THE IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH

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ABSTRACT

This paper attempted to discuss the impact of climate change on human health. General effects such as variability in occurrence of numerous illnesses are linked to seasonal trends in temperatures, among others are discussed. Direct impacts such as breakout and spread of cerebrospinal meningitis and others are highlighted. The occurrence and spread of food and water-borne diseases as a result of climate change on human health include the spread of vector born diseases through its influence on the behaviours, and geographical distribution of vectors of parasitic diseases. It also affects the emergence and re-emergence of vector-borne diseases as the life cycle dynamics of vectors and parasites are altered. Recommendations such as primary health care structures should be strengthened through employment of qualified staff to be responsive to emergences associated with climate change, among others are proffered.

INTRODUCTION

There appears to be a general agreement that climate change has a profound impact on human health although scientists do not agree on the precise mechanisms involved. For example, some scientific research results suggest that extreme weather events appear to have the greatest influence on health. With the current alarming climate change rate, humanity will face more injury, diseases and deaths due to natural disasters such as heat waves, floods, high rates of water-borne illnesses as well as premature deaths and diseases related to air pollution. In Nigeria and many parts of the world, large populations are displaced and/or will be displaced by rising sea level, floods, drought and famine. If adaptive strategies are not effectively put in place to drastically reduce and/or eliminate these impacts on our health, the Millennium Development Goals (MDGs) is not going to be achievable. Adaptation strategies that can be put in place to protect people from climate change and its effects include: provision of clean water and environment, safe and adequate food, de-silting of existing earth dams and establishment of irrigation projects, disease surveillance, immunization and treatment, safe and effective disease and vector control, protection of people from heat waves, sea level rise, floods and erosion, strengthening of primary health structures and facilities to be responsive to emergencies associated with climate change, and most importantly creating awareness on the dangers of climate change.

Climate Change and Its Effects on Health

Global socio-economic development and health have improved the general standard of living in the recent times but the resulting deteriorating global environmental conditions or f actors are now affecting human health (Nwoke and Nwoke, 2008). The major global environmental changes significantly affecting health include climate change and ozone layer depletion (WHO, 1996, McMichael, 1996).

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Developing countries like Nigeria will have most vulnerable effects of climate change particularly because of her dependency on climate sensitive resources. The primary activity in Nigeria that aids climate change is the release of harmful substances into the atmosphere, the oil and gas extraction sector, mainly gas flaring in the Niger Delta and offshore. The secondary activity is tree felling and loss of forest for logging, fuel wood collection and wood products. According to Nwoke, *et al* (2011), Nigeria destroys about 600,000 hectares of her forest annually in order to feed forest-based industries.

Nigeria as a developing nation is particularly sensitive to the effects of climate change. A large section of Nigeria's economy depends on natural resources which like the populace are particularly vulnerable to climate change. When these resources are affected, the whole change of socio-economic life of our people is greatly affected. The potential health impact of climate change is grouped into direct and indirect effects depending on whether they occur predominantly through the impact of climate variable upon human biology or are mediated by climate-induced changes on biological and biogeochemical systems (Patz and Balbus, 1996).

In Nigeria, direct impacts of climate change stem from extreme events such as heat waves, floods, landslides, droughts, windstorms and wildfires. Indirect effect of climate change on health may arise from the disruption of natural systems causing infectious diseases, malnutrition, food and water borne illnesses, increased air pollution.

General Impacts of Temperature Change

The impact of temperature on morbidity and mortality can be assessed at both the seasonal and daily levels. The variability in occurrence of numerous illnesses is linked somewhat prediction of seasonal trends in temperature (Persinger, 1980), although significant year-to-year differences do occur. Medical disorders such as bronchitis, peptic ulcer, adrenal ulcer, glaucoma, goiter, eczema, and herpes zester are related to seasonal variations in temperature (Tromp, 1963). Heart failure (most often Myocardialinfarction) and cerebrospinal accidents represent two general mortality categories that have correlated many times with ambient monthly temperatures (Persinger, 1980). Complications from these disorders can be expected at higher temperatures since the body responds to thermal stress by forcing blood into peripheral areas to promote heat loss through the skin. This increases central blood pressure and encourages contraction of blood vessels near the core of the body. However, increase in heart diseases are also noted at very cold temperatures as well. Strong negative correlations have been found between winter, temperature and deaths in certain North American and North Asian and European countries (Persinger, 1980).

Direct Impacts

In Nigeria, intense heat waves has resulted to more reported cases of cerebro-spinal meningitis (CSM), which today is found to correlate positively with highest maximum temperature of the northern harmattan season, and inversely with absolute humidity to a lesser, although still significant extent. This health condition is a feature of Nigeria's dry belt represented by the Sudan – Sahel region of the country, and occurs in the peak of the dry season. Currently, sparse cases of this health condition are presently being experienced in the southern part of the country (Nwoke, *et al;* 2011).

