

## Climate Change and Potential Impact on Disease: What are the Public Health Agenda?

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### ABSTRACT

Globally, the impact of climate change on human health is widely discussed. There are several mechanisms how environmental variability can influence the occurrence of diseases that are communicable or noncommunicable. The biophysical underlying causes of climate changes are not proportionately distributed between developed and developing countries. Developed countries contribute more greenhouse emissions, but the population health effects of climate change are estimated to be higher in developing countries compared to developed countries. Therefore, examination of challenges associated with climate change should be a priority. In the countries of North Africa and the Middle East, a clear public health agenda needs to be developed, even if local/regional factors contributing to unpredictable climatic changes are not well-known. Targeting risk factors associated with noncommunicable diseases, and adopting lifestyle changes are interventions to consider.

**Key words:** Climate change, communicable diseases, noncommunicable diseases

ملخص البحث :

يناقش حالياً على مستوى العالم تأثير التغير المناخي على صحة الإنسان. تتعدد الآليات التي يتم من خلالها تأثير التغير البيئي على حدوث الأمراض المعدية وغير المعدية، علماً بأن أسباب تغير المناخ غير متناسبة بين الدول المتقدمة والنامية. تتسبب الدول المتقدمة أكثر في انبعاثات الغازات المؤدية للتغير المناخي ولكن البلاد النامية هي الأكثر تضرراً. ولذا يجب أن يشكل التصدي للتغيرات المناخية أولوية. هناك حاجة ملحة لتطوير أجندة صحة عامة واضحة لمجابهة هذا الأمر في دول الشمال الأفريقي والشرق الأوسط. ربما يكون التصدي لعوامل الخطورة للأمراض غير المعدية وتغيير نمط الحياة هي التدابير التي يجب النظر فيها.

### INTRODUCTION

The conference on climate change (21<sup>st</sup> session of the Conference of the Parties [COP] and the 11<sup>th</sup> session of the COP serving as the meeting of the Parties to the Kyoto Protocol) was recently concluded in Paris, France during the period November 30–December 11, 2015, and the outcomes are now available.<sup>[1]</sup> An important question is what can we do as individuals, communities, and governments in the region of North Africa and the Middle East? More specifically, what is the public health agenda and how is climate change linked to health in this region?

The term “climate change” is more appropriate than “global warming” and reflects the uncertain patterns of weather conditions from severe heat waves and drought to unpredictable storms and floods depending on geographic areas mostly affected.<sup>[2]</sup> The biophysical processes that underlie these geographic changes have been described and documented<sup>[3,4]</sup> even though consensus is lacking among groups of scientists, policy makers, and governments about the causes and potential impacts.<sup>[5]</sup> Therefore, highlighting the link between global climate change and health outcomes in

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the region of North Africa and the Middle East would be timely. In this report, the association of climate change with communicable (CDs) and noncommunicable diseases (NCDs) is briefly discussed, and few ideas are presented for further consideration in response to this emerging challenge. More targeted research is encouraged.

## THE EPIDEMIOLOGIC TRANSITION

An important achievement has been the substantial increase in adult life expectancy for men and women in countries of the developing world (including North Africa and the Middle East) due to control of communicable diseases (CDs), better nutrition, and advances in medical care. In parallel, however, there have been increases in morbidity and mortality associated with NCDs. The epidemiologic and demographic transition characteristics of the populations of the developing world have been well-described.<sup>[6]</sup> Countries in North Africa and the Middle East are most likely in a mixed transition where both CDs and NCDs coexist but with a rising trend of NCDs. These countries have different generations of populations with potentially varying intrinsic biological, social characteristics and diverse external exposures. More recently, technological factors that lead to rapid cultural diffusion<sup>[7]</sup> have become realities, and their positive and negative impacts are likely to influence the speed of these transitions.

While the declining rates of CDs in the developing world are encouraging, the disease pattern is shifting to chronic diseases – i.e. NCDs – as a result of several exposures, behaviors, and lifestyles. For example, the World Health Organization (WHO) estimates that cardiovascular disease (CVD) is the leading cause of death.<sup>[8]</sup> Of particular importance is the changing lifestyle and dietary habits of these populations (e.g., migration to the urban settings; abandonment of traditional diets rich in fruits, vegetables, and fiber; and lack of physical activity – factors that promote CVD and other NCDs such as cancers).

