How to Build a Data System for Urban Malaria Surveillance

Posted by Susannah Horton in Data Solutions

Vector borne communicable diseases such as malaria pose a significant public health threat in urban clusters. Sprawling cities have been identified as primary malaria transmission hubs. These problems are due to factors such as high population density, increased inward migration, and the creation of urban slums with restricted water supply and poor sanitation. Therefore, it is important to focus on urban clusters for disease surveillance.

On the positive side, urban centers, globally and in India, are creating enabling environments for technological advancement and improved availability of data relevant to the life cycle of vector borne diseases, especially malaria. However, existing malaria surveillance systems are not leveraging this readily available data and technical know-how.

Current city-level surveillance efforts remain handicapped by highly siloed reporting frameworks that do not provide real time information and solely source data from health-related reporting mechanisms. Including nonhealth indicators that impact malaria transmission is critical to accurately predicting, detecting, and treating outbreaks.

There is an opportunity to transform existing efforts by pooling the available data and constructing a model for malaria risk forecasting, prevention, and control. An integrated data system would not only equip city governments to more accurately control malaria outbreaks, but would also provide a framework for developing similar systems for other vector borne diseases.

Here are four steps to build such a system.

1. Capture comprehensive data.

Most urban malaria surveillance systems depend on the predictive and detection power of health indicators such as vector incidence, cases of resistance, and number of deaths. As a result, they ignore a plethora of nonhealth data that are critical to constructing an accurate surveillance system.

These key indicators include climate data on temperature, humidity, and precipitation, spatial data on construction sites and fresh and stagnant waterbodies, treatment data on changes in the stock of antimalarial medicine, and demographic data on population density, socioeconomic status, and measures of water and sanitation vulnerability.

The existing surveillance systems' failure to capture these data is not due to lack of availability or access. In fact, in most settings the data can be found through census databases or open-source platforms such as Google Earth and OpenStreetMap.

Additionally, traditional malaria surveillance efforts are focused on disease entomology rather than on tracking intervention initiatives. They tend to emphasize the vector aspect of malaria surveillance and leave out the transmission and intervention components. A fully integrated data system should include transmission related indicators such as intra- and inter-city travel, seasonal migration patterns, and health facility density and capacity. Intervention information such as household-level bed net and transmission blocker initiatives should also be captured.

In the context of building a model for sprawling cities in developing countries, it is imperative that data sources are disaggregated at the ward or zone level. Urban areas that are densely populated and characterized by inward migration become highly inequitable as they expand. Poor urban slums can quickly turn into high-risk zones for malaria outbreaks. Therefore, an ideal city-level surveillance system should have the capability to identify cases at a spatially disaggregated level.

Integrating a comprehensive set of indicators in a single surveillance system will enable the creation of a model that can provide geographically focused and socially informed disease risk forecasting.

2. Adapt to city priorities.

The primary end-user of a malaria surveillance system is the city government. Therefore, the system should be responsive to the city government's mandate.

On surveillance, the objective of a city government is to monitor and control disease outbreaks on a day-to-day basis. An integrated data system provides predictive power that the governing body can leverage for evidence-based resource management and disease control. For example, if the surveillance system provides early indication of an emerging outbreak, the government can proactively initiate interventions such as increased antimalarial drug availability and bed net distribution. Similarly, if the system reveals no indication of an upcoming outbreak the governing body can limit the investment of scarce resources in vector control and drugs when they are not required.

Additionally, city government health departments have a mandate that extends beyond malaria to more broadly control all communicable diseases. Therefore, creating a platform that can be adapted for other vector borne diseases is a useful pathway for garnering support from administrative stakeholders.

It is also important that the surveillance system complies with government reporting requirements. For example, India requires the private health care sector to report malaria information. Therefore, in the Indian context, it is important to ensure both private and public sector health care data are integrated into the model.

3. Model for sustainability.

To ensure sustainability, the malaria surveillance model should be designed to not only capture a comprehensive set of data but also to be used on an accessible, user-friendly platform.

Although technical complexity is important to the risk forecasting capabilities of the model, technical accessibility is primary to the system's long-term success. If the city governing body cannot easily utilize the platform, it will immediately become irrelevant.

The model should also be technically adaptable. Data ecosystems in expanding urban areas have the potential to be unpredictable and levels of data availability can change. For example, census indicators might change or access to publicly available data could become restricted. A sustainable modular system is one that can provide malaria risk forecasting with different levels of data availability.

4. Design for scalability.

The benefits of building an integrated data system for malaria surveillance extend beyond one city and beyond one disease. Although cities throughout the world differ, a disease surveillance system that: Is designed to capture a comprehensive set of data; has a technically flexible modular framework; is tightly integrated with open data and administrative reporting; and includes a front-end customized to existing administrative workflows has the potential for widespread use across city governments. Given that city governments tend to lack the technical sophistication to build such systems, providing this type of modular platform can help city (and national) governments move the needle on vector borne disease control, and by extension, SDG3 outcomes.

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Susannah Horton is interested in Technology for Development, Education and Impact Evaluations. She has experience in rural China and urban India and is currently pursuing her MA in international economics and development at the Johns Hopkins School of Advanced International Studies (SAIS), Washington, D.C.

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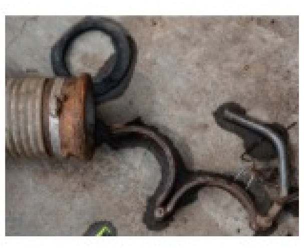

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