Making a case for

# Planetary Health

in sub-Saharan Africa

**POLICY BRIEF**

**Issue 2 Dec. 2021**

## Key Messages

- Kenya's commitment to mitigation and adaptation in its National Climate Change Action Plan contains limited reference to health outcomes.
- A rapid review of research output published between 2013 – 2019 in Kenya identified trends in climate change and health topics in 52 studies.
- Studies on climate change impacts on vector-borne disease were most frequent in the evidence base and key gaps included impacts associated with nutrition, flood risks, heat exposure and air pollution.

# A rapid review of research literature on the health impacts of climate change in Kenya: 2013 – 2020

## Background

Recent extreme weather events have brought to light the vulnerabilities of human health, wellbeing and livelihoods to a changing climate. While the ensuing global attention has sharpened national commitments towards mitigating greenhouse gas (GHG) emissions, adaptation planning has received less consideration and support. For certain low and middle-income countries with minimal historic GHG contributions but high exposure to extreme weather events, effective adaptation policy is paramount to reaching development goals and contingent on access to finance, good governance and a strong evidentiary basis for action (UNEP 2021). Facilitating the latter is a growing body of scientific literature on climate change impacts and early warning systems, though research output tends to be dominated by high income countries (Klingelhöfer et al. 2020).

Kenya's equatorial position and large agrarian sector make it highly vulnerable to the impacts of climate change (Mwangi & Mutua 2014; Althor et al. 2016; Signorelli et al. 2016). Kenya's commitment to mitigation and adaptation activities, outlined in the National Climate Change Action Plan (NCCAP; 2017 – 2022), contains only limited reference to activities to reduce the risks of adverse health outcomes. In support of strengthening adaptation policy planning for health, this rapid review was conducted to assess the research intensity on climate change impacts on health in Kenya and to identify evidence gaps and opportunities.

## Methods

Rapid reviews condense the stepwise methodology of a systematic review into an abbreviated timeframe to provide an evidence-based output linking knowledge generation with policy development (Haby *et al.* 2016). Based on a global literature review by Berring-Ford *et al.* (2021) that evaluated more than 15 000 studies related to health impacts associated with climate change, a set of research articles analysing data sets from Kenya and published between 1 January, 2013, to 9 April,, 2020, were identified. In November 2021, we carried out a rapid review of these studies to describe their characteristics.

Studies were selected from three databases, namely, PubMed, Scopus and Web of Science using human screening and machine-learning methods as described by Berring-Ford *et al.* 2021.

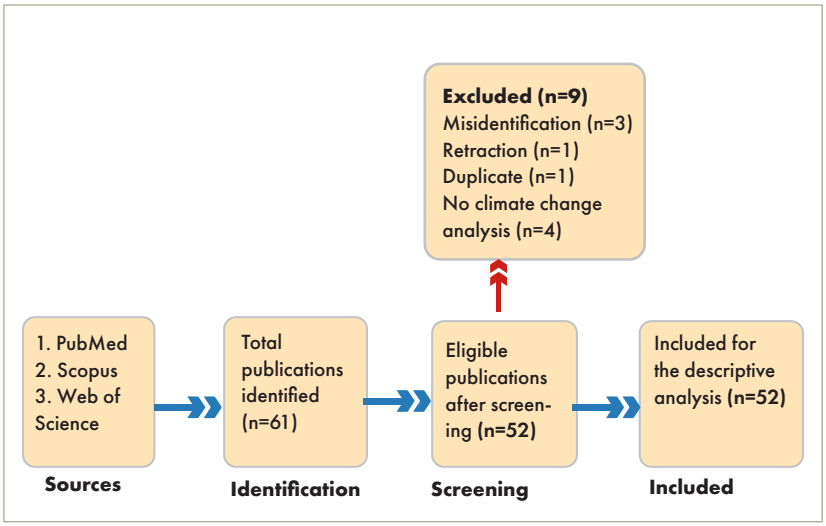


Figure 1. Selection procedure for inclusion in review of publications on health impacts of climate change in Kenya.

A total of 61 studies were identified relevant to Kenya. From these, nine studies (9/61; 15%) were excluded due to misidentification (n=3; studies based in Uganda, Malawi and India); retraction (n=1); duplicate (n=1); and no analysis of climate change or climate factors (n=4). The remaining 52 studies underwent descriptive analysis to summarize temporal, thematic, and methodology trends (Appendix 1).

