


## Chapter 2

# Climate Change and Human Infectious Diseases

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### ABSTRACT

*Climate change is one of the most serious dangers to human health in the 21st century. Climate extremes, air quality, sea-level rise, and water supplies all have a direct impact on human health. Climate change has an influence on infectious diseases as well. In this chapter, the authors explained the influence of climate change on human infectious diseases. The authors also discuss how society may respond to and adapt to climate change. The variables influencing the spread and severity of human diseases were explored as well. These variables include human and animal migration, control methods, medication availability, human behavior, and the quality of public health facilities. The authors also discuss the importance of genome research in climate change and infectious diseases. Finally, as the world faces present and future difficulties in climate change and an increased threat of infectious diseases, the authors emphasize on the importance of scientific networks and collaborations for effective multidisciplinary engagements.*

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## INTRODUCTION

According to the World Health Organization, among the greatest dangers to human health is climate change. Climate change directly affects health (Epstein 1999; Kovats *et al.*, 2000; Costello *et al.*, 2009; Willox *et al.*, 2015). Ways through which climate change could affect human health include the following:

- (1) Changes in temperature and rainfall,
- (2) Climatic extremes,
- (3) Reduction in air quality, and
- (4) Influences on food production and water quality (Field *et al.*, 2014).

As reported by the European Environment Agency, in the 20<sup>th</sup> century, there is an increase in the global average temperature by 0.74°C the global average surface temperature. In addition, since 1961, there has been a 1.8 mm increase every year in the sea level. Furthermore, mountain icebergs are contrasting. The acidic nature of the water in the ocean needs urgent attention (EEA 2008). In the wake of all these developments, it was forecasted that in the 21<sup>st</sup> century, there would be an increase in temperature of about 1.5 – 5.8°C. The temperature rise would be associated with irregularities in weather events which may in turn lead to floods, and drought (IPCC 2001).

Three constituents are crucial for most infectious diseases: (1) pathogen, (2) vector/host, and (3) the environment for the disease transmission (Epstein 2001). The lifecycle of many pathogens is so dynamic that they require the intervention of a vector or an intermediate host for completion. In fact, the distribution, breeding, and pathogen transmission need a suitable climatic condition. Hence, irregularities in the climate could affect pathogens and vectors which may in turn have influence on infectious diseases (Epstein 2001). Over time, studies have confirmed that the increase in infectious diseases could be linked to climatic variations extremity (Epstein *et al.*, 1999, Ostfeld and Brunner, 2015), while extreme weather conditions could lead to more outbreak of diseases in a place (Epstein 2000). Generally, the geographical and periodic distribution of infectious diseases is controlled by climate change while weather affects the timeline and severity of the disease epidemic (Kuhn *et al.*, 2005; Wu *et al.*, 2014).

Studies have shown that many of the infectious diseases in which insects act as the vector are very nociceptive to climate change (Kuhn *et al.*, 2005; Tian *et al.*, 2015). Examples of such infectious diseases include malaria, dengue, hantavirus, and cholera. Increase in temperature and flooding may also increase the outbreaks of giardiasis, salmonellosis, and cholera. Watts and colleagues reported that the

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