Heat waves have resulted in the non-or very minimal use of insecticide-treated bed nets meant for protection against mosquito-borne diseases by people in rural areas. Rural dwellers complain of discomfort in using these nets because the heat waves appear increased under nets. There is thus a result upsurge in the mosquito-borne diseases (malaria and lymphatic filariasis) in poverty – stricken areas with no money for facilities such as fans and air conditioners. Most importantly however, extreme temperatures being experienced in certain parts of Nigeria affects the

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chemical composition of the insecticide treated nets, making them less effective. This is the same situation for vaccines meant for prevention of diseases as well as heat-sensitive diagnostic reagents. With the precarious electricity situation in the country in conjunction with increased daily temperatures degrades the vaccines as well as stored drugs thereby reducing their relative effectiveness. In other parts of the world heat waves lead to increase in death rates especially in the cities that are overcrowded, amongst the elderly and young children who are most susceptible to the effects of heat stress. Shea (2007) observed that children burn easily from skin exposure, putting them at increased risk of skin damage from UV radiation. In fact, children sunburned between the ages of 10 and 15 years have a threefold increase in the risk of later developing skin cancer (American Cancer Society, 1996). Low income families are such as thorough insulation or air-conditioning (Hoemer and Robinson, 2008). In Nigerian, this group usually have more children in one family resulting in over crowing in homes and easier spread of infectious diseases.

Impacts of Hot Weather: General Relationship

` Much of the temperature – mortality research has concentrated on heat and cold wave episodes. It appears that hot weather extremes have a more substantial impact than cold, and many "heat stress' indices have been developed to assess the degree of impact (Quagle and Doehring, 1981). Kalkstan, 1982, Steadman, 1984, Driscoll, 1971b). These researchers identified high temperature as the most important causal mechanism in summer. Interestingly, many studies have found that most of the excess deaths that occurred during periods of intense heat were not attributed to causes traditionally considered to be weather-related, such as heat stroke (Gover, 1938). Consequently, many researchers continue to use total mortality figures in their analyses, as death from a surprisingly large number of cases appear to escalate with increasing temperature (Applegate, *et al*, 1981, Jones, *et al*, 1982). One of the most commonly reported findings in heat wave mortality studies involves the lag time between the temperatures event and the mortality response. A lag time of one day was most often uncovered (Ellis, 1972, Ekis; *et al*, 1975; Ellis and Nelson, 1978). Others, however, have observed a two – three – day lag (Sehuman, 1972; Oechshily and Buechley, 1970) and some have no lag (Kalkstein and Davis, 1985). Temperature affects not only mortality, but also morbidity. Applegate, *et al* (1981) demonstrated the relationship between temperature and morbidity. In the study, he found that emergence room hospital visits and admissions appear to be correlated with the 1980 heat wave in Tennessee.

Indirect Impacts

One of the major indirect impacts of global climatic change upon human heath could occur via effects upon cereal crop production. Cereal grains account for around 66% of all food stuffs consumed by humans. These impacts could occur via the effect of variations in temperature and moisture upon germination, growth and photosynthesis as well as indirect effect on plant disease, predators-pest relationship and supplies of irrigation water. Globally, approximately 800, million people are undernourished. Climate change is likely to further affect food production, distribution and storage, especially in sub-Saharan Africa (Epstein, 2005). Resource scarcity coupled with population growth can lead to war, political instability, poverty, substance abuse, crop failure, rising consumer prices and the disruption f social structure. This makes it difficult to ensure environmental sustainability, eradication of extreme poverty and hunger in the affected areas.

Climate Change, Food and Water-Borne Diseases

Global climate change interferes with ecological systems interaction, thus altering the hydrologic cycle not only by altering mean meteorological measures but by

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increasing the frequency of extreme events such as excessive precipitation, surges, floods and droughts. These extreme weather-related events can affect water availability, quality, or access, posing a threat to human populations. Water-borne pathogens often act in concert through two major exposure pathways: drinking water and recreational water use.

WHO (1996) noted that with global climate change, outbreak of food and water-borne infectious diseases/agents such as diarrhea, cryptosporidiosis, giardiasis, *solmonella*, *Escherichia coli* and *Rotovirus* which are reported to increase. These diseases increase as a result of the contamination of water supplies through the disruption of water and water sanitation systems, which can be caused by toxic runoff from increased rainfall and flooding. Food contamination can result from lack of air conditioning or refrigeration. For examples, higher temperatures in Europe were found to contribute to an estimated increase of 30% in cases of *Solmonella* (Pats, 2005, Kovats, 2004). Developing countries are particularly susceptible to this, as water carries wastes. Shallow water provides breeding environments for mosquitos. For the past few decades there have been alarming reported cases of cholera outbreaks in various parts of the country with resultant deaths. The cases occurred in areas where conditions are known to be particularly unhygienic and where residents lack of clean water (Nwoke, *et al;* 2011).

