

CLIMATE CHANGE AS A SOCIAL HEALTH DETERMINANT AND THE MITIGATING INDIGENOUS INTERVENTIONS: A HERMENEUTIC LITERATURE REVIEW

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ABSTRACT

As indigenous health scholars we are mindful of the fact that that climate change is experienced differently in North and South countries, although the impacts can be equally severe. Climate change and its consequences can affect the health of impacted communities in different ways. Climate change is currently a dominant topic of global discourse but remains poorly discussed by indigenous communities in the countries of the South. Misunderstandings about climate change, a lack of community-based health data and inadequate knowledge about progress may limit discussions. Indigenous communities who depend on land and water for sustenance are hit harder by the effects of climate change and unpredictable weather events. Unpredictable weather events include droughts, heat waves, floods and storms which can negatively impact the health and wellbeing of the population. The paper reports the findings of a hermeneutic literature review that unpacks climate change as a social health determinant and discusses mitigating indigenous interventions used to cope with the negative effects of climate change. A hermeneutic circle was used as a framework for the literature review. A contextual interpretive understanding of climate change as a social determinant was created based on all the papers that were reviewed. Each paper that was reviewed influenced each new paper that was read and interpreted; hence the circle. The review yielded three main themes on climate change as a social determinant of health: climate change extant as a syndrome, climate change is an inter and trans-generational problem in sub-Saharan countries and placed-based versus universal health related interventions to address climate change.

Keywords: Adaptation, climate change, indigenous interventions, hermeneutic literature review, social determinant of health.

INTRODUCTION

Globally, climate change and its consequences are experienced differently in the countries of the South and North (Spence & Pidgeon 2010; Kurukulasuriya, Mendelsohn, Hassan, Deressa, Diop & Mahamadou 2006). Climate change impacts in sub-Saharan African countries are influenced by their histories of colonialism and imperialism (Reynolds 2006, Harrison 1981; Rodney 1973). Climate

changed has negatively impacted among others, sub-Saharan Africa, Asia and the Amazon. The poor ability of these regions to adapt to climate change may be due to the perpetuation of social inequality caused by the historical invasion of these regions by European settlers (Reynolds 2006; Harrison 1981; Rodney 1973). The continuous inventions in the "name of science and economic development" by the countries of the North perpetuate the alteration and warming up of the earth (Reynolds 2006; Harrison 1981; Rodney 1973).

Power stations emit large quantities of greenhouse gases by burning coal and large industries that require power are also found in developing countries. Greenhouse gasses cause global warming, which affect life, both on land and at sea. Motor vehicles and aeroplanes contribute to climate change by burning hydrocarbon based fuels. The depletion of the ozone layer is caused by the release of chlorofluorocarbon compounds (CFCs) such as dichlorodifluoromethane. The use of these compounds, historically used as propellants or refrigerants, are banned or heavily curtailed in many countries (Fenger 2009; McMichael & Lindgren 2011). Deforestation for urbanization and agriculture strips the land of resilience and endurance (Brown 1976; Ilife 1995). Resources are depleted through accelerated species invasions (Ashton, Hyatt, Howe, Gurevitch and Lerdau 2005; Lotze, Lenihan, Bourgue, Bradbury, Cooke, Kay & Jackson 2006). Historical colonialism in Sub-Saharan countries has left a scar represented by economic inequalities and lack of infrastructure in indigenous communities. Whilst economic development in the countries of the North has continued, the countries of the South are underdeveloped with multiple social determinants of health (Williams, Phillips, Jolly, Stiles & Aggarwal 2004).

The United Nations Framework Convention on Climate Change in 1992 directed a global debate on indigenous ways of mitigating climate change impacts in many countries. The Law of the Rights of Mother Earth drafted in Bolivia relies heavily on indigenous knowledge to assign rights to natural processes and "life systems". Bolivia's indigenous people have developed knowledge and strategies to protect "Mother Earth" and her "life systems" against the negative effects of climate change (Deangelis 2013). In contrast, sub-Saharan African countries have remained silent on the climate change debate despite on-going detrimental health impacts which undermine health equity (Byass 2009, Berrang-Ford 2012; Fussel, 2010).

