

Adaptation to climate change and diseases: a perceptual study in the Kwahu south district, Ghana

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Abstract: The challenge of health in a country does not lie mainly with poor sanitation and other factors, but also lies with adverse climate change. The notion that climate change generally increases human diseases has garnered considerable public attention, but remains controversial and seems inconsistent with other people in most part of Ghana. The study aimed at analyzing the perceptions of the people of the Kwahu South District on climate change and health-related issues in their communities. This is also to assess the communities' adaptation strategies to climate change and health-related issues. One twenty (120) household partially pre-coded questionnaire were administered in three communities namely Kwahu Praso Nos. 1 and 2 and Kwahu Besease. A cluster and quota sampling techniques were used to aggregate the three communities before probability simple random sampling technique was used to select the respondents from each community. There was a low level of awareness about climate change and health. Again, knowledge and capacity at local level to understand and adapt climate change-related diseases is low. The common diseases in the community associated with climate change were malaria, heat stress diseases such as skin rashes and respiratory infections. Coping strategies and adaptation mechanism were limited, due to their low knowledge on climate change and health related diseases. It is important for awareness creation on climate change and health issues by the District Health Directorate.

Keywords: Climate change, adaptation, health, Kwahu South District.

INTRODUCTION

Climate change has attracted considerable attention in recent years as key global challenge of our time. These changes in climatic conditions and climate variability can also affect human health both directly and indirectly, via changes in biological and ecological processes that influence the transmission of several infectious diseases [1]. The distribution of climate-related health burdens is described as almost inverse to the global distribution of greenhouse gas emissions [2].

Africa is likely to be affected the most and is the region where the observed adverse consequences of climate change are most apparent. Predictions are that the loss of healthy life years due to global environmental change (including climate change) is 500 times greater in Africa than in Europe, and yet health is widely recognized globally as a fundamental human right [3].

In sub-Saharan Africa, the threats to health by climate change operate through direct consequences from extreme weather and through indirect pathways such as changing patterns of disease and morbidity,

water and sanitation, food security, global economic crisis, population pressure, migration and urbanization [4].

Specifically for Ghana, although Global Circulation Models (GCMs) agree generally that mean temperatures will rise, little agreement exist on future precipitation amounts or seasonality. Some GCMs project increased precipitation in the northern three regions and others project decreases. For example, across most ecological zones of Ghana, dry season mean temperatures are projected to rise by about 1.5 to 2.0 ° C to about 3.0 ° C by 2080. Forecasted changes in precipitation range from 48 percent decreases to 45 percent increases in wet season rainfall by 2080 [5].

There is no doubt that the climate in Ghana has changed significantly with impacts being felt everywhere in the Ghana. Studies showed that, there is 1°C increase in temperature over a 30-year period from the historical records, increased evaporation, decreased and highly variable rainfall pattern and frequent and pronounced drought spells. Again in Ghana over the past 40 years (1960-2000), average annual temperatures

have been rising steadily in 5 of the 6 agro-ecological zones of Ghana [6]. This trend is projected to continue into the future and this would have a number of implications on the health of the people.

Kwahu South District which is part of Ghana cannot be left out of the adverse climate change. The change in climate in the communities poses a threat to the health conditions of the people of the Kwahu South District. Thus climate change presents major challenges regarding the well being of the population. Climate change endangers human health, affecting all sectors of their society. The environmental consequences of climate change, both those already observed and those that are anticipated such as changes in precipitation resulting in drought, heat waves and degraded air quality have affected human health both directly and indirectly.

The objective of this paper is to examining the perceptions of the people of the Kwahu South District on climate change and health-related issues in their communities. This is also to assess the communities' adaptation strategies to climate change and health-related issues.

METHODOLOGY

Research Design and Sampling Techniques

Both qualitative and quantitative research design was used, known as triangulation. Primary and secondary data were also used. Primary source of data for this paper were obtained directly from respondents. Secondary data were sourced from textbooks, articles from journals, reports, published and unpublished thesis and also internet links. A cluster and quota sampling techniques were used to disaggregate the three communities before probability simple random sampling technique was used to select the respondents from each community.