## Results

Publications increased overall through the time period with a noticeable uptick in 2019 (Figure 1) led by qualitative studies on climate change adaptation and perception studies (5/15). Half of all studies (26/52) used quantitative methods to assess impacts on, or associations between, health and climate variability and nearly 20% of studies (11/52) used qualitative methods (Table 1).

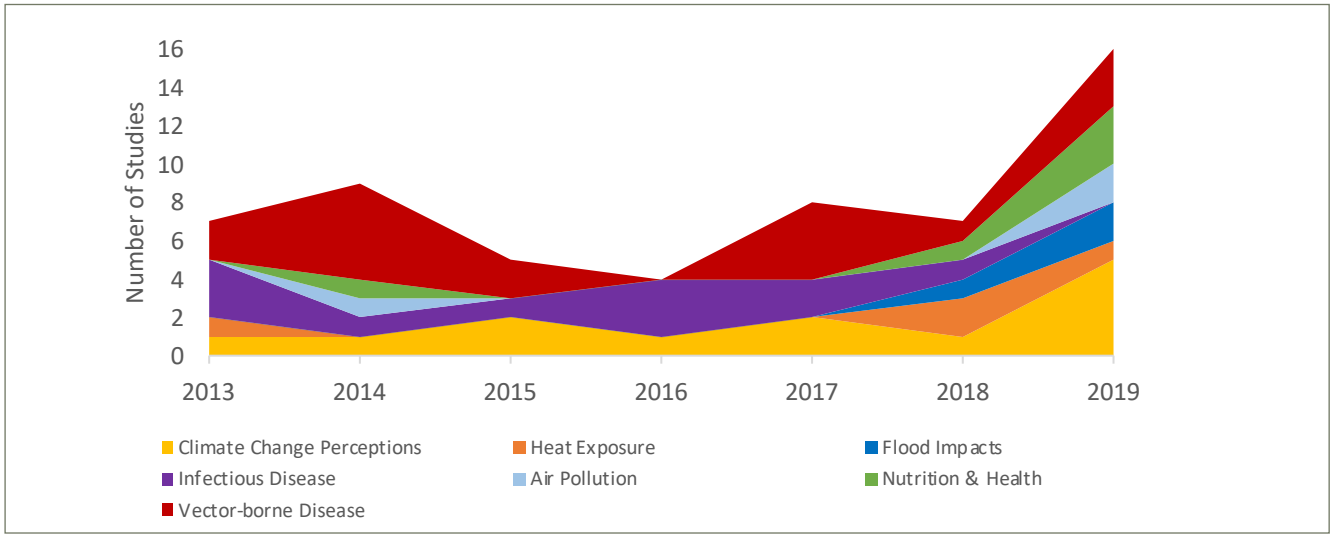


**Figure 2. Temporal trends of journal publications on health impacts of climate variability in Kenya (2013–2020).**

Climate change impacts were categorized into health-related topics: vector-borne disease; infectious disease; flood impacts, heat exposure; air pollution; studies on nutrition and health outcomes; and qualitative studies on climate change adaptation and perceptions. Vector-borne disease was the most frequently researched theme (31%), in which most studies (13/17) were focused on malaria. In total, just over a quarter of studies (29%) were categorized as topics related to flooding, air pollution, heat exposure, or nutrition and health (detailed topic analysis, Figure 3).

**Table 1. Summary of Study Characteristics**

| Study Characteristics | Studies (%) |
|---|---|
| Study Design | |
| Statistical Model | 26 (50) |
| Qualitative Methods | 11 (19) |
| Literature Review | 7 (13) |
| Cross-Sectional Study | 5 (10) |
| Risk Mapping | 2 (4) |
| Policy Review | 1 (2) |
| Case-Control Study | 1 (2) |
| **Health Topics*** | |
| Vector-borne Disease | 17 (31) |
| Other Infectious Disease | 11 (20) |
| Climate Change Adaptations | 6 (11) |
| Climate Change Perceptions | 5 (9) |
| Nutrition & Health | 5 (9) |
| Heat Exposure | 4 (7) |
| Flood Impacts | 4 (7) |
| Air Pollution | 3 (6) |

*Studies could be categorized into >1 health topic.

# Discussion

We performed a rapid evidence review to map the current research evidence on climate-related health outcomes in Kenya. As a highly vulnerable country, the consequences of climate variability on health in Kenya are likely to be profound, necessitating a strong evidence base to support adaptation policy planning. While this review did not include a search of grey literature, publications were obtained from three prominent bibliographic databases and are a reasonable representation of the relevant research intensity in Kenya in recent years.