The existing evidence for climate change in sub-Saharan African countries (Fussel, 2010; Berrang -Ford 2012; McMichael & Lindgren 2011) indicates extensive and complex negative consequences. These impacts intensify the social determinants of health such as unemployment, poverty, poor health resources and marginalizations which are continuously experienced by people in sub-Saharan African countries (Byass 2009; McMichael & Lindgren 2011; McMichael 2013).

Climate change presents itself as a syndrome that reflects the interrelatedness of environmental, health, and social impacts in the world, especially in sub-Sa-

haran African countries (McMicheal 2013). A syndrome in medical terms implies clinically defined symptoms from a single cause combined to create a distinct clinical picture. In our case, a dysfunctional syndrome can be defined as a condition where climate change can interact with poverty, social relationships, social development and the environmental consequences to have negative health impacts (Lahsen, Sanchez-Rodriguez, Lankao, Dube Leemans, Gaffney, Mizra, Pinho, Osmman-Elasha & Smit 2010).

These impacts pose fundamental threats to well-being (Woodward, Hales & Weinstein 1998). Indigenous communities in sub-Saharan Africa may have indigenous interventions that can be used to adapt to climate related diseases and injury (McMicheal 2013; SEA/AC/Meeting 1n.2: 1). This paper seeks to unpack the complexities and uncertainties related to climate change as a social determinant of health. We also look for evidence of mitigating indigenous interventions in sub-Saharan African countries.

CLIMATE CHANGE AS A SOCIAL DETERMINANT OF HEALTH

As scholars in indigenous health, we do not look at health from a biomedical model perspective only. We shun away from the narrow perspective of the biomedical health model with its focus on biological factors and biomedical processes (Grant, Haskins, Gaede; & Harward 2013). We focus on macro-social factors such as poverty, social relationships, social development, and environmental consequences that view climate change in the context of social determinants of health (McMichael & Lindgren 2011). This focus allows us to ask health related questions from a social perspective where health is conceptualised from multiple dimensions (Raphael 2006).

Our inquiry focuses on climate change and its impact on the social determinants of health in indigenous communities in sub-Saharan African countries. Communities survive in a more stable climate, communities living in areas characterised by extreme weather events struggle (Solbrig 1991). Extreme weather events impede health promotion especially sub-Saharan African countries as they exacerbate existing social health inequalities (McMichael & Lindgren 2011). The magnitude and severity of climate changes, especially extreme temperatures pose direct health risks which may result in morbidity and mortality (McMichael & Lindgren 2011). The Intergovernmental Panel for Climate Change (IPCC) predicts higher temperatures increased water stress, with a resulting decrease in crop production that will affect subsistence farmers in Africa (Baka *et al.* 2007). Heat waves, floods, and droughts affect human survival (McMichael & Lindgren 2011). Ecological disharmony caused by climate change influences crop survival and causes shifts in disease vectors which confound existing indigenous interventions amongst populations (McMichael 2013; Ford 2012).

The climate-health field is a newly established field (Ford 2012) which lacks adequate, standardized and quality control measures. This hermeneutic literature review may contribute to an understanding of the prevention of climate-related

diseases, injuries and deaths (SEA/AC/Meeting 1/7.2: 1) and promote the use of existing indigenous interventions (McMicheal 2013; Ford 2012) as adaptation strategies.

METHODOLOGY

Design

Aim: This review is aimed at unpacking climate change as a social health determinant and describing existing indigenous interventions that help in mitigating climate change. Both peer-reviewed and grey literature dating back to the 70s through to 2015 was explored.

The literature review used a hermeneutic framework to identify and refine searches (Baell & Cecez-Kecmanovic 2010; Smythe & Spence 2012). The available evidence for climate change as a social determinant of health in sub-Saharan countries was gathered. Hermeneutic literature reviews aim to create a contextual interpretive understanding of all the papers that are reviewed. The search in hermeneutic review extends beyond database searches; and identifies evidence through snowball and citation tracks (Baell & Cecez-Kecmanovic 2014). Most importantly, in hermeneutic literature review, the researcher is allowed to move from a general to a specific search by identifying relevant publications (Baell & Cecez-Kecmanovic 2014).