The research tools that were used to collect both quantitative and qualitative data for this study were structured questionnaires and observation respectively. One hundred and twenty questionnaires (both open ended and closed ended) designed by the researchers helped in obtaining the quantitative data from the people while personal observation also helped the researcher obtained the qualitative data. With quantitative data, analysis was done using the Predictive Analytics Software (PASW, v.17). The results were tabulated and statistical tools such as charts were used in the interpretation of the result. Multiple response questions were analyzed so as to give frequencies and percentages. Tables and bar charts were used to present different variables. Cross-tabulation allowed a comparison of different study parameters in the three communities namely Kwahu Praso No. 1, Kwahu Praso

No.2 and Kwahu Besease. Sample size of each community is indicated in table 1.

Table 1: Communities and their sample size

COMMUNITIES	SAMPLE SIZE
Kwahu Praso No. 1	30
Kwahu Besease	40
Kwahu Praso No. 2	50
Total sample size	N= 120

Description of the study area

The Kwahu-South District is located in the Eastern Region of Ghana and it lies between latitudes 6°35' N and 6° 45'N and longitude 0° 55' W and 0° 20'W. The current size of Kwahu South District is 602 km². Mpraeso is the district capital.

The Kwahu South District lies within the wet Semi Equatorial region. It experiences the double maxima rainfall pattern namely major and minor seasons. The major rainy season starts from April, reaching its peak in July. On the other hand, the minor rainy season starts from September, ending in October/November. Annual average rainfall is between 1,580 mm and 1,780 mm. Mean monthly temperature ranges from as high as 30°C in the dry season to about 26°C in the wet season. It is worthy to note that the relatively higher altitude has moderating influence on the local temperature. Relative humidity ranges between 75% and 80%.

RESULTS AND DISCUSSIONS

Respondents' perception on the causes of climate change

The growing body of evidence on climate change shows that human activity is altering the climate through the process of global warming resulting from unprecedented accumulation of greenhouse gases into the atmosphere [7]. This assertion supports the perception of the local people on the causes of climate change in their communities. As indicated in Fig 1, 80% of respondents were with the view that the major human activities that causes climate change in their communities were cutting down of trees by chain saw operators and also cutting down of trees for agricultural purposes. The remaining 20% of human cause of climate change were attributed to fumes from vehicles and burning of refuse dump. This result implies that the predominant activity that causes climate change in the three communities is cutting down of trees by chain saw operators and farmers.

On the other hand, respondents attributed the natural causes of climate change to the Almighty God while others also perceived change in climate in their community for the past years to human beings sinful

attitude to God. Thus climate change is a punishment from God.

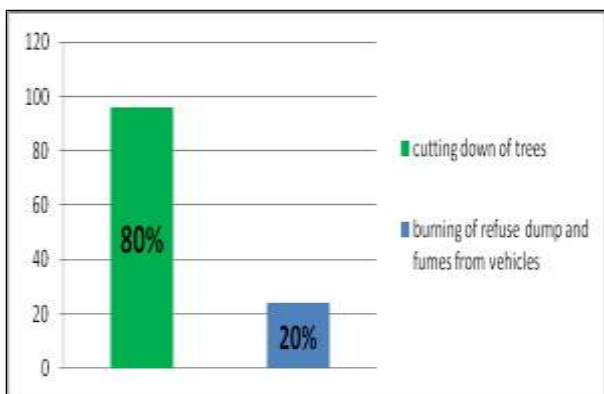


Fig-1: Human activities that causes climate change in the three communities. Source: Field Survey, 2013.

Perceptions on reality of climate change

The reality of climate change to some group of people is a myth. The views of the local people were sought about the extent to which they agree or disagree about the reality of climate change. Out of the 120 respondents interviewed from the three communities, about 72% strongly agreed that climate change is real (Fig 2), while 27% also agreed that climate change is real. Only a small percentage of two strongly disagreed that climate change is real. This result implies that majority of the people in the Kwahu South district agree widely with scientific community that climate change is already a reality. This respondent result is shown in Fig 2.

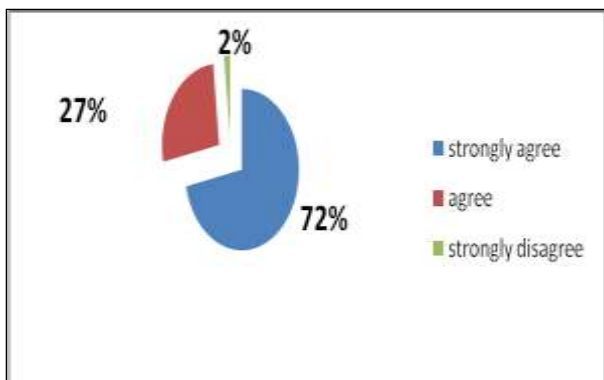


Fig-2: Extent to which the local people agree that climate change is real Source: Field Survey, 2013.