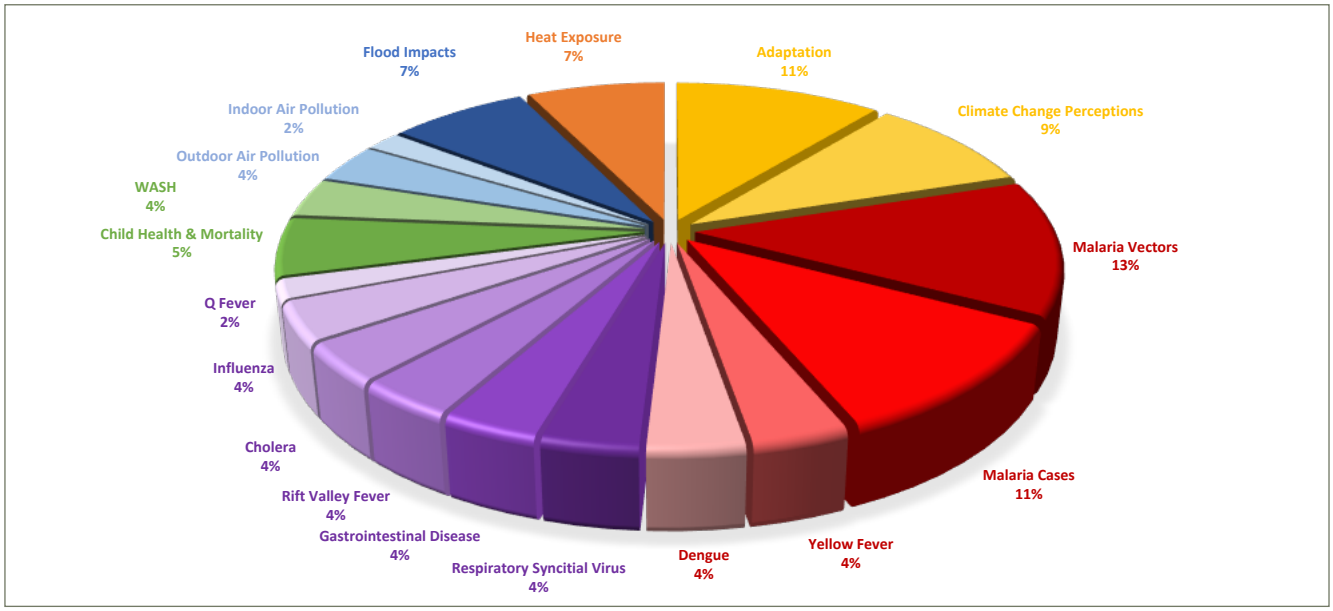


**Figure 2. Detailed topic analysis of 52 publications on health impacts of climate change in Kenya. Studies could be categorized into more than one health topic.**

Temporal trends in climate change and health research in Kenya show a general increase in publications over the seven-year period. This aligns with a global expansion in output on climate change impacts reported by various authors (Klingelhöfer *et al.* 2020; Berring-Ford *et al.* 2021) and implies growing awareness of Kenya's vulnerabilities as well as potentially improved research funding opportunities. Publications on malaria vectors and disease incidence, as well as climate change adaptation studies were dominant. Conversely, flood impacts, air pollution, heat exposure, and child nutrition and mortality were the least studied topics and given their potential burden on health, represent an important gap in the evidence base.

Flood risks are considered to be high and increasing in Kenya, as reported in a recent review of population exposure to flooding using high-resolution satellite data; results suggest that the proportion of vulnerable people in Kenya has increased by 1.2 – 1.5 times in comparison to previous estimates from projection models (Tellman *et al.* 2021). Moreover, air pollution and heat exposure topics represented fewer than 15% of studies in contrast to a review of global research output that identified heat stress and air pollution as the most commonly evaluated health outcomes of climate variability (Berring-Ford *et al.* 2021). Air pollution has been ranked as the fourth most important risk factor to health in Kenya (Achoki *et al.* 2019) but in our review just three studies measured concentrations of major air pollutants in outdoor or indoor air and none attempted to quantify the corresponding health risk to residents.