Search strategies through the hermeneutic circle

A wide variety of data sources were searched. Key electronic databases and websites of different Governments in the Southern African Development Community (SADC), World Health Organisation, and the United Nation Reports. Key journals such as Climate Change, Climate Research, Global Environmental Change, Lancet and Global Health Action were also searched. Citations from the reference lists of previously gathered papers and ancestry searches on key climate and indigenous knowledge system papers, reports, book chapters were performed. The databases and these other sources were selected given the multifaceted nature of climate change.

The search followed the iterative and open ended steps of a hermeneutic circle. The various steps of a hermeneutic circle facilitate an understanding of relevant literature on climate A fully explicated process guided the review. The review was done in consultation with academics (authors of this paper) and the departmental clinical information scientist. Since the review was based on sub-Saharan African countries, the Southern African Bibliographic Information Network (SABINET) was searched separately with the following direct search terms: climate change, indigenous interventions, social determinant of health and countries of the south and sub-Saharan countries. The search was open-ended allowing both seminal and recent literature and reports. The seminal literature and reports served as the primer to the vocabulary that is used in climate change (Baell & Cecez-Kecmanovic 2010). The two searches were underpinned

by the hermeneutic framework. The various steps of a hermeneutic circle facilitate an understanding of relevant literature on climate change as a social determinant of health, and create a deeper understanding of the individual texts that were reviewed (Baell & Cecez-Kecmanovic 2010; Smythe & Spence 2012; Baell & Cecez-Kecmanovic 2014).

SEARCHING OF LITERATURE

Sorting research results

The SABINET search yielded 513 titles with (233) from SA ePublications, (161) from Social Sciences and Humanities, (65) from Science, Technology and Agriculture, (54) from Law and (46) from Open Access. One hundred (100) of the titles from this initial search were repeats of other titles. The repeats were deleted and only four hundred and thirteen (413) titles remained. The four hundred and thirteen (413) titles were further sorted through the Scopus database. This allowed for citation ranking and identification of relevant literature that is extensively used by other scholars. Only eighty titles relevant to climate change and health in Africa were included in this review.

Selecting search results

The abstracts of the eighty titles were read and analysed for fore-sight and understanding. In this search most articles were from different environmental, climate change and health related journals with McMichael as the most cited author on climate change and health. Even though the current process of selection of the literature yielded relevant journals on climate change not all of the abstracts were on climate change and health. The eighty abstracts were further viewed afresh to discern the objectives (Smythe & Spence 2012). Only twenty two abstracts that contained climate change as a social determinant of health and mitigating indigenous interventions for adaptation in sub-Saharan countries were relevant to this review.

Acquiring relevant documents

Full articles and reports of the twenty two abstracts were retrieved and downloaded by the first author. All literature and reports were published in English and the publications were dated from 1970 to 2015. To increase the robustness of the search, the full articles were shared with the second author for expert opinion.

Reading the identified publications

Following the retrieval of the articles, each paper was reviewed without any linear process (Smythe & Spence 2012). Through immersion and re-reading the same texts, several texts emerged as historical literature. For example, the work of Harrison (1981) and Rodney (1973) provided a foundation for this review (Baell & Cecez-Kecmanovic 2010). Moreover, these seminal texts pursued climate change with a different lens which revealed assumptions (Smythe & Spence 2012) on the effects of climate change.

Identification of further literature and search terms

The second search was launched by scanning through central terms which were: climate change and health effects and Africa in order to corroborate the a priori search. This search was only launched in some of the health related electronic bibliographic databases under EBSCOhost as the authors were from health sciences. These databases were: Academic Search Complete, CINAHL, GreenFILE, MEDline, Wildlife and Ecology Studies. The results yielded forty eight articles of which repeats were automatically deleted and only thirty articles remained. The thirty articles were further reviewed jointly with the twenty two from the broader search for articulation and classification of the texts.

Refinement of the search

The two fore-mentioned searches increased the understanding of how climate change exacerbates multiple diseases and ill-health factors that cause a 'syndrome' in sub-Saharan African countries. In this process we applied dynamic reflexivity and sink back into the texts (Smythe & Spence 2012) to refine the literature at hand. Through the thinking journey we developed the three inter-related arguments that were aligned with the aim of the review.