Perceptions on temperature and rainfall for the past years

In finding out about the perception of the local people on the climate variables, majority of the respondents (97%) from Kwahu Besease indicated that temperature as the main climatic variable has increased in their community for the past years whiles 88% of the

respondents from Kwahu Praso No. 1 opined that temperature has also increased in their community for the past years. In Kwahu Praso No 2, the story of their temperature perception was no different from what pertained in Kwahu Besease and Kwahu Praso No 1. This result implies that majority of the people in the three communities’ perceived increasing temperature over the past years as being the cause of climate variability and change. This finding is in line with the study led by Stanturf *et al*, “Ghana Climate Change Impacts, Vulnerability and Adaptation Assessment” which reported that, over the past 40 years (1960-2000), average annual temperatures have been rising steadily in 5 of the 6 agro-ecological zones of Ghana [8].

With rainfall, 90% respondents from Kwahu Besease affirmed that there has been a decreasing trend of rainfall pattern in their community, 89.5% respondents from Kwahu Praso No. 1 also was with the opinion that rainfall has decreased for the past years in their community whiles in Kwahu Praso No.2, 88% respondents reported that rainfall patterns in their community has decreased for the past years.

Respondents information indicated that the rainfall pattern in their community has decreased for the past years. This results is in line with the findings of Global Facility for Disaster and Recovery (GFDRR) which proposed that there is also evidence that rainfall over Ghana was particularly high in the 1960s, and decreased to particularly low levels in the late 1970s and early 1980s, producing an overall decreasing trend in the period 1960 to 2006, with an average precipitation of 2.3 mm per month (2.4%) per decade [9].

Projections and perceptions of climate change for the next thirty years

Intergovernmental Panel on Climate Change (IPCC) projection shows that there will be a 1.4 to 5.8°C (2.5 to 10.4°F) increase in globally averaged surface temperature between 1990 and 2100 [10]. In order to put this number in perspective, a survey was conducted to also find out respondents view about climate change for next coming years in their communities.

Majority of respondents from the three communities (96%) predicted that for the next thirty years temperature in their community will rise whiles the remaining 4% were of the view that the next 30 years temperature will decline. On the other hand majority of respondents (89%) also predicted that rainfall pattern in their community will decline whiles the remaining few respondents (11%) reported that there will be variability in rainfall pattern for the next thirty years in their community.

The result coincided with Global Circulation Models (GCMs) which agree that mean temperatures will rise in future in Ghana. To GCM little agreement exists on future precipitation amounts or seasonality; some GCMs project increased precipitation in the northern three regions and others project decreases. For example, GCM projects that across most ecological zones of Ghana, dry season mean temperatures are projected to rise by about 1.5 to 2.0 ° C to about 3.0 ° C by 2080. Forecasted changes in precipitation range from 48 percent decreases to 45 percent increases in wet season rainfall by 2080.

Common Diseases Associated with Climate Change Malaria

Malaria is one of the most important public health problems in the world. It has been ranked as one of the top three killers among communicable diseases [11]. In the three study communities, one hundred and eighteen respondents constituting 98% indicated that malaria is a major health problem in their community (Table 2). It was clear that respondents' perception on rate of malaria diseases in their community were in line with reported cases of malaria diseases in their health centre. The Out Patients Department Register at Kwahu Praso No. 2 health center indicated that from 2009 to 2012 the total reported cases of malaria were 14,020 [12]. This implies that the incidence rate of malaria in the three communities is very high. As indicated in Fig 3, there is an increasing trend of malaria reported cases from 2009 to 2012 at Kwahu Praso No. 2 Health Centre. The respondents attributed the high rate of malaria in their communities to recent rise in temperature for the past years which is favourable for breeding mosquitoes.

The findings do coincide with National Research Council finding which states that temperature plays a fundamental role in the rate of multiplication of the parasite in the mosquito. [13]. Also parasite of

malaria disease are sensitive to changes in temperature, as temperatures rise the malaria parasites develop and multiple more quickly in the mosquito vectors, thereby increasing the proportion of infective vectors [14].

