



RESULTS FOR  
DEVELOPMENT



# Translating Modeled Evidence for Decision-Making

**Kenya Report**

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# Kenya

*Burgeoning modeling capacity in Kenya plays an increasing role in health policy decisions on topics as diverse as predicting the distribution of disease vectors and assessing novel climate change adaptation strategies. But global evidence suggests that decision-makers do not always take best advantage of modeled evidence when it is available.*

## In this report, we ask:



- What factors enable exchange between modelers and decision-makers?
- What forums exist for the translation of modeled evidence into practice and policy?
- How can we strengthen the modeling-to-decision-making ecosystem in Kenya?

*We conducted a desk review and interviewed five government officials and four modeling organization representatives to find out.*






## They said....

COVID-19 has generated new enthusiasm for modeling in Kenya and resulted in new mechanisms for enabling exchange with decision-makers.

### Enablers for Kenya's modeling success include:

-  High-level government leadership for modeling
-  History of investment in modeling capacity development

### Challenges that the ecosystem faces include:

-  Low decision-maker capacity to interpret and modeler capacity to communicate models
-  Lack of transparency on model data, methodology, and assumptions
-  Low availability of high-quality data on which to build models
-  Competing political interests in decision-making
-  Lack of coordination among external "parachute" modelers who provide conflicting evidence to the government

## What is next?

We recommend that funders, partners, modelers, and decision-makers in Kenya take steps to:

-  Invest in long-term modeling capacity development, including in the creation, communication, and interpretation of models by modelers and decision-makers.
-  Build on the successes and lessons of COVID-19 exchange mechanisms for modelers and decision-makers.
-  Create communities of practice to support knowledge sharing on modeling in Kenya.
-  Develop coordination mechanisms, led by the government where possible, to organize transparent discussion and debate of modeled evidence.

## Introduction

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Decision-makers in the health sector often face complex choices and trade-offs. Modeled evidence can be a valuable tool for helping to inform policy- and practice-level decisions, with 95% of surveyed modelers and decision-makers in one World Health Organization (WHO) survey agreeing that modeled evidence should be used to inform guidance for public health recommendations, particularly to determine the relative effectiveness and cost-effectiveness of various interventions (Norris et al., 2018). However, decision-makers do not always use modeled evidence for reasons that include a lack of policy-relevant models, the perception that models are too complex to understand or based on too many assumptions, and a lack of communication between decision-makers and modelers (Knight, G. M., 2016; Campbell et al., 2009; Innvær et al., 2002; Oliver et al., 2014). The inability to ensure that decisions are informed by the best available data can result in losses in efficiency, effectiveness, and impact, which affect the end users of the health system.

Research-to-decision-making partnerships that help to ensure decision-makers have access to the information they need for a decision process in a format that is accessible to them are thus critical to advancing the use of evidence in policy and practice decisions. Research-to-decision-making partnerships can take many different forms, including embedded policy units, networks, secondments, or staff exchanges. They can be facilitated by individuals, programs, or organizations that aim to increase interactions between the production and use of research evidence in policy and practice decisions.

Several studies in the literature on Kenya point to different models that have been developed to inform a range of issues including predicting changes in the distribution of disease vectors in Kilifi County on the Kenyan Coast (Le et al., 2019), estimating the cost-effectiveness of a scaled up integrated HIV, malaria and diarrhea prevention campaign (Kahn et al., 2012), estimating the distribution of tsetse flies (Moore & Messina, 2010), and assessing climate change adaptation strategies for small-scale farmers (Claessens et al., 2012). In each of these examples, however, the extent to which the models were developed for and used to inform policy- or practice-level decisions is unclear.