Associations between crop yields, climate variability and undernutrition in children have been published in other African countries (see Belasova *et al.* 2017; Wakefield *et al.* 2018), however in our review this topic was relatively understudied in Kenya, comprising 5% of output. Despite this, maternal health and child undernutrition remains the second most important risk factor for loss of health in Kenya (Achoki *et al.* 2019). The discrepancy between the risk ranking and research output may be related to insufficient longitudinal data sets from low-resource regions and the inherent difficulties related to accommodating for interactions among variables in ecosystem-mediated pathways.

The most frequently researched topic, vector-borne disease, centred on climate change impact studies on malaria. Regional malaria endemicity is a risk factor for premature mortality and malaria is one of the top five infectious causes of death in Kenya (Frings *et al.* 2018). Despite gains made with malaria control programs, recent projection models suggest that increases in precipitation may influence a resurgence in cases (Amadi *et al.* 2018).

In our review, adaptation studies comprised 11% of publications and were predominantly undertaken as qualitative studies using focus groups, questionnaires, and key expert interviews. These studies evaluated adaptation activities undertaken by individuals and communities against particular threats such as flood risks, drought, and gender-based vulnerabilities. Kenya's NCCAP has minimal reference to health and lacks targets to

measure the effectiveness of adaptation activities. Mounting estimates of the cost of adaptation activities in LMICs has prompted analysis of their value. However recent reports suggest that implementation of adaptation policies has been relatively low worldwide such that conducting value assessments has been a challenge (WHO 2019; UNEP 2021). To this end, incorporating health targets into climate change adaptation policies is urgently required and identification of opportunities to improve the evidence base is a first step in supporting development of these targets.

This rapid review was conducted to assess trends related to research intensity on climate change and health in Kenya using a subset of articles obtained from a previously published global dataset. Several limitations to our review should be noted. The original global review did not incorporate grey literature or a comprehensive search of all bibliographic databases, this may have resulted in underrepresentation of research published as reports, conference abstracts, or in local or regional specialty journals not included in major citation databases. We also identified 15% of studies within the Kenya subset that were misidentified by machine-learning methods (or human error) and likewise acknowledge that misidentification of studies from Kenya may have resulted in an incomplete data set. Finally, the rapid review methodology condenses certain elements of a systematic review to prioritize a timely output but in so doing, compromises on procedures that aim to reduce bias. In this review, no risk of bias assessment was conducted, limiting our conclusions on the quality of evidence produced.

## Conclusions

This review provides an initial summary of trends in research intensity on climate change and health impacts in Kenya and identifies further research opportunities. Interest in understanding the impacts of climate variability on human health and livelihoods has risen worldwide over the past decade and this is reflected in greater research output relevant to Kenya and its citizens. However, key gaps in the knowledge base are apparent primarily related to health impacts associated with child nutrition, flood risks, heat exposure and air pollution – all of which are projected to influence human health and quality of life in Kenya. Effective adaptation planning against climate impacts on health in Kenya hinges on the availability of sufficient evidence and efforts to focus research output on understudied climate-sensitive outcomes are encouraged. Next steps should include triangulation between the results of this review on evidence gaps, availability of open-access secondary datasets, and the burden of disease in Kenya to identify priorities for new research efforts.

**Effective adaptation planning against climate impacts on health in Kenya hinges on the availability of sufficient evidence and efforts to focus research output on understudied climate-sensitive outcomes are encouraged.**

