Mapping fever etiologies in malaria-endemic areas:
An interactive, open-access, on-line map

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Introduction

The causes of acute febrile illness are largely unknown in developing countries where diagnostic facilities for infectious diseases remain limited. With the shift to treatment of malaria based on parasite detection, it is now clear that a large proportion of patients with fever do not have malaria. Diseases such as dengue, leptospirosis, rickettsioses, community-acquired bacteraemia, and others are among the important causes of fever that require specific treatment approaches, but that currently cannot be diagnosed accurately in the vast majority of health care settings in tropical and subtropical regions.

Methods

A systematic review was conducted of studies published between 1980 and 2013 from sub-Saharan Africa and Southeast Asia, identifying major pathogens causing non-malaria febrile illness (NMFI) in these regions. Results of the literature review were compiled into a database, standardised using SNOMED Clinical Terms® and displayed in an interactive map that can be used to filter data by geographic region, patient age, study type, and other characteristics. A survey was conducted to seek feedback on the NMFI map from target users, including public health policy makers, programme implementers and funders, practitioners, epidemiologists, and clinical and implementation researchers.
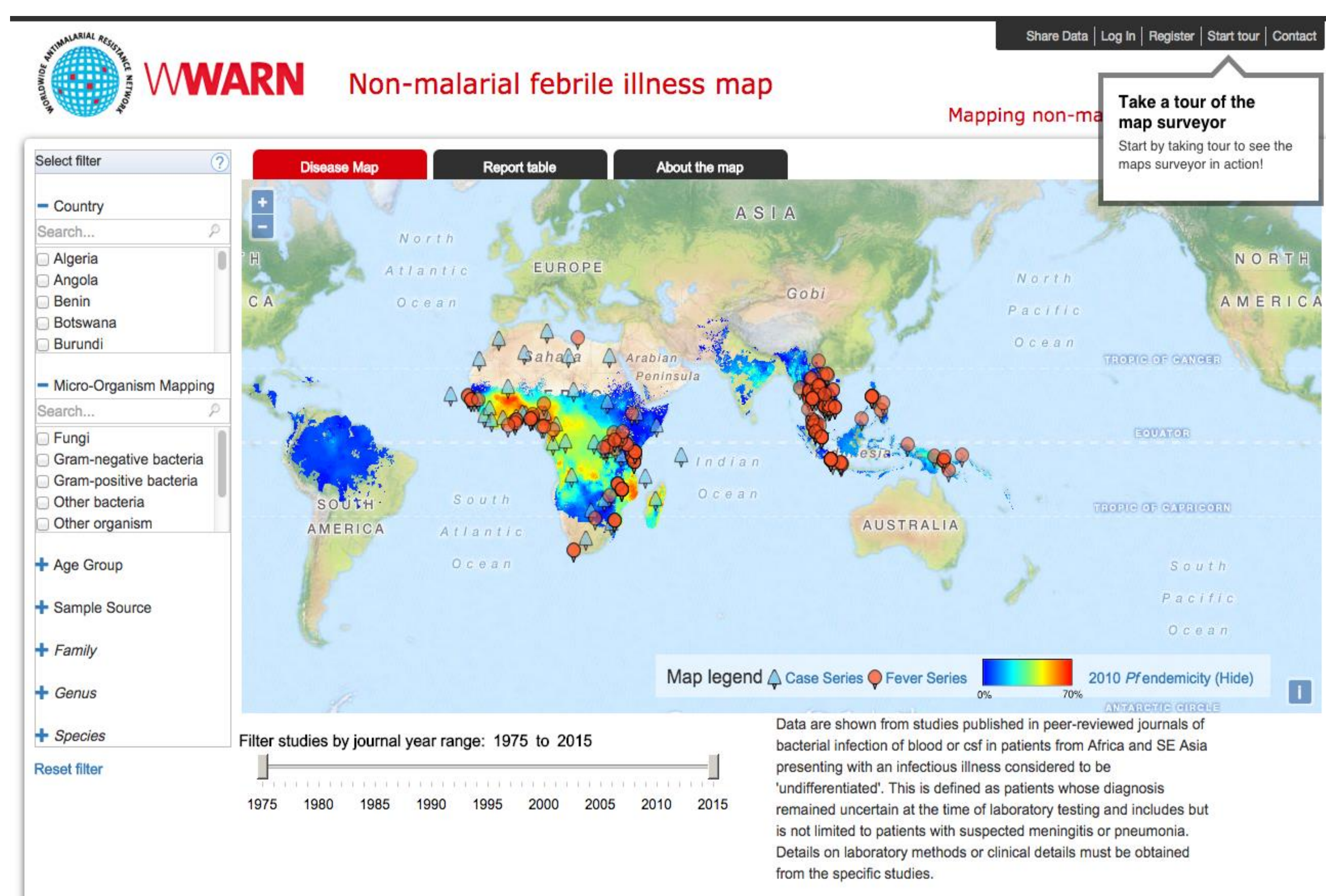

Figure 1. Screen capture of the map home page. Each red circle represents a published study with data on fever case etiologies in a patient population. Blue triangles represent fever case reports or case series. The filters at left and bottom can be used to display specific geographical regions, pathogen groups or names, patient and sample characteristics, and publication dates.