This rapid study aimed to describe the state of modeling for public health decision-making in Kenya. It explored programmatic decision-making and did not include an examination of cost-effectiveness modeling. We attempted to build a foundational understanding of the public health modeling ecosystem, with a focus on human immunodeficiency virus / acquired immunodeficiency syndrome (HIV/AIDS), malaria, and tuberculosis, separate from the exceptional circumstances created by the coronavirus (COVID-19) pandemic. Given that we conducted the study during the pandemic, however, respondents frequently mentioned it in the context of their modeling work. We therefore include modeling insights specific to COVID-19 as they were discussed.

Our study aimed to answer three key research questions:

1. What factors at various levels facilitate or inhibit exchange between decision-makers and modelers?
2. What challenges do partnership structures that support evidence translation face? What are they doing well? How are they learning? Where do they need support?
3. What recommendations can be drawn to inform changes to funding approaches, organizational structures and practices, or country and global policies to facilitate the use of modeled evidence in decision-making?

## Findings

The findings in this report are informed by desk research and eight key informant interviews (four decision-makers and four modelers). Three were female, and six were male. Four participants came from major organizations that do modeling in Kenya and several other African countries. Five participants were from departments of the national Ministry of Health (MOH) working on malaria, HIV/AIDS, and tuberculosis. The remainder worked on cross-cutting activities that spanned the health system, such as monitoring and evaluation.

## NOTES ON METHODOLOGY

**Study Coordinator:** Results for Development Institute (R4D)

**Primary Researcher:** Peter Muriuki (independent consultant)

**Funder:** Bill & Melinda Gates Foundation

**Period:** November 2021-January 2022

**Desk Review:** Gray literature, government documents, and peer reviewed publications

**Key Informants:** 9 individuals in government or partner organizations working in malaria, HIV/AIDS, tuberculosis, or in health system-spanning roles

**Sampling:** Key informants were purposively sampled based on a mapping of key actors in the modeling space in Kenya and suggestions from the Foundation, other interviewees, and the Ministry of Health

**Interviews:** 45-70 minutes, conducted and recorded on Zoom with a semi-structured qualitative interview guide

**Analysis:** Transcripts were coded based on theme and content

*See Annex for more detail*

In this section, we summarize key findings about the use of modeled evidence in public health decision-making in Kenya, with a focus on the mechanisms that enable exchange between the producers and users of modeled evidence and factors that inhibit this exchange.

**Table 1: Type and number of interviews conducted**

Stakeholder Category	Position/Department
Ministry of Health, 001	Monitoring & Evaluation Division
Ministry of Health, 002	National AIDS & Sexually Transmitted Infection (STI) Control Programme
Ministry of Health, 003	Information Manager
Ministry of Health, 004	National Tuberculosis, Leprosy and Lung Disease Programme
Ministry of Health, 005 (incomplete)	Division of the National Malaria Programme
Modeling organization 1	Principle Investigator/Chief Executive Officer
Modeling organization 2	Technical Director
Modeling organization 3	Program Director
Modeling organization 4	Post-Doctoral Scientist

## Landscape of public health modeling and decision-making in Kenya

### Mapping key stakeholders in evidence-to-policy decisions

#### Producers of modeled evidence

Kenyan universities are among the most prominent developers of mathematical models that are designed to inform public health decision-making. They include institutions such as the Center for Epidemiological Modeling and Analysis (CEMA), an affiliate of the University of Nairobi, Strathmore University, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Moi University, and Dedan Kimathi University.

Research institutes such as the Kenya Medical Research Institute (KEMRI), a state corporation with 14 centers across the country that serves as the national medical research arm of the Kenyan Government, also develop models to inform public health decision-making. The KEMRI-Wellcome Trust Research Programme (KWTRP) – a partnership among KEMRI, Oxford University, and the Wellcome Trust – is embedded in one of the centers and is a core partner in the country’s disease modeling efforts. KWTRP has three hubs located in Kilifi, Nairobi, and Eastern Uganda. The Kilifi site is the main hub, while the Nairobi program is strategically located to facilitate close policy engagement interactions with the Ministries of Health and Education.