# Appendix: List of publications reviewed

| Document title | Study Design | Location | Topic |
|---|---|---|---|
| Njuguna C, Njeru I, Mgamb E, Langat D, Makokha A, Ongore D, Mathenge E, Kariuki S. (2016). Enteric pathogens and factors associated with acute bloody diarrhoea, Kenya. BMC Infect Dis 16, 477. | Case-Control Study | Kilifi and Nairobi | Infectious Disease: Gastrointestinal |
| Osiemo MM, Ogendi GM, M'Erimba C. (2019). Microbial Quality of Drinking Water and Prevalence of Water-Related Diseases in Marigat Urban Centre, Kenya. Environ Health Insights. Mar 14;13:1178630219836988. | Cross-Sectional Study | Baringo County | Infectious Disease: Gastrointestinal |
| Gatari M, Kinney PL, Yan B, Sclar ED, Volavka-Close N, Ngo NS, Mwaniki Gaita S, Law A, Ndiba PK, Gachanja AN, Graeff J, Chillrud S. (2019). High airborne black carbon concentrations measured near roadways in Nairobi, Kenya. Transportation Research Part D: Transport and Environment. | Cross-Sectional Study | Nairobi | Air Pollution: Outdoor |
| Maes P, Harries AD, Van den Bergh R, Noor A, Snow RW, Tayler-Smith K, Hinderaker SG, Zachariah R, Allan R. (2014). Can timely vector control interventions triggered by atypical environmental conditions prevent malaria epidemics? A case-study from Wajir County, Kenya. PLoS One. Apr 3;9(4):e92386 | Cross-Sectional Study | Wajir County | Vector-borne Disease: Malaria Vectors |
| Omukunda E, Githeko A, Ndong'a MF, Mushinzimana E, Atieli H, Wamae P. (2013). Malaria vector population dynamics in highland and lowland regions of western Kenya. J Vector Borne Dis. Apr-Jun;50(2):85-92. PMID: 23995309. | Cross-Sectional Study | Morani & Kombewa | Vector-borne Disease: Malaria Vectors |
| Chepkorir E, Lutomiah J, Mutisya J, Mulwa F, Limbaso K, Orindi B, Ng'ang'a Z, Sang R. (2014). Vector competence of Aedes aegypti populations from Kilifi and Nairobi for dengue 2 virus and the influence of temperature. Parasit Vectors. Sep 15;7:435. | Cross-Sectional Study | Coastal Kenya & Nairobi | Vector-borne Disease: Dengue Vector |
| Okaka FO, Odhiambo BDO. (2019). Health vulnerability to flood-induced risks of households in flood-prone informal settlements in the Coastal City of Mombasa, Kenya. Nat Hazards 99: 1007–1029. | Qualitative Methods | Coastal Kenya | Qualitative Study: CC Adaptation, Flood Impacts |
| Tongruksawattana S, Wainaina P. (2019). Climate shock adaptation for Kenyan maize-legume farmers: choice, complementarities and substitutions between strategies, Climate and Development. 11:8, 710-722. | Qualitative Methods | Eastern & Western Kenya | Qualitative Study: CC Adaptation, Agriculture |
| Ebi KL, Otmani Del Barrio M. (2017). Lessons Learned on Health Adaptation to Climate Variability and Change: Experiences Across Low- and Middle-Income Countries. Environ Health Perspect. Jun 20;125(6):065001. | Qualitative Methods | Kenya | Qualitative Study: CC Adaptation, Socio-economic |
| Coughlan de Perez E, Nerlander N, Monasso F, van Aalst M, Mantilla G, Muli E, Nguyen T, Rose G, Rumbaitis Del Rio C. (2015). Managing health risks in a changing climate: Red Cross operations in East Africa and Southeast Asia. Climate and Development. 7:3, 197-207 | Qualitative Methods | Kenya | Qualitative Study: CC Adaptation, Socio-economic |
| Muricho DN, Otieno DJ, Oluoch-Kosura W, Jirström M. (2019). Building pastoralists' resilience to shocks for sustainable disaster risk mitigation: Lessons from West Pokot County, Kenya. International Journal of Disaster Risk Reduction. 34(3):429-435. | Qualitative Methods | West Pokot County | Qualitative Study: CC Adaptation, Agriculture |

