

Africa needs specialist capacity to tackle the spread of infectious diseases

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Dr Joseph Sempa of SACEMA presenting at the 2019 Clinic on Meaningful Modelling of Epidemiological Data. Credit: AIMS-South Africa

Over the past 10 years, a community of practice has begun to develop in Africa around research that uses models to understand and evaluate

population-level health problems and their potential solutions. This type of research—known as Applied Epidemiological Modelling—involves developing and applying analytical tools for problems that can't be addressed by traditional statistical methods. These tools are particularly useful for combating infectious diseases.

This kind of modelling is a complex, multidisciplinary field that has flourished over the past [15 to 20 years](#). But most work has been done by researchers based in Europe and North America—far away from the places where [infectious diseases](#) pose the biggest threat. This mismatch can lead to imbalances in the focus of research. For example, published papers may focus more on topics of academic interest or popular appeal than on pressing local [health](#) issues.

Models have enormous potential to improve how decisions are made about [public health](#) in African countries. For example, they have been used to address important questions such as [how to evaluate new vaccines](#) and [how climate change will affect disease vectors](#). Models can also incorporate economic costs and be used [to inform decisions about investing in public health](#).

The problem of capacity

Learning to address such questions is difficult. Students must develop a deep understanding of health issues as well as sophisticated [mathematical skills](#). They must also learn to communicate about their work to policy makers and the public.

Worldwide, the main approach to developing these skills follows the traditional model of postgraduate education. New researchers learn from long-term association with those who have done key work in the field before them.

There are two problems with this approach. First, it is a slow way to transfer skills, with each expert only able to supervise a few students at a time. Second, it is a very localised process: it builds expertise only where it can already be found.

Meanwhile, diseases such as [Ebola](#), [measles](#) and [yellow fever](#) continue to spread in areas of the world that lack the expertise to integrate models and data in a way that is useful to inform policy decisions. This means it is necessary to develop local capacity in these methods.

Making it work

The traditional approach to capacity development for mathematical modelling, including epidemiological modelling, involves bringing small groups of specialists from developed countries to teach short courses to groups of African students. These typically last for no more than a week and are usually one-off events, or are repeated with new groups of students.

That approach can be useful for imparting technical skills. But it's not enough to build local capacity. This is because technical skills are not embedded in a broader context of how to approach applied, interdisciplinary research—including working with collaborators trained in different disciplines and communicating results to policy makers.

On top of this, the short-term nature of the interactions means that mentoring and instructional skills development are not emphasised.

Alternative ways of working have been developed. For the past 10 years workshops run under the [International Clinics in Infectious Disease Dynamics](#) programme have helped develop capacity in Applied Epidemiological Modelling on the continent.

We have built workshops—referred to as Clinics—that are very hands-on. These are focused explicitly on communication and on contextualising models within public health questions. At the same time, they are aimed at developing key technical skills.

They also differ from typical workshops by integrating participants from around the world. But, importantly, all clinics have African faculty members who develop and present material. The aim is to make these workshops a true international endeavour, rather than a one-way transfer of knowledge.

Another emphasis has been on helping African participants build networks across geographic and disciplinary borders. Participants come from a wide range of backgrounds, including mathematics, statistics, public health, and epidemiology. And we have created a pipeline that allows some strong participants to eventually develop into workshop faculty.

The programme has two core components. These emphasise the use of data to inform the construction of clear and concise models appropriate to answer a given question.

Meaningful modelling: the annual [Clinic on Meaningful Modeling of Epidemiological Data](#) exposes participants to a diverse set of modelling approaches that allow them to engage with real-world questions about infectious [disease](#) dynamics. Participants learn to integrate mathematical models with epidemiological data.

The Clinic consists of two tracks. One targets quantitative scientists; the other, public health workers. In the second week participants collaborate on research projects, working in interdisciplinary groups. Six weeks after the clinic, they must submit group reports on their work. This gives them real-world experience working in international, interdisciplinary

teams to produce a research product.

Health researchers and population biologists: Another annual Clinic focuses on [Dynamic Approaches to Infectious Disease Data](#). It targets public health researchers and population biologists studying infectious diseases.

Instruction focuses on identification of infectious disease research questions that can be usefully addressed using mechanistic models and construction of models tailored to these questions. Participants develop written research proposals for their systems of interest. They also receive guidance to seek out the resources they need for carrying out their proposed research.

Faculty members are from many fields and at different career stages. This ensures that participants have someone to engage with about their current work or future plans; enhances programme sustainability; and builds local capacity in both training and research. And [innovative teaching and learning techniques developed for the Clinics](#) have even been adapted for [training students in other parts of the world](#).

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