Other research partners with modeling capacity include the United States Centers for Disease Control and Prevention (CDC) and Qhala – a private organization focused on data and digital solutions. Many of Kenya’s academic institutions and research partners have a history of collaborating with universities outside of Kenya, such as Imperial College in the United Kingdom and the University of Washington in the United States. Prior to the ongoing COVID-19 pandemic, they engaged primarily in developing models to inform other health priorities, such as rabies, neglected tropical diseases, malaria, influenza, tuberculosis, and HIV/AIDS. As COVID-19 rapidly spread across the globe, academic and research partners with the capacity to develop models turned their focus and efforts to producing data to inform the government’s response to a virus

about which little was known, and for which actionable evidence to guide decisions about school closures, lockdowns, and other measures was critically needed.

Finally, several regional initiatives including the East African Integrated Disease Surveillance Network (EADSNet), the Network on Health and Equity in East and Southern Africa (EQUINET), the East Central and Southern Africa (ECSA) community, and the WHO Regional Office for Africa support modeling activities that help to inform public decision-making in the region.

## **Users of modeled evidence**

Modeled evidence is used to inform decision-making in several government ministries and departments in Kenya, including the Ministry of Health, Ministry of Education, the presidency, and departments of health in the county governments.

The value of modeling in decision-making – offering a way to better understand a problem and identify solutions for addressing it, was elevated by urgent COVID-19 decision-making needs. Many of the policy decisions taken by the Government of Kenya to inform prevention, control, and management of COVID-19 cases, including whether to impose lockdowns and curfews and ban international travel, were informed by models. Even though our interviews were not focused on COVID-19 modeling, nearly all informants noted how modeling for COVID-19 has encouraged greater acceptance of modeled evidence more generally.

Prior to the spread of COVID-19, research and academic partners developed mathematical models to address specific health issues, such as the eradication of rabies. They worked jointly with the MOH to support policy formation and health regulation and established close working relationships by aligning their research agenda with the Ministry’s annual work plan and pursuing joint applications for research grants. In other instances, the MOH invited collaboration from research partners to address a specific evidence need. During the pandemic, there was a proliferation of models developed without the involvement of the MOH, resulting in conflicting evidence that impeded effective decision-making.

*“There were a lot of what we refer to as “parachute modelers” who landed. Because they are often partners that work with the MOH, so they would go to different influence points and so some big [modeling] consultancy groups would go to the Minister, another big consultancy group would go to the PS [Permanent Secretary], another to one of the directors. This was kind of scattering decision-making by feeding many different places and essentially they were offering, like, free services for only a short period of time and obviously they would turn that into a business.” -- Modeling organization representative*

The Government of Kenya formed the National COVID-19 Task Force to ensure a coordinated response to the pandemic. Within the task force, the Kenya COVID-19 modeling review team brings together key stakeholders, including the MOH, the WHO country office, the US CDC, CEMA at the University of Nairobi, Jomo Kenyatta University of Agriculture and Technology, KEMRI-Wellcome Trust and Qhala, to review and reach consensus on the best available evidence for health decision-making during the pandemic. The task force brings members together in face-to-face and virtual meetings that were convened weekly at the height of the pandemic, and now monthly, to jointly develop policy briefs and craft advisories for the government.

There are many other users of modeled evidence outside of the health sector in Kenya. For instance, the Ministry of Education approached the National COVID-19 Task Force seeking guidance on different school reopening scenarios. The Task Force developed models to explore

the risks associated with different strategies, such as re-opening schools with 50% of student populations, re-opening with only senior students reporting first, and different levels of students attending school on alternative days of the week. Modeling outputs have also been presented to civil society and religious organizations through the Interfaith Council, established by the government to guide the resumption of public worship during COVID-19, and they have been shared with the public through visualizations on websites.