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| Ajuang CO, Abuom PO, Bosire EK, Dida GO, Anyona DN. (2016). Determinants of climate change awareness level in upper Nyakach Division, Kisumu County, Kenya. Springer-plus. Jul 8;5(1):1015. | Qualitative Methods | Kisumi County | Qualitative Study: CC Perceptions |
| Otieno PS, Ogutu CA, Mburu J, Nyikal RA. (2017). Effect of Global-GAP Policy on Climate Change Perceptions of Smallholder French Beans Farmers in Central and Eastern Regions, Kenya. Climate. 5(2):27. | Qualitative Methods | Central and Eastern Kenya | Qualitative Study: CC Perceptions |
| Okaka FO, Odhiambo BDO. (2018). Urban residents' awareness of climate change and their autonomous adaptive behaviour and mitigation measures in the coastal city of Mombasa, Kenya. South African Geographical Journal, 100(3): 378-393. | Qualitative Methods | Coastal Kenya | Qualitative Study: CC Perceptions |
| Okaka FO, Odhiambo BDO. (2019). Households' perception of flood risk and health impact of exposure to flooding in flood-prone informal settlements in the coastal city of Mombasa. International Journal of Climate Change Strategies and Management, 11(4):592-606. | Qualitative Methods | Coastal Kenya | Qualitative Study: CC Perceptions, Flood Impacts |
| Abdi IH, Affognon HD, Wanjoya AK, Onyango-Ouma W, Sang R. (2015). Knowledge, Attitudes and Practices (KAP) on Rift Valley Fever among Pastoralist Communities of Ijara District, North Eastern Kenya. PLoS neglected tropical diseases. 9(11): e0004239. | Qualitative Methods | North Eastern Kenya | Qualitative Study: CC Perceptions, Rift Valley Fever |
| Attaway DF, Jacobsen KH, Falconer A, Manca G, Rosenshein Bennett L, Waters NM. (2014). Mosquito habitat and dengue risk potential in Kenya: alternative methods to traditional risk mapping techniques. Geospat Health. Nov;9(1):119-30. | Risk Mapping | Kenya | Vector-borne Disease: Dengue |
| Omondi CJ, Onguru D, Kamau L, Nanyingi M, Ong'amo G, Estambale B. (2017). Perennial transmission of malaria in the low altitude areas of Baringo County, Kenya. Malar J. Jun 17;16(1):257. | Risk Mapping | Baringo County | Vector-borne Disease: Malaria |
| Redding DW, Tiedt S, Lo Iacono G, Bett B, Jones KE. (2017). Spatial, seasonal and climatic predictive models of Rift Valley fever disease across Africa. Philos Trans R Soc Lond B Biol Sci. Jul 19;372(1725):20160165 | Statistical Model | Kenya | Vector-borne Disease: Rift Valley Fever |
| Wakefield J, Fuglstad GA, Riebler A, Godwin J, Wilson K, Clark SJ (2019). Estimating under-five mortality in space and time in a developing world context. Statistical methods in medical research, 28(9), 2614–2634. | Statistical Model | Kenya | Health and Nutrition: Child Health and Mortality |
| Bisanzio D, Mutuku F, LaBeaud AD, Mungai PL, Muinde J, Busaidy H, Mukoko D, King CH, Kitron U. (2015). Use of prospective hospital surveillance data to define spatiotemporal heterogeneity of malaria risk in coastal Kenya. Malar J. Dec 1;14:482 | Statistical Model | Coastal Kenya | Vector-borne Disease: Malaria Vectors |
| Odhiambo Sewe M, Bunker A, Ingole V, Egondi T, Oudin Åström D, Hondula DM, Rocklöv J, Schumann B. (2018). Estimated Effect of Temperature on Years of Life Lost: A Retrospective Time-Series Study of Low-, Middle-, and High-Income Regions. Environ Health Perspect. Jan 12;126(1):017004. | Statistical Model | Western Kenya and Nairobi | Heat Exposure |
| Bakshi B, Nawrotzki RJ, Donato JR, Silva Lelis L. (2019) Exploring the link between climate variability and mortality in Sub-Saharan Africa. International Journal of Environment and Sustainable Development Vol.18 No.2, pp.206 - 237 | Statistical Model | Kenya | Flood Impacts; Heat Exposure |