Climate Change and Vector-Borne Diseases

One of the indirect effects of climate change on health is that the resulting changes in temperature and precipitation as well as other climatic factors influence the behavior and geographical distribution of vectors of parasitic diseases. This usually lead to changes in the incidence and distribution as well as the emergence and re-emergence of vector-borne diseases (Patz, *et al*, 1996) as the life cycle dynamics of vectors and parasites are altered (Nwoke, *et al*, 2005). According to WHO (1996), vector-borne diseases that are most likely to be affected by rising temperature are, malaria, lymphatic filariasis, schistosomiasis, river blindness/onchocercerciasis and dengue. Those that are less likely to be affected by temperature include guinea worm, trypamosomiasis, leshmaniasis and yellow fever.

Costello, (2009) has noted that by 2080, an estimated 260-320 million more people around the world will be affected by malaria as a result of climate change. The influence of climate change on vector-borne parasitic diseases can be direct or indirect on the vector biology. For instance, an increase in temperature accelerates the vector's metabolic rates which consequently affects the nutritional requirement of the vector. Under such condition, the blood-sucking vectors such as mosquitoes, sand flies and black flies feed more frequently, leading to increased egg production. This in turn increases the transmission potential of these vectors.

Other vector-borne diseases have been observed to shift in their prevalence from known geographical boundaries. For example, from 1953, the climatic conditions on the Sahel part of Africa (including Nigeria) have become drier and harsher, and as a result, the northern boundaries of tsetse fly and African trypanosomiasis distribution have shifted 50-100 km southwards (Laveissiere and Hervouet, 1991). This no doubt has contributed to negative impact on the trypanosomiasis transmission and distribution in the Sahel region (Cathanal, 1993). Linked also to low humidity and high temperature, cerebro-spinal meningitis endemicity boundary has now shifted southwards in Nigeria, and leishmaniasis that was hitherto none existing in Nigeria is now being reported in the northern part of the country. On onchocerciasis (river blindness), studies on the impact of climate change on black fly population in West Africa have shown that if temperature and precipitation were to change across areas immediately south of the Sahel, as predicted by a general cerciasis vector population could increase as much as 25% at the

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current breading sites (Garms, *et al*, 1978, Walsh, *et al*, 1993; Mills, 1995). Nwoke, 1988, Nwoke, *et al*, 2004, Nwoke *et al*, 2009). Schistosomiasis is a major based parasitic disease and any climate change or environmental modification/degradation that affects the physical or chemical properties of the `water bodies and human behaviour as well as the contact of man with snail - infested water bodies will definitely affect disease emergence and re-emergence (Prah and James, 1997; WHO 1996; Nwoke, 2005; Nwoke and Nwoke, 2008).

These vector-bone diseases constitute public health problem and intense human suffering. Beyond their toll of individual illness and health, these diseases have insidious effects on society. They impede national and individual development, make fertile lands inhospitable, impair intellectual and physical growth and exact huge cost in treatment and control.

As a result of high mortality, they remove individual supply of labour years in the future (Duke, 1990). As a cause of disability, they withdraw the affected persons potential supply of labour years (Evans, 1998); Benton, 1998). Derivation or depopulation of some major agricultural fertile villages in Nigeria; and consequent population maladjustment have been attributed mainly to parasitic diseases (Bradley, 1976; Nwoke, 1990).

CONCLUSION

Climate has a profound effect on human health and well-being. Climate change is associated with changes in birth rates, outbreaks of pneumonia, influenza, bronchitis, sohistogomiazsis, among others, and is related to other morbidity effects linked to high pollution levels. Large increases in mortality and morbidity have occurred during previous heat and could waves. Hot weather extremes appear to have a more substantial impact on mortality than cold waves episodes. As a cause of high mortality development is hindered as individuals supply of labour years are removed. Outbreaks of diseases due to climate change results in economic losses due to inefficiency, low productivity, absenteeism at work as well as the cost of caring for victims of endemic diseases which are quite prohibitive (WHO, 1993).

RECOMMENDATIONS

1. Modern techniques should be used in investing water to ensure that harvested rain water is free from breeding vectors
2. The primary health care structures should be strengthened to be responsive to emergencies associated with climate change this involves employing qualified and experienced staff including those trained in the operation, quality control and maintenance of public health infrastructure
3. Emergency management and disaster preparedness programmes should be maintained and strengthened. This should include local health services capacity to conduct rapid health needs assessment and to make psychological support interventions
4. New irrigation projects and facilities should be constructed in drought prone areas to ensure that agriculture is not rainfall. This will lead to increased food production and consequently reduce malnutrition

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