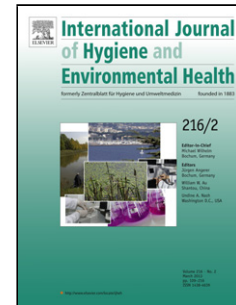


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## Burden of Climate Change on Malaria Mortality

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### ABSTRACT:

In 2016, an estimated 445,000 deaths and 216 million cases of malaria occurred worldwide, while 70% of the deaths occurred in children under five years old. Changes in climatic exposures such as temperature and precipitation make malaria one of the most climate sensitive outcomes. Using a global malaria mortality dataset for 105 countries between 1980 and 2010, we find a non-linear relationship between temperature and malaria mortality and estimate that the global optimal temperature threshold beyond which all-age malaria mortality increases is 20.8°C, while in the case of child mortality; a significantly lower optimum temperature of 19.3° is estimated. Our results also suggest that this optimal temperature is 28.4°C and 26.3°C in Africa and Asia, respectively – the continents where malaria is most prevalent. Furthermore, we estimate that child mortality (ages 0-4) is likely to increase by up to 20% in some areas due to climate change by the end of the 21<sup>st</sup> century.

Keywords: Climate Change Impacts, Malaria Mortality, Health

JEL codes: C21, Q54, I10

### 1. Introduction

In 2016, an estimated 445,000 deaths and 216 million cases of malaria occurred worldwide, while 70% of the deaths occurred in children under five years old (WHO, 2017). The balance between temperature and precipitation is critical for breeding and transmission of malaria vectors and hence for the transmission of malaria. Although, the fact climatic variables affect malaria transmission is known (Alonso et al., 2011), the impact of climatic exposure on malaria mortality is less clear.

Malaria is one of the most widely transmitted vector-borne diseases; the death burden of malaria has increased over the last decade (WHO, 2016). Vector-borne diseases (VBD) are infections transmitted by the bite of infected arthropod species such as mosquitoes, ticks, triatomine bugs, sandflies, and blackflies. These are among the major microbial causes of morbidity and mortality in the world today, affecting nearly half of the world's population, the majority of who reside in developing countries located in the tropical and subtropical climate (WHO, 2016).

Malaria is considered one of the most sensitive to changing environmental conditions (Martens, 1998; Martens et al., 1999; Rogers and Randolph, 2000; and Kim et al., 2012); it is also the most deadly and widespread. In 2014, ninety-seven countries and territories had malaria transmission while an estimated 1.2 billion people were at high risk<sup>1</sup>.

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<sup>1</sup> Population at risk (High + Low): High=population living in areas (reported malaria incidence  $\geq 1$  per 1000/year) defined at administrative level 2 or lower. Low=population living in areas (reported malaria incidence  $< 1$  per 1000/year)

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