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# Editorial: Digital tools and innovation for the prevention and control of vector-borne diseases

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## Editorial on the Research Topic

### Digital tools and innovation for the prevention and control of vector-borne diseases

Vector-borne diseases are a group of heterogeneous diseases and a major threat to the health of over three-quarters of the human population who inhabit at-risk areas. Many of those infections are also considered neglected tropical diseases, which, as their name suggests, do not receive the necessary attention or resources to be controlled, thus affecting with disproportional force the most vulnerable communities in tropical and subtropical regions.

Current trends suggest that driving factors such as climate change, human mobility, and social determinants will likely enable the increase of disease burden in the future, resulting in additional stress for healthcare systems in endemic regions for vector-borne diseases. The lessons learned in the last pandemic advocate for preparedness and adaptation as the best options to face present and future public health risks and threats.

As a contribution to this goal, we present here a collection of notable contributions to innovations in the prevention and control of vector-borne diseases. Focused mostly on the surveillance of diseases such as dengue, leishmaniasis, and malaria and their vectors, all five manuscripts in this Research Topic share a common vision that surveillance must be improved to keep up with the current times, maintaining its usefulness as a main pillar of public health.

Modern tools for vector-borne disease surveillance are paramount in any health system. On this matter, it is essential to have access to quality data and comprehensive platforms capable of integrating information from multiple sources to help decision-makers understand the complex dynamics of interaction between human and medically relevant vectors and implement the best informed and effective preventive and control measures.

Two of the contributions in this Research Topic explore improvements in surveillance systems. First, [Ureña et al.](#) proposed an optimal solution with an overall surveillance system framework with a transdisciplinary vision that integrates sample management, vector surveillance, weather information, and georeferencing of cases for the prediction of possible outbreaks as a suitable option for low and middle-income countries. Second, [Manouana et al.](#) analyzed significant information gaps and potential research interests to increase knowledge of the distribution of arboviral diseases and their vectors through

African countries to improve strategies to successfully prevent, monitor, and control disease outbreak. Both manuscripts should be selected reads for any health professional seeking to understand the complexities of modern health systems when faced with such formidable challenges as diseases with epidemic threat.

Providing quality information for surveillance systems is far from being an easy task. The effectiveness of any system strongly depends on the quality and consistency of the sources that nourish them, as much as their processing ability and timeliness in which they produce actionable data. While facing vector-borne diseases, perhaps one of the most underrated tasks in surveillance is identifying and classifying species of medical relevance to know their geographical range and estimate vector–human interaction. This is a time-consuming and cumbersome activity that pays off by adding specificity to preventive and control measures and results in fewer environmental impacts and better outcomes.

Two contributions in our Research Topic assess this essential activity. First, [Tebo-Nzesseu et al.](#) studied the spatial distribution and ecology of leishmaniasis-transmitting sand flies. Their results underscore the importance of having updated vector profiles and environmental information datasets for identifying risks for the human population and alternative transmission cycles. Next, an innovative approach by [Loh et al.](#) demonstrated the feasibility of using bulk mosquito samples for analyzing DNA markers, which improves accuracy in the surveillance of relevant mosquito vector species. This method could provide information not only about the vector species but also about their reservoirs and parasites, opening multiple possibilities for understanding host–reservoir interactions in a cluster approach instead of a linear perspective.

In a final contribution focused on drug efficacy, [Vieira Santos et al.](#) analyzed the effect of artesunate–mefloquine combination therapy on survival in *Plasmodium berghei*-infected mice, using experimental statistical and modeling approaches. Their findings support the efficacy of the dual scheme versus monotherapy and propose the use of TTE analyses for malaria survival models as a tool for drug efficacy surveillance in a landscape where drug resistance is a latent threat to control efforts.

In conclusion, the Research Topic presented here highlights the need for prevention and control measures against vector-borne diseases to evolve in line with social, biological, and environmental

changes. In the current scenario and considering the trends, there must be a more significant effort to improve the speed with which innovations are adopted and thus, be able to obtain better results than those we have today.

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