

INPLASY

Raising awareness on the future disease expansion and epidemic risk of Yellow Fever due to climate change and human behaviours: a systematic scoping review protocol

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Langevin, E; Thollot, Y.

Corresponding author:

Yael Thollot

yael.thollot@sanofi.com

Author Affiliation:

Sanofi (14, Espace Henry Vallée, 69007 Lyon, France).

ADMINISTRATIVE INFORMATION

Support - Sanofi.

Review Stage at time of this submission - Formal screening of search results against eligibility criteria.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 22 November 2024 and was last updated on 22 November 2024.

INTRODUCTION

Review question / Objective What data are currently available on the future trends of YF virus, disease and vector evolution in the context of climate change and human behaviour? i. In currently endemic regions ii. In non-endemic regions.

Background Yellow Fever (YF) is a mosquito-borne vaccine preventable disease with epidemic potential, which is caused by the yellow fever virus (YFV) an orthoflavivirus that is transmitted to humans by the bites of infected *Aedes*, *Haemogogus* or *Sabethes* mosquitoes (World Health Organisation. 2023).

Currently, the disease is endemic in parts of Africa, the Caribbean and South and Central America. As of 2023, 34 countries in Africa and 13 countries in Central and South America were either endemic for, or had regions that are endemic for, YF (World Health Organisation. 2023).

YF is a high-impact, high-threat disease, with risk of international spread, which represents a potential threat to global health security. Various factors may influence the spread of YFV, including insufficient vaccination coverage, virus adaptation or failures in vector control. However, one key factor is climate change. The effects of climate change are expected to lead to more frequent severe heatwaves, droughts, floods and storms. It may also impact El Niño oscillations – increasing the number of regions experiencing extreme weather. Along with climate change, human behaviour (such as migration, urbanization, changes in land use, deforestation and forest fragmentation, altered travel, and trade routes, vector control and prevention) is also thought to be a driving factor in the probable expansion in the range of *Aedes*, *Haemogogus* or *Sabethes* mosquitoes, resulting in the spread of YF to new areas. This may alter the risk of YF urban cycles, transmission of YFV, and variations to YF circulation (World Health Organisation. 2023). However, predicting the evolution of YF

transmission is complex. It is yet to be understood why – despite the widespread infestation of the *Aedes aegypti* – YF outbreak has not occurred in Asia or the Pacific region.

Rationale To address the risk of possible YF expansion, it is important to evaluate current evidence. Systematic scoping reviews seek to explore the scope of literature on a given topic by following a systematic approach to map and summarize the available evidence. The objective of this systematic scoping review is to identify and describe currently available literature on YF in the context of climate change and human behaviours, to raise awareness and develop a call to action. We plan to discuss the potential effects of weather patterns and climate projections on YF vectors and hosts. We will also explore the possible effects of climate change drivers such as deforestation and urbanization, on the transmission and spread of YFV and YF vectors, as well as the consequences of altered human mobility, including the roles of air travel, migration, altered travel and trade routes.

METHODS

Strategy of data synthesis A three-step search strategy was utilized in this systematic scoping review. First, a search was conducted of PubMed / MEDLINE, Embase, and Cochrane Library to identify studies for inclusion. A second search was then undertaken across abstract books of the below-specified meetings to identify any other congress abstracts for inclusion, and The Journal of Climate Change and Health for any additional articles. Finally, a search was conducted of reference lists of selected ‘sentinel’ papers and supplemented with additional articles provided by experts.

The research questions were used to develop an initial search strategy designed for PubMed / MEDLINE in conjunction with an information professional (Appendix II). Development of the search strategy involved specifying relevant terms (including synonyms, abbreviations, variant spellings, etc.) and index terms i.e. Medical Subject Headings (MeSH) and using Boolean operators to create search queries. The search queries were tested to identify the search strategy with the optimal balance between sensitivity and specificity. This initial search strategy was adapted for each included database.

Congress abstracts were also searched to identify relevant evidence; manual searches of abstract books were conducted for the previous two years of the following congresses:

- Conference of the International Society of Travel Medicine (CISTM)

- American Society of Tropical Medicine & Hygiene Congress (ASTMH)
- Pan-American Dengue Research Network (PanDengue Net) Meeting.