Results

The map is available on-line in open-access format at **http://www.wwarn.org/surveyor/NMFI** and also in an offline-capable format. Data have been extracted from 379 publications from 54 countries. The review highlights the high level of heterogeneity in methods studying fever aetiology. Depending on laboratory capacity, the proportion of pathogens identified varied substantially. Clear regional knowledge gaps were identified in sub-Saharan Africa.
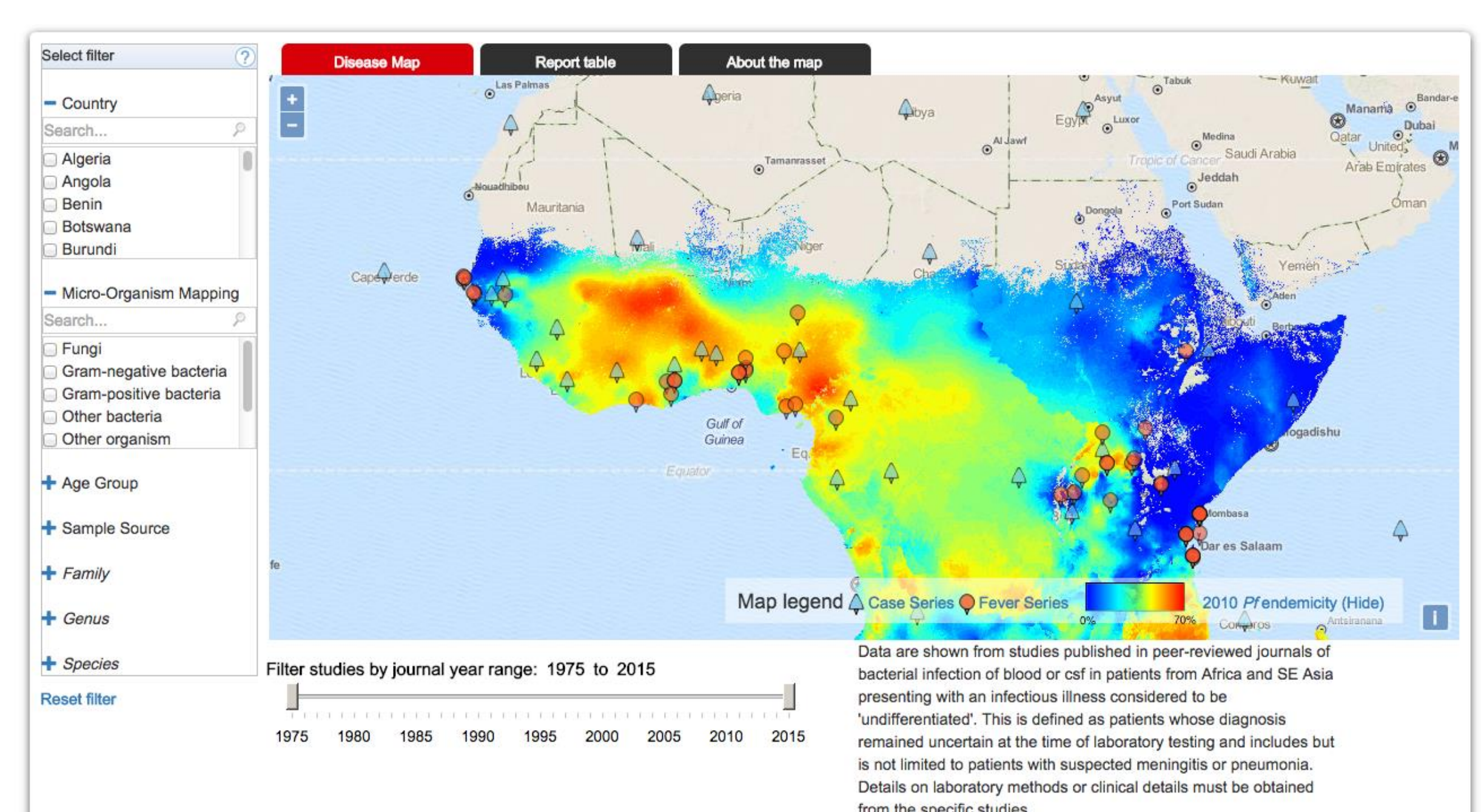
Figure 2. Malaria transmission intensity can be displayed with an optional color-coded overlay from the MAP Data Explorer by the Malaria Atlas Project (http://www.map.ox.ac.uk/explorer/).
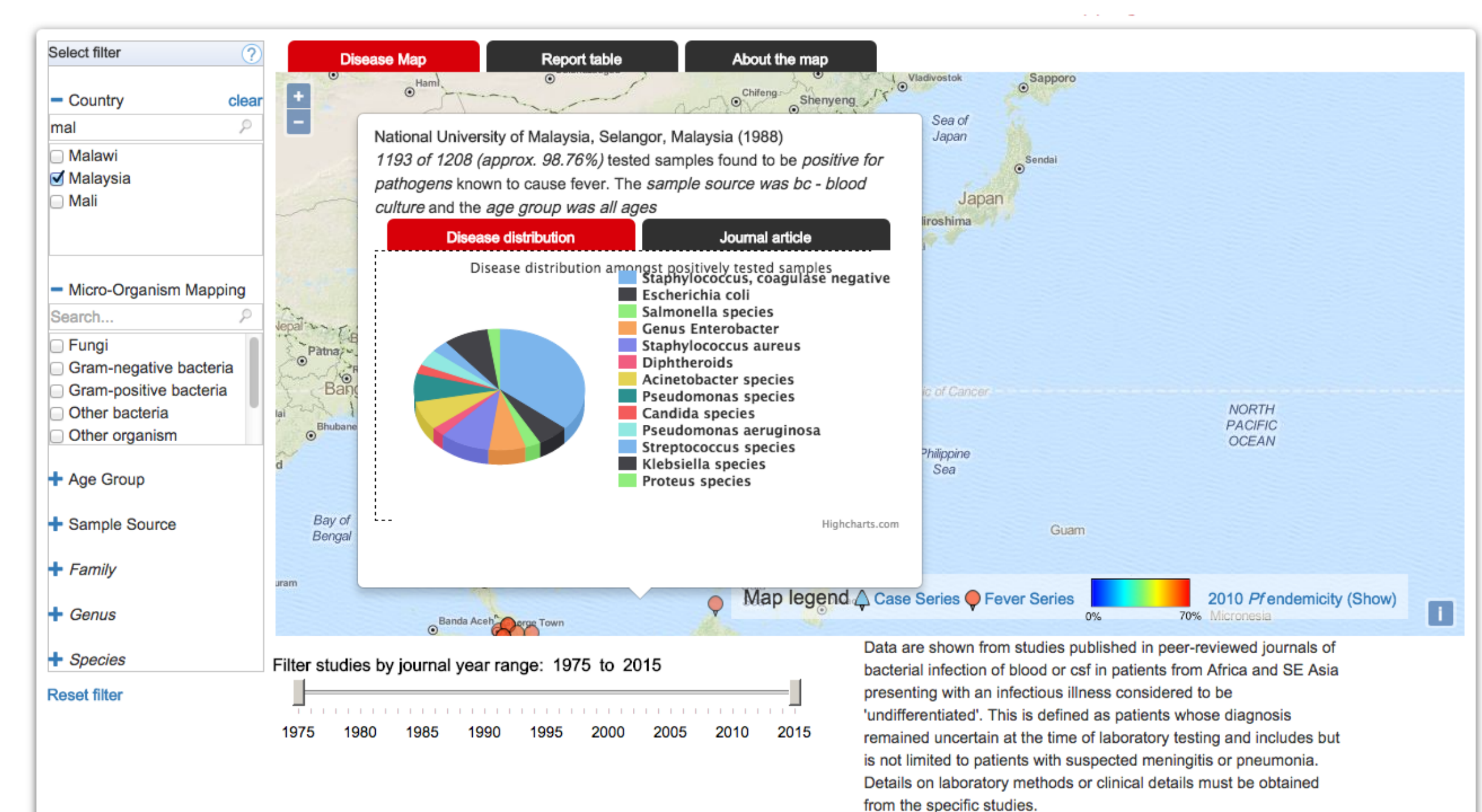
Figure 3. Clicking on an icon displays a pop-up graphic showing pathogens identified, information on the study, and a link to the publication abstract.

Conclusions

- **Open-access global NMFI maps will provide both a central resource of known pathogen distributions, and a clear picture of how future focused research may most efficiently address the major knowledge gaps.**

- **On-going work includes expanding the NMFI mapping project for global representation, to include the remaining tropical and subtropical regions of Asia, Central and South America, and the Caribbean; and including available data on antimicrobial resistance for the mapped pathogens.**

- **As confirmed by our target user survey, we anticipate that this centralized data source will help to optimize the use of data on NMFI – both available and forthcoming – and to inform further work in this area.**