RESULTS AND DISCUSSION

This review provided a big picture by discerning the meanings behind the narratives (Smythe & Spence 2012). We report the review through narratives as supported by Smythe & Spence (2012) who indicated that narratives are not a string of facts but detailed information about the subject matter. The narratives were closely examined and reviewed for the discovery of the health impacts of climate change in sub-Saharan African countries. Three interrelated themes were identified: (1) climate change existing as a dysfunctional syndrome, (2) climate change is an inter- and trans-generational problem in sub-Saharan African countries and (3) placed-based versus universal health related indigenous adaptation interventions.

Climate change extant as a dysfunctional syndrome

Climate change is a social determinant of health with complex and multifaceted impacts (McMicheal *et al.* 2007; Stringer, *et al.* 2009). The multiple effects of climate change on health can be viewed as a syndrome with many symptoms. These symptoms were progressively ignored by the invasions and inventors (Harrison 1981; Aldy, Krupnick, Newll, Parry & Pizer 2010).

This review highlights that the complexities and uncertainties of climate change are severely experienced in regions that were previously colonised like sub-Saharan African countries (Harrison 1981). The long lasting repercussions are felt

through the convergence of multiple health effects from climate change into an unmanageable syndrome (see Figure 1 below).

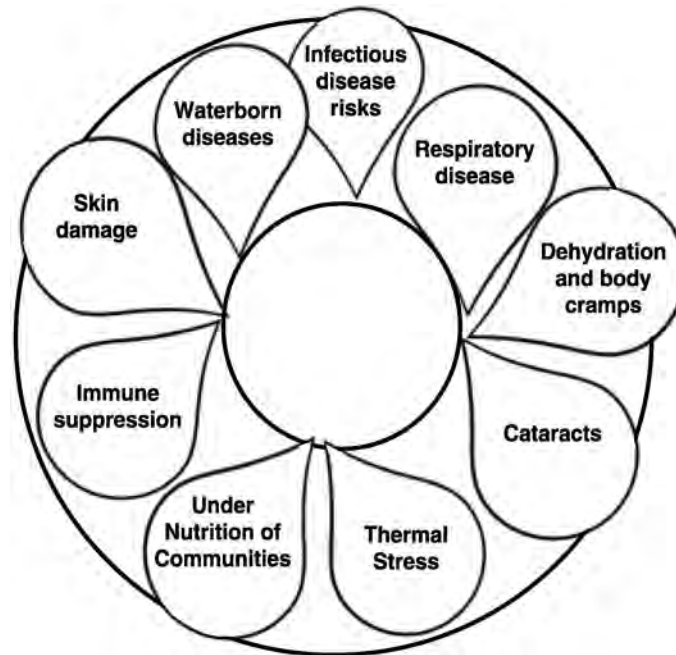


Figure 1: A pictorial representation of the convergence of multiple opportunistic diseases that create a dysfunctional syndrome affecting communities in Sub-Saharan countries due to the continuous climate change. Adapted from (McMichael 2010).

Various health problems exist because of the climate change health syndrome (Figure 1). The effect of extremely high temperatures is felt differently in the heat in the countries of the South and North. High temperatures and limited water supplies force people to use unsafe drinking water to manage heat stress. Populations in sub-Saharan African countries are prone to waterborne diseases and experience physical symptoms of heat-related illnesses such as heat cramps, heat syncope, heat exhaustion, heat stroke and deaths (Bunyavanich, Landrigan, McMichael & Epstein 2003; McMichael 2013; McMichael & Lindgren 2011). Chronically ill and elderly people may experience exaggerated symptoms caused by electrolyte imbalances that result in dehydration and related systemic clinical manifestations (McMichael & Haines 1997; McMichael 2013; McMichael & Lindgren 2011). Extreme temperatures may also affect physiological functioning, mood and behaviour, which can lead to accident proneness, aggressiveness and workplace unproductivity, especially in outdoor manual labour which is characteristic of much work in the developing world during summer (Luber

2008). Climate change continues to undermine development in sub-Saharan Africa, with the continuous development in the countries of North who can afford technological heat control apparatus.