Eligibility criteria The eligibility criteria of the studies for inclusion will be evaluated using the patients, exposure, and outcomes (PEO) framework. The PEO framework will enable the identification of the population of interest (studies reporting YFV / disease / vector evolution) and the factors (climate change and human behaviour [including migration, urbanization, changes in land use, deforestation and forest fragmentation, altered travel, and trade routes, vector control and prevention]) that affect the outcomes of interest (future evolution of virus, vector and disease).

Participants / populations: All studies reporting YFV, disease or vector evolution will be considered, including human or non-human focused studies.

Outcomes: Publications containing data relating to predicting / modelling / forecasting trends over time of:

1. YFV and YF disease (e.g. burden of disease, number of human / non-human cases, disease severity and mortality, and geographical distribution)
2. YF vector (*Aedes*, *Haemagogus* or *Sabethes* mosquitoes) evolution, changes in mosquito development / distribution, changes in YF transmission in relation to climate change / variability, and / or in relation to human behaviour

Publications containing no data related to future trends of YF epidemiology or vector evolution in relation to climate change or human behaviour, publications on vaccine efficacy, or publications only relating to *Aedes albopictus*, will be excluded. Publication types: Journal articles and congress abstracts will be considered for inclusion. Review articles and other publication types containing no original data will be excluded.

No restriction on language or publication timeframe will be applied.

Publication status: Published and unpublished literature, including congress abstracts will be considered for inclusion.

Source of evidence screening and selection

The titles and abstracts of each study will be screened by two independent reviewers for assessment against the inclusion criteria. Studies that meet the inclusion criteria at the first screening round will be retrieved in full text and linked to their relevant citation within Covidence (Veritas Health Innovation Ltd. VIC, Australia), a web-based platform for review management.

For the second screening round, the full text will be assessed against the inclusion criteria by two independent reviewers, and reasons for exclusion will be recorded and reported in the systematic scoping review. Any disagreements that arise between the reviewers at each screening round will be resolved through discussion, or with a senior member of the review team. The results of the search and the study inclusion process will be reported in full in the final systematic scoping review and presented in a PRISMA-ScR flow diagram (Tricco et al. 2018).

Data will be extracted from studies included in the systematic scoping review by a reviewer using a bespoke data extraction form developed by the review team. The data extracted will include specific details about the participants, concept, context, study methods, and key findings relevant to the review question. A draft data extraction form will be created in Excel to capture agreed data categories from the included studies. The form will be tested on five records by one member of the review team, with the results reviewed by the wider team. Any amendments will then be incorporated, before building the form within Covidence.

Reference

Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169:467–473. doi: 10.7326/M18-0850.

Data management Following the searches, a list of identified studies was collated within EndNote (Clarivate Analytics, PA, USA). Duplicates were removed, before being uploaded into Covidence.

Reporting results / Analysis of the evidence A narrative summary will be developed to accompany the tabulated and / or charted results and will describe how the results relate to the review's objective and questions. A PRISMA flowchart diagram of the review will also be developed.

Presentation of the results The extracted data will be presented in diagrammatic or tabular form in a manner that aligns with the objective and questions of this systematic scoping review. A PRISMA diagram, as produced by Covidence, will be included. The tables and / or charts will report on the agreed data categories and any other elements deemed relevant.

Language restriction No restriction.

Country(ies) involved France - Sanofi (14, Espace Henry Vallée, 69007 Lyon, France).

Keywords Yellow fever; Mosquito vectors; Epidemiology; Climate change; Human behaviour.

Dissemination plans The literature review will be summarised into a manuscript publication and published in an appropriate journal.

Contributions of each author

Author 1 - Edith Langevin - Author 1 supported in the drafting of the protocol, inputted in the search strategy and reviewed the results of the screening.

Email: edith.langevin@sanofi.com

Author 2 - Yael Thollot - Author 2 supported in the drafting of the protocol, inputted in the search strategy and reviewed the results of the screening.

Email: yael.thollot@sanofi.com