

THE OPPOSING EFFECTS OF CLIMATE CHANGE AND SOCIO-ECONOMIC DEVELOPMENT ON THE GLOBAL DISTRIBUTION OF MALARIA

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Background and Aims: The current global geographic distribution of malaria results from a complex interaction between climatic and non climatic factors. Over the past century, socio-economic development and public health measures have contributed to a marked contraction in the distribution of malaria. Previous assessments of the potential impact of global changes on malaria have not quantified the effects of non climate factors.

Methods: In this paper, we describe an empirical logistic regression model of the past, present and potential future distribution of malaria which incorporates both the effects of climate change and of socio-economic development. In our approach, we use a WHO estimate of malarious regions, present climate data published by the University of East Anglia, and socioeconomic and climatic projections based on the latest IPCC report.

Results: A logistic regression model using temperature, precipitation and gross domestic product per capita (GDPpc) identifies the recent global geographic distribution of malaria with high accuracy (sensitivity 85% and specificity 95%). Empirically, climate factors have a substantial effect on malaria transmission in countries where GDPpc is currently less than US\$20 000. Using projections of future climate, GDPpc and population consistent with the IPCC A1B scenario, we estimate the potential future population living in areas where malaria can be transmitted in 2030 and 2050. In 2050, the projected population at risk is approximately 5.2 billion when considering climatic effects only, 1.95 billion when considering the combined effects of GDP and climate, and 1.74 billion when considering GDP effects only.

Conclusions: Under the A1B scenario, we project that climate change has much weaker effects on malaria than GDPpc increase. This outcome is, however, dependent on optimistic estimates of continued socioeconomic development. Even then, climate change has important effects on the projected distribution of malaria, leading to an increase of over 200 million in the projected population at risk.