Natural disasters cause the loss of lives, livelihoods and damage the environment in sub-Saharan Africa. These extreme events include fires, droughts, hurricanes and floods (McMichael and Lindgren 2011; McMichael 2009). In sub-Saharan Africa, droughts have detrimental effects on natural and indigenous food sources while floods, fires and storms create unfavourable living conditions. Under-nutrition results when low quality food is consumed and nutritional needs are not met. Sub-Saharan populations experience displacement and social exclusion associated with natural disasters. Anxiety, post-traumatic stress disorder and depression may arise from the resulting trauma, loss of loved ones and property (Berry, Bowen & Kjellstrom, 2010; Luber 2008; McMichael 2009).

Floods and droughts influence water quality and vegetation. When swamps are created during floods and heavy rainy seasons, vectors such as mosquitos flourish. The inclusion of malaria eradication in the MDGs aims to curtail morbidity related to malaria. Currently, Brazil is affected by the Zika virus which relies on a mosquito vector. Climatological conditions, economic status and technological developments have confounded efforts to eradicate suitable breeding sites (SABC News January-February 2016). Children born with developmental brain abnormalities will add to the burden of care of Brazilian health care facilities, because these children require specialised care in resource scarce settings.

Negative health impacts associated with climate change are likely to converge to cause a syndrome. These health impacts could arise from 1) greater risk of injury, disease, and death due to intense heat waves and fires; 2) lost work capacity and reduced productivity in vulnerable populations due to heat stress; 3) increased risk of under-nutrition resulting from diminished food production in the sub-Saharan region; 4) increased risk of food and water borne diseases. These impacts may converge and merge as opportunistic symptoms to create a dysfunctional syndrome. Climate change is often seen as a 'catch all term' (James & Jones 1974) but different populations around the world may experience different negative impacts affecting the presentation of the syndrome.

Human rights movements raising awareness for the impacts of climate change on health have been launched across the globe, including sub-Saharan African countries (Carta *et al.* 2009). Interestingly, most human rights movements campaigning for awareness in the countries of the South originate as initiatives developed in the countries of the North (Carta *et al.* 2009; Hay *et al.* 2002). A typical example is Unilever, an Anglo-Dutch multinational company that produced detergents (Rodney 1973), a process that contributed to the drying of most African rivers. In 2010, Unilever launched the Unilever Sustainable Living Plan (USLP) (Cowan 2015) as a positive movement to mitigate climate change and promote sustainable living in order to redress past practices that left many

indigenous people with dry rivers and without water. Like other multinational companies, such efforts may decouple the company's growth from their environmental impacts while increasing positive social impacts (Cowan 2015). As most of these human rights movements are from the countries of the North, often linked to specific companies, we need to stimulate initiatives based on indigenous knowledge and experiences from the South. The consequences of climate change are exacerbated by factors such as lack of resources, marginalization and poverty which have a likelihood of ancestral and generational transfer (Byrne, & Glover 2002; Smit, & Pilifosova 2001; Byass 2009; Raleigh 2010) especially in sub-Saharan African countries.

Climate change is an inter-and trans- generational problem in sub-Saharan African countries

The health consequences of climate change can be experienced immediately or transmitted across generations (Wunsch, Schmitt & Baker, 2013). The transmission of adverse health effects due to climate change could occur because factors are interrelated over an extended period of time (McMichael 2013). For example, 1,1,1-Trichloro-2,2-bis (p-chlorophenyl) ethane (DDT) used as pesticide and insecticide for control of vectors for malaria and visceral leishmaniasis (Beard 2005) will remain in the environment long after use. There is suggestive evidence that extended human exposure to this chemical may cause conditions such as pancreatic cancer, neuropsychological dysfunction, and have negative reproductive outcomes (Beard 2005).

Not only is DDT a human health hazard but long term use has had major environmental consequences and is associated with dramatic declines in many fauna and flora (Beard 2005) in sub-Saharan African countries. The Gates Foundation Malaria Control Program in Africa still uses DDT as a preferred insecticide for malaria vector control (Beard 2005). Despite the negative consequences, no effective replacement for DDT has been found. It is evident that the current health consequences associated with climate change experienced in sub-Saharan African countries are underappreciated. While first world and G8 countries are increasing production, sub-Saharan Africa is struggling to adapt to climate change caused by industrial activities in those countries. The current health effects associated with climate change (Lotze *et al.* 2006; Bruce *et al.* 2006; McMichael 2013) are due to the generational (inter/trans) alteration of earth systems which have diverse and far-reaching consequences for human health.