Respiratory tract infections

As indicated in table 2, 98 respondents constituting 82% reported that apart from malaria disease, respiratory infection is also a health threat in their community. The Out Patients Department (OPD) register also revealed that total reported cases of respiratory infections at Kwahu Praso No.2 Health Centre from 2009 to 2012 were 3,618 respectively. (14) In Fig 3, there is also an increasing trend of respiratory track diseases that have been reported in the Kwahu Praso No.2 Health Centre. With regard to this, respondents attributed the high rate of respiratory track diseases to dust in their community as a result of prolonged dryness of the atmosphere.

Heat stress diseases

The Resource Innovation Group (TRIG), states that extreme heat is a direct threat to public health. High temperatures can cause serious heat-related illnesses and even death, especially among vulnerable populations such as individuals who perform strenuous work outdoors and the elderly [15]. Respondent's perception of temperature in their communities for the past years indicated that temperature has increased. This rise of temperature has affected the health of conditions of the people of Kwahu Praso No 1, Kwahu Praso No.2 and Kwahu Besease. Respondents (67%) reported that heat stress diseases such as measles and rashes also pose a health threat to them. Reported cases of heat stress diseases at Kwahu Praso No. 2 Health Centre indicates that heat stress diseases show an increasing trend from the year 2009 to 2012 as shown in Fig 3. A total of 1453 reported cases on heat stress diseases such as measles, skin rashes were reported from the year 2009 to 2012.

Table-2: Respondents view on incidence rate of common diseases in their communities. Source: Field Survey, 2013

Diseases	Incidence rate of diseases				Total	
	High		Low			
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Malaria	118	98%	2	2%	120	100%
Respiratory track	98	82%	12	18%	120	100%
Heat stress	80	67%	40	53%	120	100%

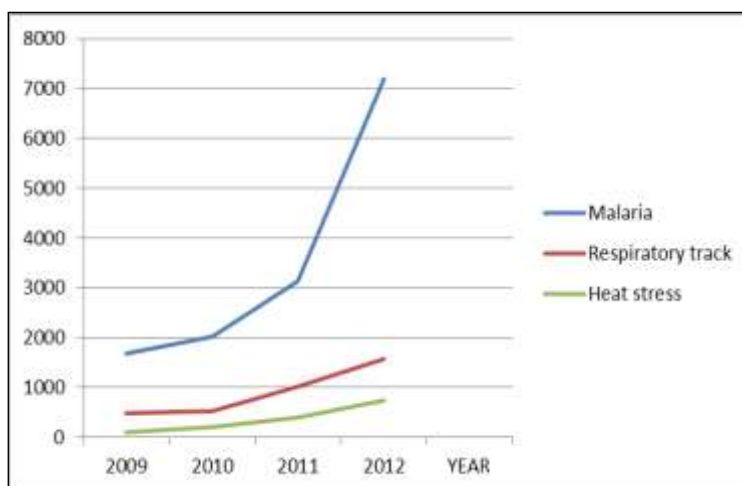


Fig-3: Reported diseases at Kwahu Praso No. 2 Health Centre Source: OPD Register, 2013

Household measures individuals have put in place to adapt to climate change

Adapting to climate change and health has become a major challenge in most part of Ghana. In finding out the adaptation strategies individuals have put in place to protect them from adverse climate change, few respondents (37%) said that they wear loose clothes during high temperature to protect them from heat stress diseases.

About 2% also affirmed that they ration the use of water in their homes as a result of climate change related water shortages. Majority of respondents (57%) revealed that they have improved insurance scheme against the effects of climate change. The other 8 respondents (4%) were of the view that they educate their household on the adverse impacts of climate change on their health. These household adaptation strategies are not planned to some extent by respondents.

Government and Non- governmental organizations (NGOs) policies on adaptation strategies

To read majority of respondents (84.2%) were with the opinion that provision of health insurance scheme and distribution of mosquitoes nets by the government has helped them to adapt to climate change implications on health. At the same time majority of respondents from the three (95.8%) revealed that there are no NGOs policies on climate change adaptation to health.

They further noted that apart from policies on insurance scheme, government of Ghana do not have any programme or project that will help them to adapt to climate change implications on health. It was also observed that the major clinic that served the three communities were Kwahu Praso No 1 Health Centre.

CONCLUSION

Climate change has been identified as one of the pressing environmental problems that have attracted the attention of concerned scientists and scholars for more than a century. This paper revealed, from respondents perceptions on climate change and health related issues in the communities for the past years. They also predicted increased temperature and decreased rainfall patterns for the next thirty years, using their experiential predictions.