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| Asefi-Najafabady S, Vandecar KL, Seimon A, Lawrence P, Lawrence D. (2018). Climate change, population, and poverty: vulnerability and exposure to heat stress in countries bordering the Great Lakes of Africa. Climatic Change 148, 561–573 | Statistical Model | Kenya | Heat Exposure |
| Carvalho RL, Lindgren R, García-López N, Nyambane A, Nyberg G, Diaz-Chavez RA, Boman C. (2019). Household air pollution mitigation with integrated biomass/cookstove strategies in Western Kenya. Energy Policy. | Statistical Model | Western Kenya | Air Pollution: Indoor |
| Tonnang HE, Tchouassi DP, Juarez HS, Igweta LK, Djouaka RF. (2014). Zoom in at African country level: potential climate induced changes in areas of suitability for survival of malaria vectors. International journal of health geographics, 13, 12. https://doi.org/10.1186/1476-072X-13-12 | Statistical Model | Kenya | Vector-borne Disease: Malaria Vectors |
| Le PVV, Kumar P, Ruiz MO, Mbogo C, Muturi EJ. (2019). Predicting the direct and indirect impacts of climate change on malaria in coastal Kenya. PLoS One. Feb 6;14(2):e0211258. | Statistical Model | Kilifi County | Vector-borne Disease: Malaria Vectors |
| Tompkins AM, Di Giuseppe F. (2015). Potential Predictability of Malaria in Africa Using ECMWF Monthly and Seasonal Climate Forecasts. Journal of Applied Meteorology and Climatology, 54(3), 521–540. | Statistical Model | Kenya | Vector-borne Disease: Malaria Vectors |
| Ruiz D, Brun C, Connor SJ, Omumbo JA, Lyon B, Thomson MC. (2014) Testing a multi-malaria-model ensemble against 30 years of data in the Kenyan highlands. Malar J 13, 206. | Statistical Model | Western Kenya | Vector-borne Disease: Malaria |
| Emukule GO, Mott JA, Spreeuwenberg P, Viboud C, Commanday A, Muthoka P, Munywoki PK, Nokes DJ, van der Velden K, Paget JW. (2016) Influenza activity in Kenya, 2007-2013: timing, association with climatic factors, and implications for vaccination campaigns. Influenza Other Respir Viruses. Sep;10(5):375-85. | Statistical Model | Kenya | Infectious Disease: Influenza |
| Stoltzfus JD, Carter JY, Akpinar-Elci M, Matu M, Kimotho V, Giganti MJ, Langat D, Elci OC. (2014). Interaction between climatic, environmental, and demographic factors on cholera outbreaks in Kenya. Infect Dis Poverty. Oct 1;3(1):37. | Statistical Model | Kenya | Infectious Disease: Cholera |
| Wardrop NA, Thomas LF, Cook EA, de Glanville WA, Atkinson PM, Wamae CN, Fèvre EM. (2016). The Sero-epidemiology of Coxiella burnetii in Humans and Cattle, Western Kenya: Evidence from a Cross-Sectional Study. PLoS Negl Trop Dis. Oct 7;10(10):e0005032. | Statistical Model | Western Kenya | Infectious Disease: Q Fever |
| Bakhtsiyarava M, Grace K, Nawrotzki RJ. (2018). Climate, Birth Weight, and Agricultural Livelihoods in Kenya and Mali. American journal of public health, 108(S2), S144–S150. | Statistical Model | Kenya | Health and Nutrition: Child Health and Mortality |
| Grace K, Brown M, McNally A. (2014) Examining the link between food prices and food insecurity: A multi-level analysis of maize price and birthweight in Kenya. Food Policy. June 46:56-65 | Statistical Model | Kenya | Health and Nutrition: Child Health and Mortality |
| Amadi JA, Olago DO, Ong'amo GO, Oriaso SO, Nanyingi M, Nyamongo IK, Estambale BBA. (2018) Sensitivity of vegetation to climate variability and its implications for malaria risk in Baringo, Kenya. PLoS ONE 13(7): e0199357. | Statistical Model | Baringo County | Vector-borne Disease: Malaria |
| Gopal S, Ma Y, Xin C, Pitts J, Were L. (2019). Characterizing the Spatial Determinants and Prevention of Malaria in Kenya. Int J Environ Res Public Health. Dec 12;16(24):5078. | Statistical Model | Western and Coastal Kenya | Vector-borne Disease: Malaria |

