) to store water. A third of the households reported that they did not store water.

Waste disposal practices

Solid waste was collected by private service providers, a relatively small number of households resorted to burning and burying of refuse. About forty-six percent (46.3%) of households had their refuse collected three times a week and nearly a third of households (32.4%) reported a daily refuse collection. Although there was no report of indiscriminate dumping of refuse by residents who were unable to afford waste collection service fees, the transect walk through the community revealed choked gutters and littering of black plastic bags. Silage was disposed by draining into gutters (55.7%) and thrown onto streets or compounds. Only a small proportion of households used a sewerage system (2.8%) and soak away pit (0.9%). Households were a predominant source of solid waste in the study area (Table 3).

Table 3 Waste disposal methods in Lenshie Quarter, 2017

Solid waste		Liquid waste	
Method	Count (%)	Method	Count (%)
House-house collection	64 (58.2)	Soak away pits	1 (0.9)
Dumping (unregulated areas)	18 (16.4)	Drainage into gutters	59 (55.7)
Communal site	22 (20.0)	Sewerage system	3 (2.8)
Burned by household	3 (2.7)	Thrown into streets/ compounds	41 (38.7)
Buried by household	2 (1.8)	Others	2 (1.9)
Others	1 (0.9)		
Total	**110 (100)**	**Total**	**106 (100)**

Toilet facilities

Among the households surveyed, 78.7% lacked toilet facilities. The most commonly used toilet facility was the water closet (38.5%), followed by the Kumasi Ventilated Improved Pit latrine (KVIP) (19.8%). Although there was no report of open defecation, bucket or pan latrines, 15.7% admitted defecating into plastic bags which they dumped into gutters. The Lenshie Quarter community also had a communal bath which the inhabitants patronized for a fee.

Food habits and food hygiene

Sixty percent of households cooked their food at home, 6% bought food from food vendors and 34% sometimes bought and cooked their own food. The most common method for storing leftover cooked food was in the fridge/freezer (33.6%). Other forms of storing food included leaving it on the stove (24.8%), in cupboard (11.5%), and on top of a table (15.9%). The rest simply cooked enough food to avoid having any left over. Leftover foods were mostly stored in covered containers

Sources of Pollution

The predominant cooking fuels used by respondents were charcoal (46.4%) and LPG (46.4%). Only

one household in the sample used wood (0.9%) which in addition to other biomass contribute to household air pollution (Table 4). With regards to noise pollution, religious activities and social events such as weddings and funerals were the most sources (53.3%) (Table 4).

Table 4 Sources of environmental pollution

Sources	Frequency(Percentage)
Cooking fuel	
Charcoal	52 (46.4%)
Liquefied petroleum gas (LPG)	52 (46.4%)
Kerosene	5 (4.5%)
Wood	1 (0.9%)
Others	2 (1.8%)
Total Source of air	112 (100)
pollution Burning of waste Cooking fuel	34 (34.3) 14 (14.1)
Fumes from cars	10 (10.1)
Others (burning of weeds, smoking of fish and grilling meat)	41 (41.4)
Total	99 (100)
Source of noise pollution Church Events	29 (27.6) 20 (19)
Mosque	7 (6.7)
Others (road traffic, drinking bars, music vendors, commercial waste collector vehicles)	49 (46.7)
Total	**105 (100)**

The main methods of control were the use of insecticides, manual killing and 'Kwawe last stop' a local term for a glue board (82.3%). The glue holds the rodent in place and prevents it from escaping.

Discussion

The study shows the environmental conditions at the Lenshie Quarter, an urban community located at Teshie a suburb of Accra, Ghana within the Ledzokuku-Krowor Municipal Assembly (LEKMA). The average household size was 4 persons. This exceeds the household size reported by the Ghana Demographic and Health Survey in 2014 which reported 3.4 persons per household. The finding also exceeds the LEKMA District report of 3.6 persons per household in the 2010 Housing and Population Census report.[5,8] The median age of 26 years qualifies the population as an intermediate population, which ranges between 25-29 years.5 Majority (75.5%) has either basic or secondary education. The study showed a relation between level of education and concern for the environment since individuals with advanced levels of education showed more concern for the environment.[6,7]