## CLIMATE CHANGE AND POTENTIAL EFFECTS ON COMMUNICABLE AND NONCOMMUNICABLE DISEASES

A brief comment on climate change and its expected influence on CDs and NCDs will justify current and future concerns. The impact of the environment on vector-borne and water-borne diseases is not difficult to explain:<sup>[2]</sup> (a) Vectors for diseases such as malaria and many emerging infections (such as dengue fever and chikungunya) need a water source. Predictable rainfall favors seasonal and

stable transmission, influences susceptibility, acquisition of immunity, and allows community preparedness to avoid major outbreaks. Water shortages, bouts of drought, and unpredictable rainfall create environments that change vector habitat dependence of these vectors on the human host for survival. A recent, on-going, outbreak in Brazil and other South American countries provides a contemporary example of climate change and a serious outcome from a conventionally transmitted infectious disease.<sup>[9,10]</sup> Zika virus (a mosquito-borne *flavivirus* [same genus that encompasses dengue, West Nile virus, and yellow fever]) has now been reported to be associated with a major outbreak of microcephaly when infections occur during early pregnancy. It is hypothesized that water shortages in Brazil may have contributed to the vector (*Aedes aegypti* and other *Aedes* spp.) preponderance in water reservoirs within human dwellings in the urban settings. (b) Climate changes can also lead to water shortages or floods and thus create insanitary environments leading to outbreaks of cholera and other water-related epidemics.<sup>[7]</sup>

Multiple pathways can explain how climate change can increase complications of NCDs including cardiovascular, respiratory, cancer, mental health, and injuries. Specific examples include environmental exposures such as air pollution, changes in available diet and its quality, ozone exposure, altered ultraviolet radiation, increased use of herbicides and pesticides, social inequalities due to the scarcity of resources and distribution within and between countries, and extreme weather events leading to injuries and fatalities.<sup>[11]</sup> The relationship between climate change, food consumption, and NCDs needs emphasis because individuals and communities can actively participate to reduce potential adverse outcomes. For example, livestock production at a global level contributes to a sizable proportion (~15%) of greenhouse gas emission and the consumption levels are rising. Can we change our eating habits and reduce meat consumption? Based on data from the WHO,<sup>[12]</sup> six risk factors (high blood pressure, tobacco use, high blood glucose level, physical inactivity, overweight/obesity, and high cholesterol levels) are leading causes of death attributed to CVD, metabolic diseases, and cancer. Therefore, changing dietary habits and increasing physical activity can substantially improve individual as well as population health. The WHO estimates that the life-years that are lost due to disability or premature death (disability-adjusted life years [DALYs]) for causes attributed to climate change would be much higher in the developing regions compared to developed regions of the world.<sup>[12]</sup> These DALY estimates per million people are 3071.5 in Africa

and 1586.5 in Eastern Mediterranean, compared to 8.9 in the developed countries. It should be noted that most of the greenhouse emissions that adversely affect the environment are produced by developed countries.<sup>[2]</sup>

## CONCLUSIONS

Considering that climate change is inevitable and taking into account the current rising trends of NCDs in North Africa and the Middle East, what should be the agenda? Our focus on climate change and its potential consequences should be primary prevention. Innovative, community-supported programs are likely to succeed. From the outset, there should be a realization that involvement of individuals and communities is needed, i.e., this task should not be delegated only to governments. Individuals can benefit by adopting some simple actions and likewise the population at large. Governments may help by providing appropriate legislation and public health acts. At the individual level, the epidemic of obesity coupled with the lack of physical activity needs to be addressed. The idea of intermittent fasting (reduced meal frequency) has been shown to have its effect on metabolism and weight control; in human and animal studies, it was found to be useful.<sup>[13-15]</sup> Unlike conventional fasting that is well-known in the countries of North Africa and the Middle East, fluids (including tea and coffee), vegetables, and fruits are allowed.

Depending on the preferred schedule, only one major meal may be adequate during a day. Adherence to this simple regimen should be high. In addition, the idea of some “meatless” days should be considered – several communities routinely adopt a Saturday or Monday for meatless diets. Community walking programs for adult men and women, adolescence, and children should be encouraged, and alternatives to the use of motor vehicles such as the use of bicycles should be facilitated by providing traffic arrangements, protection, and security. Risks associated with the use of tobacco are well-known; the experience of developed countries in eliminating tobacco use in public places and overall through increase in taxes and legislation should be options. Annual health examinations should be regularly performed to screen and identify early signs of CVD, cancer, metabolic diseases, and others. The agenda should also include research support to provide relevant data and how to develop early warning systems for CDs as well as systems that can track trends of NCDs. Finally, professional organizations and other nongovernmental groups have a major role to educate their members and the community.

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