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| Frings M, Lakes T, Müller D, Khan MMH, Epprecht M, Kipruto S, Galea S, Gruebner O. (2018). Modeling and mapping the burden of disease in Kenya. Scientific Reports, 8(1). | Statistical Model | Kenya | Vector-borne Disease: Malaria |
| Nyoka R, Omony J, Mwalili SM, Achia TNO, Gichangi A, Mwambi H. (2017). Effect of climate on incidence of respiratory syncytial virus infections in a refugee camp in Kenya: A non-Gaussian time-series analysis. PLoS One. Jun 1;12(6):e0178323. | Statistical Model | Kenya | Infectious Disease: Respiratory Syncytial Virus |
| Haynes AK, Manangan AP, Iwane MK, Sturm-Ramirez K, Homaira N, Brooks WA, Luby S, Rahman M, Klena JD, Zhang Y, Yu H, Zhan F, Dueger E, Mansour AM, Azazzy N, McCracken JP, Bryan JP, Lopez MR, Burton DC, Bigogo G, Breiman RF, Feikin DR, Njenga K, Montgomery J, Cohen AL, Moyes J, Pretorius M, Cohen C, Venter M, Chittaganpitch M, Thamthitiwat S, Sawatwong P, Baggett HC, Luber G, Gerber SI. (2013). Respiratory syncytial virus circulation in seven countries with Global Disease Detection Regional Centers. J Infect Dis. Dec 15;208 Suppl 3:S246-54. | Statistical Model | Kenya | Infectious Disease: Respiratory Syncytial Virus |
| Shilenje ZW, Ongoma V. (2014). Observed surface ozone trend in the year 2012 over Nairobi, Kenya. Atmosfera, 27, 377-384. | Statistical Model | Nairobi | Air Pollution: Outdoor |
| Thomson P, Bradley D, Katilu A, Katuva J, Lanzoni M, Koehler J, Hope R. (2019) Rainfall and groundwater use in rural Kenya. Sci Total Environ. Feb 1;649:722-730. doi: 10.1016/j.scitotenv.2018.08.330. Epub 2018 Aug 25. | Statistical Model | Coastal Kenya | Health and Nutrition: WASH |
| Walker M, Winskill P, Basáñez MG, Mwangangi JM, Mbogo C, Beier JC, Midega JT. (2013) Temporal and micro-spatial heterogeneity in the distribution of Anopheles vectors of malaria along the Kenyan coast. Parasit Vectors. Oct 28;6:311. | Statistical Model | Kilifi County | Vector-borne Disease: Malaria Vectors |
| Kipruto EK, Ochieng AO, Anyona DN, Mbalanya M, Mutua EN, Onguru D, Nyamongo IK, Estambale BB. (2017). Effect of climatic variability on malaria trends in Baringo County, Kenya. Malaria Journal, 16. | Statistical Model | Baringo County | Vector-borne Disease: Malaria |
| Shah MM, Krystosik AR, Ndenga BA, Mutuku FM, Caldwell JM, Otuka V, Chebii PK, Maina PW, Jembe Z, Ronga CO, Bisanzio D, Anyamba A, Damoah R, Ripp K, Jagannathan P, Mordecai EA, LaBeaud AD. (2019). Malaria smear positivity among Kenyan children peaks at intermediate temperatures as predicted by ecological models. Parasites & Vectors, 12. | Statistical Model | Kisumi County | Vector-borne Disease: Malaria |
| Omolo N, Mafongoya PL. (2019). Gender, social capital and adaptive capacity to climate variability. International Journal of Climate Change Strategies and Management. | Literature Review | Kenya | Qualitative Study: CC Adaptation, Socio-economic |
| Bazeyo W, Mayega RW, Nabukenya I, Keyyu J, Mamuya S, Tabu SJ, Senna L, Mohammad M, Rugigana E, Alingi A, Mapatano M, Kiguli J, Orach CG, Burnham G, Killewo J. (2013). Institutional frameworks for management of epizoonotic emergencies in six countries in the Eastern Africa region: a situational analysis. East Afr J Public Health. Jun;10(2):387-96. | Literature Review | Kenya | Infectious Disease: Avian Influenza |
| Wong KV, Paddon A, Jimenez A. (2013). Review of World Urban Heat Islands: Many Linked to Increased Mortality. J. Energy Resour. Technol. June; 135(2): 022101. | Literature Review | Kenya | Heat Exposure |

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|---|---|---|---|
| Okaka FO, Odhiambo BDO. (2018). Relationship between Flooding and Out Break of Infectious Diseasesin Kenya: A Review of the Literature. J Environ Public Health. Oct 17;2018:5452938. | Literature Review | Kenya | Flood Impacts |
| Mutonga D, Langat D, Mwangi DN, Tonui JC, Njeru M, Abade A, Irura Z, Njeru I, Dahlke M. (2013). National surveillance data on the epidemiology of cholera in Kenya, 1997-2010. The Journal of infectious diseases, 208 Suppl 1, S55-61 . | Literature Review | Kenya | Infectious Disease: Cholera |
| Ahmed QA, Memish ZA. (2017). Yellow fever from Angola and Congo: a storm gathers. Trop Doct. Apr;47(2):92-96. | Literature Review | Kenya | Infectious Disease: Yellow Fever |
| Baba MM, Ikusemoran M. (2017). Is the absence or intermittent YF vaccination the major contributor to its persistent outbreaks in eastern Africa? Biochem Biophys Res Commun. Oct 28;492(4):548-557. | Literature Review | Kenya | Infectious Disease: Yellow Fever |
| Wakhungu MJ (2019). An ethnography of policy: water reuse policy in Kenya. Water Policy. | Policy Review | Kenya | Health and Nutrition: WASH |

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Amadi, J.A., Olago, D.O., Ong'amo, G.O., Oriaso, S.O., Nanyingi, M., Nyamongo, I.K., *et al.* (2018) Sensitivity of vegetation to climate variability and its implications for malaria risk in Baringo, Kenya. PLoS ONE 13(7): e0199357. https://doi.org/10.1371/journal.pone.0199357

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