The relatively smaller proportion of male respondents (44.6%) may be as a result of the greater availability of female respondents during the interviews, as most occurred in the afternoons and extended into the early evening. Additionally, female respondents were directly involved in practical aspects of food hygiene, solid and liquid waste management. A study by Tackie-Ofosu posits that in developing countries, women are directly concerned with household chores and they play a decisive role in areas such as solid waste management.[10,20] Eighty-seven percent of all dwelling units were compound houses. The 2010 Population & Housing Census elucidates that majority of urban dwellers tend to live in compound houses, usually due to low, affordable rents. Those who cannot afford standard housing often resort to makeshift housing which can have detrimental effects on the physical and mental health of an individual.[8] A 2017 Bank of Ghana Housing Brief Report also revealed that 45% of families in both urban and rural areas lived in compound houses with inadequate conditions.[9] It was suggested that if 2 million self-contained dwellings are built in urban areas by the year 2020, this may help alleviate housing problems, however, this study shows that many people still live in com-

pound houses. The inner walls (96.2%) and floors (90.7%) of most houses were made from cement.[10] This trend is also seen in the Ghana Living Standard Survey (GLISS) 2014, where in Accra, the main floor material used was cement (79.7%)and nine out of every ten households (91.5%) lived in dwellings where the outer wall was constructed with cement or concrete.[11] Similarly, the outer wall of dwellings in the present study were made from cement blocks (91.9%). Roofs were made from slate/ asbestos (88.8%). In contrast, GLISS 2014 report demonstrated that majority of dwellers in Greater Accra Region used metal sheets as the main material for roofing of dwellings.[11] Two-thirds of respondents reported their dwellings lacked a ceiling. This affects thermoregulation in the dwelling units. The hot weather in the tropics would enhance the heat in the house and without a ceiling, pests and rodents may gain access to the building more readily. Pests and rodents have the ability to transmit diseases in human habitation. Nearly 87.9% households had windows with nets and of those that had nets, 84.2% were intact.

This practice of screening houses is commendable as research has shown that the nets of doors and windows confers a degree of protection against malaria vectors and reduces the screening incidence of malaria due to the low density of biting mosquitoes.[12] The most common source of drinking water was from bottle or sachet water (80.6%), followed by pipe-born water (16.7%), with the least source being obtained from borehole (1.9%). This contrasts with the 2010 Population and Housing Census Report of LEKMA which indicated that households obtained their main source of drinking water from pipe borne water outside their dwelling (32%) followed by sachet water (23.6%) and then bottled water (0.7%).5 Sachet water was originally considered an improved source of water only if the household used an improved water source for other purposes such as cooking and handwashing.[13]

However, the Multiple Indicator Cluster Survey (MICS) 2017/18 now classifies 'packaged water' as an improved source.[14] This implies that households in Lenshie Quarter have access to improved sources of drinking water and is in sync with 93% of urban areas in Ghana which have access to improved drinking water.[14] Households were a predominant source of solid waste in the study area. Private service providers in waste management reportedly collect 60% of refuse generated daily resulting in heaps of rubbish in gutters, households, communal sites and other public places.[15] Though the method and frequency of disposal appears to be adequate, the dumping of refuse into gutters by some members of the community can have detrimental effects on the environment, particularly during the raining season. A similar situation was reported in Sabo-Zongo, a slum neighborhood in Accra, Ghana, where inhabitants dump rubbish in gutters.[2] Residents who lived downstream of run-off and flood channels bore the brunt of waste, both solid and liquid. The standing water also served as breeding grounds for mosquitoes. The GLISS 2014 also reports that urban dwellers discharge their liquid waste into drains (52.2%), open areas (42.3%), sewer (3.0%) and septic tanks (2.4%), a pattern similar to what was observed in the study area.[11]

The disposal of liquid waste into open spaces creates breeding grounds for insect vectors and facilitates transmission of vector-borne diseases. Uncollected litter and refuse dumps harbor vermin, rodents and vectors and causes stench within the environment. The presence of malodor has been associated with poor self-reported health. Most households (78.7%) lacked toilet facilities. Inequalities in sanitary conditions, particularly with access to toilet facilities in the Greater Accra Region, have been linked to household wealth. Flush toilets (both septic and skewered) are usually found in households in the higher wealth bracket, while pit latrines are common in low-income households.[16] Our study did not investigate the relationship between sanitation and wealth quintiles. The use of flush toilets as the most commonly owned latrine facility was also reported by Udofia and colleagues who surveyed five neighborhoods in the Greater Accra Region to reflect rural, peri-urban and urban settings. [3] According to the MICS 2017/18, a quarter

of urban households (25%) had an improved toilet facility which was not shared.