In addition to this, the paper has further revealed that the health status of the people in the three communities studied are overburdened as a result of climate change leading to high susceptibility to various diseases and health systems that could be termed opportunistic diseases like buruli ulcer. The major diseases that the study revealed in the three communities were malaria, respiratory tract infections and heat stress diseases. It is evident that the three communities are overly vulnerable to impacts of climate change that have serious bearing on population health status. Also it was observed that Kwahu Praso No. and Kwahu Besease are deprived of Health centers, where the populace could access health services.

However, the study has revealed certain significant issues that have been addressed by the recommendations given below. Though these suggestions may not be all encompassing, they nonetheless can help control and reduce the effects of climate change on the health of the rural people.

RECOMMENDATIONS

Adaptation strategies

Coping strategies and adaptation mechanism were limited at the study site. This study has shown that no network or institution in the Kwahu South District Assembly is specifically addressing these problems. It

is therefore important that network and institutions such as health directorate in collaboration with NGOs in the district should be established to create awareness on climate change. The proposed network and institutions should also address environmental health in general with an initial emphasis on linkages between climate change, water and food security.

Warning system on climate change and diseases

Essential is monitoring and developing early warning systems for diseases such as malaria, respiratory tract infections and heat stress diseases. Thus government in collaboration with health directorates can distribute mosquitoes' nets to the community clinics to address issues of health. Also public education on climate change adaptation is very crucial exercise that should be undertaken by the District Health Directorate.

Mitigation policies

It was revealed that the major human causes of climate change in the three communities were cutting down of trees by chain saw operators and farmers. Therefore mitigation programmes and policies by the government such as sanctions and even arresting of offenders are very crucial to reduce major causes of climate change in the district.

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REFERENCES

1. McMichael AJ, Campbell-Lendrum DH, Corvalán CF, Ebi KL, Githeko AK, Scheraga JD; Climate Change and Human Health. Risks and Responses, WHO Press, Geneva Switzerland, 2003; 102-103.
2. Patz J, Gibbs H, Foley J, Roger J, Smith K; Climate Change and Global Health: Quantifying a Growing Ethical Crisis, *Eco-Health*, 2007; 4(4): 397-405.
3. Besada H, Sewankambo N; Climate Change in Africa: Adaptation, Mitigation and Governance Challenges, CIGI, Canada, 2009; 15-16.
4. Costello A, Abbas M, Allen A, Ball S, Bell S, Bellamy R, Patterson C; Managing the health effects of climate change: lancet and University College London Institute for Global Health Commission. *The Lancet*, 2009; 373(9676): 1693-1733.
5. Stanturf JA, Warren ML, Charnley S, Polasky C, Scott LG, Armah F; Ghana Climate Change, Vulnerability And Adaptation Assessment, USAID, USA, 2011; 2-3.
6. EPA; Ghana's Second National Communications to UNFCCC, UNFCCC, Ghana, 2011; 22-21.
7. Alley RB, Clark PU, Huybrechts P, Joughin I; Ice-Sheet and Sea-Level Changes, *Science journals*, 2005; 310 (5747): 456-460.
8. Stanturf JA, Warren ML, Charnley S, Polasky C, Scott L.G, Armah F, et al; Ghana Climate Change, Vulnerability And Adaptation Assessment, USAID, United State 2011; 21-24.
9. GFDRR; Vulnerability, Risk Reduction, and Adaptation to Climate Change: Country Profile Ghana. NW Washington, USA, 2011:3-4.
10. Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt KB; Summary for Policymakers. In: Climate Change: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (eds.) Cambridge University Press, United Kingdom, 2001; 12-13.
11. Sachs J, Malaney P; Review Article the Economic and Social Burden of Malaria. *Nature*, 2002; 415: 680-685.
12. Kwahu Praso Health Centre, OPD Register, 2013.
13. National Research Council; Under the Weather: Climate, Ecosystems and Infectious Disease, National Academy Press, Washington, D.C., 2001.
14. Ambu S, Lim LH, Sahani M, Bakar MA; Climate Change- Impact on Public Health in Malaysia. *Environ. Health Focus*, 2003; 1: 13-21.
15. The Resource Innovation Group, Climate Change and Public Health. A Guide for Increasing the Capacity of Local Public Health Department Oregon USA, 2010, 19-20.