The health consequences of climate change can be transmitted over generations via distal or proximal pathways (McMichael 2013). In sub-Saharan African countries, the distal pathways typically involve longer time periods and include waterborne diseases, air pollution related effects, cerebra-vascular system diseases, malnutrition, violence and injury, mental health, women's and child health and occupational health. Proximal pathways are factors that occur over a short period of time like thermal stress which can lead to death, disease,

injury, storms, cyclones, floods, fires, sea-level rise, physical hazards and displacement of communities. Avoiding the perpetual cycle of inter- and trans-generational transmission will require a commitment from states and institutions to include indigenous people during the development and implementations for remediation of climate change impacts (Harrison 1981; Ford 2012; Wunsch *et al.* 2013). Indigenous knowledge-based interventions need to be formulated and implemented in order for them to be effective adaptive measures.

Placed-based versus universal health related indigenous adaptation strategies

Our review identified various placed-based indigenous adaptation strategies used in the sub-Saharan region to counter the effects of climate change. For example, local medicinal plants have been used to treat diseases such as malaria, diarrhoea and intestinal worms and other waterborne diseases (Cunnigham 1996). Cow and chicken dung have been used to combat declining soil fertility (Mapfumo *et al.* 2013). Subsistence farmers in Ghana and Zimbabwe are also known to practice shifting cultivation or crop rotation (Mapfumo *et al.* 2013).

Crops suited to particular climatic conditions are planted and cultivated. The tim

Place-based indigenous adaptation strategies are strategies that focus on particular places, peoples and cultures (Intergovernmental Panel on Climate Change [IPCC 2001a]; Intergovernmental Panel on Climate Change [IPCC 2001b; Ford 2012; Harrison 1981). Place-based adaptation strategies are underpinned by indigenous knowledge of lands and resources, cultural identity, strong social networks and kinship (McMichael 2013; Ford 2012).

Despite the richness and ability of place based adaptation strategies to overcome climate change, policy makers prefer detached universal adaptation strategies (Vogel *et al.* 2007; Ford 2012). Most universal adaptation strategies are aimed at reducing health damaging emissions from large-scale energy systems, using cars with low emissions and promoting low-greenhouse-gas-emission diets, including the reduced consumption of animal products (Woodward *et al.* 2014). These universal strategies are irrelevant to indigenous communities where climate change continues to affect the health of populations in sub-Saharan Africa and other middle and low income countries.

CONCLUSION

Populations south of the Sahara are facing perpetual health problems related to climate change. The invasions and inventions of the world (earth and space) by the countries of the North are at the roots of the complexities and uncertainties that are currently experienced by the populations in different parts of the world, sub-Saharan African countries included. Except for a few texts on the genesis of climate change, this review has shown that there is silence about who bears the responsibility of climate change. Instead, this review provides evidence on how this phenomenon is progressing. Climate change and its consequences

have mushroomed rapidly, driven by over population and exploitation of natural resources.

Centuries of exploitation, habitat transformation and pollution have obscured the total magnitude of biodiversity loss and loss of ecological resilience (Lotze *et al.* 2006). The interconnectedness of the environmental with health and social issues constitute what is seen as a syndrome of different diseases presenting differently in many countries south of the Sahara.

As scholars in the indigenous health fraternity from sub-Saharan countries we are in agreement with the results of the review that emphasizes the alternation and escalation in aetiology of disease vectors and other social health problems due the global climate changes (Berrang- Ford *et al.* 2012; FOssel, 2010). According to Wunsch *et al.* (2013) scientists researching climate change need to make provisions for the needs of future generations as climate change is a problem for multiple generations for decades and beyond.

Adaptation strategies for climate change are place- and culture-specific, and mediated by different commonly held world-views. Commonly held world-views place significant value on interpersonal and environmental relationships, stewardship, life experience and balance, spiritual considerations, family, tradition, and oral history (Ford 2012). Despite these strategies being effective in mediating climate change effects, they are globally marginalised. Where we live contributes to adaptation and may even confound adaptation strategies (Armah *et al.* 2015). It is evident from the review that it is not the climate itself that affects human health but the consequences which are environmental, ecological and social (McMichael & Lindgren 2011).

Lastly the review indicated that an intergenerational climate study amongst public, private, national, and international institutional organisations may be useful.

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