Regular handwashing with soap and running water can reduce the incidence of diarrhea and pneumonia by 50%, however it has been reported that only 15% of Ghanaian households have handwashing facilities. In this study, a relatively higher proportion of toilets facilities had handwashing facilities (84.3%). A systematic review of handwashing adherence in low-to middle-income countries suggests poor behavioural change.[18] The predominant cooking fuels used by respondents were charcoal (46.4%) and LPG (46.4%). The Ghana Living Standards Survey 2014 report indicated charcoal (43.6%) and LPG (35.8%) as the main cooking fuels and the use of LPG in Accra (52.7%) exceeds that reported in rural areas of the country.[11] The use of biomass fuels like charcoal and firewood have been found to contribute to household air pollution (HAP) and in low-and middle-income countries, HAP is increasingly becoming recognized as a potential risk factor for asthma and other respiratory symptoms.[19] Though the present study did not investigate the effect of burning traditional fuels on the health of the respondents, the burning of biomass fuel is of major public health concern because of its association with a wide range of illnesses like pneumonia, stroke and lung cancer and cardiovascular diseases. Pneumonia contributes to under-five mortality in low- and middle-income countries.[20] Pregnant women have a two-fold risk of developing pre-eclampsia or eclampsia when exposed to fumes from burning biomass compared to those house cleaner cooking fuels.[21,22]

Using cleaner fuels in conjunction with improved ventilation can be effective in reducing household air pollution. Air pollution results from burning waste (34.3%), cooking fuels (14.1%) and fumes of cars (10%). Other sources of air pollution were from burning of plant materials like weeds, smoking fish and grilling meat for commercial purposes (Table 4). Burning garbage, wood, agricultural materials and emission from transport contributes particulate matter, nitrogen dioxide (NO2), sulphur dioxide (SO2), carbon monoxide (CO) and lead (Pb) to outdoor air.

These outdoor pollutants are known to increase mortality particularly from respiratory diseases like asthma, chronic obstructive pulmonary disease and lung cancer.[23] Adverse effects have also been reported in the digestive, urinary and nervous systems.[24] Poor ventilation in the built environment can result in high concentrations of air pollutants from combustion of solid fuels and tobacco smoking.[25,26]

Noise is any unwanted sound that can cause some physical and psychological stress to the human body as well as environmental pollution by destroying environmental properties exposed to it.[22] Generally, noise levels ranging from 5 decibel (dB) to 20 dB is noticeable loudness to the human ear. These levels have been associated with subfertility and increased risk of type 2 diabetes, particularly from long term exposure to road traffic noise.[28,29]. The presence of pests and vectors suggests insanitary conditions among the households surveyed. The main methods of control for the pest were manual killing and glue board traps, and control for the vectors were mainly the use of insecticides. Indoor residual spraying is one of the vector management strategies being promoted by the National Malaria Control Program (NMCP) to prevent mosquito bites within the home environment.[29] However, the frequent use of insecticides, particularly those containing pyrethroids has been shown to increase resistance in mosquitoes combined with the use of insecticide treated nets (ITNs), they can offer the greatest of protection against malaria.[24,30]

Breeding sites might have contributed to malaria (42.6%) topping the list of all self-reported diseases in the survey. This finding is in line with malaria being among the top ten diseases reported in outpatient departments in Ghana and is found mostly among vulnerable groups like pregnant women and children under 5 years of age. [28] A community diagnosis is used to study demographic characteristics of a community, identify adverse environmental and health conditions for

intervention, and highlight positive behaviour that can be reinforced to promote and maintain health.

The health promoting conditions identified were the use of pipe-borne water for domestic purposes, the practice of covering stored water and the practice of hand hygiene which together might have contributed to the low reported prevalence of cholera. Furthermore, food habits and hygiene were adequate for the majority. Among the health demoting conditions described were choked gutters and inadequate drainage resulting in insanitary conditions attracting vectors and rodents. Municipal authorities through their Environmental Health Officers and communal or hired labor or both can work to improve adverse environmental conditions in the community.

An inter-sectoral approach between academic, health and environmental authorities which comprised public education, monitoring neighborhood noise levels and air quality, adequate risk assessment and risk communication would be helpful in addressing both noise and air pollution in the community. A continuous engagement between academic institutions and community, through community diagnoses, can be a critical tool to empower communities to seek improvements leading to a healthy environment and better health.

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