*“We also take in data like hospitalizations and vaccination that comes from government. We also extract data from other sources that are not necessarily government, like population data, catchment areas...I would say mobility data that comes from Google or Facebook. That is the kind of information we ingest. Then we use that information to understand or predict the near and the longer future...We feed back to two places - the government through the Ministry of Health but also feed back to the public through a website. So, for the general public, we feed them with visualizations and for the MOH we give them actual figures and what might happen in the event we do A or B. We give advisories to government in [the] form of policy briefs and also meetings to discuss with them the different things about COVID.” -- Modeling organization representative*

## Translators of modeled evidence

Some of the research organizations described by study informants have departments dedicated to engaging decision-makers with evidence with the intention of influencing policy.

*“When you talk about policy translation, most of our work ends up in publications. They end up in public domain through [other] publications. Some of our research work that ends up at the policy level and the management has aimed to make sure that we do policy briefs for the Ministry whenever possible...we also have stakeholder workshops that we do to disseminate the final findings, including [to] the patients who participated in the various studies.” -- Modeling organization representative*

*“We have a very strong department of knowledge translation and these people are very aggressive even in social media...We have a department that is helping us known as Knowledge Translation Department. If you talk to them, they will tell you how they are doing it, they are experts in knowledge translation...so once you do research, you can engage the department and they can help you to formulate your research into policy and*

## FROM EVIDENCE TO POLICY – SOME DEFINITIONS

**Translation or knowledge translation** describes the process of making evidence more accessible for decision-making – packaging and presenting it in formats that are accessible and easy to understand.

We use **knowledge broker** to describe an organization that facilitates exchange and interaction between users and producers of evidence to increase knowledge and inform policy and practice-level decisions. Knowledge brokers are typically embedded in research institutions (Cvitanovic, C., 2018).

A **boundary organization** similarly facilitates exchange between decision-makers and research and academic partners, but it is typically positioned as a separate entity focused on building relationships between the two groups (Cvitanovic, C., 2018).

*they have been trained also in making it easy to adopt it.” -- Modeling organization representative*

One informant emphasized the importance of engaging with Ministry partners early in the design of models, to build buy-in and awareness. The importance of building relationships and trusted partnerships with decision-makers to increase the likelihood that findings will be used in decision processes was also cited.

*“The other one is to involve the protocol development from the beginning. Anytime you come up with a project, make sure that the Ministry people are in the protocol, they are aware what you are trying to do from the beginning... You know, to become a friend of the government teams. Volunteer to participate in the technical working groups and make sure that they know you, they can trust you, you built that rapport... you can’t just come from somewhere and push the government to adopt... so you have to learn that kind of skill... how to go around.” -- Modeling organization representative*

*“So, the only time that your research findings can end up with the decision-makers, you must deliberately engage the Ministry from the beginning, you set up stakeholders’ meeting, you develop a policy brief, so I can tell you that it is not a walk in the park.” -- Modeling organization representative*

Our findings suggest that efforts to ensure modeled evidence is relevant and accessible to decision-makers tend to be embedded in organizations that conduct modeling, aligning with the definition of a knowledge broker. While these organizations are established primarily as research partners to support the production of evidence, they also have a function aimed at ensuring the evidence they produce is relevant, timely, and appropriate for decision-making. Examples of these organizations include CEMA, KEMRI, KEMRI-Wellcome Trust, Amref Health Africa, and the Clinton Health Access Initiative (CHAI). Each of these organizations develops various mathematical models and engages decision-makers with evidence.

## **Funders of modeled activities**

The main funders of modeling activities in Kenya include the Bill & Melinda Gates Foundation (BMGF), National Institute for Health Research (NIHR), Norwegian Fund, Foreign Commonwealth Development Office (FCDO), Global Fund, Government of the Netherlands, United States Agency for International Development (USAID), and the European Union. The Kenyan government funds KEMRI and the country’s public universities but does not offer funding for modeling to private sector organizations or private universities.



**Figure 1: A representation of different actors in the modeling landscape in Kenya**

Main Funders	Main Modeling Organizations	Main Decision-Makers
<ul style="list-style-type: none"> <li>• Bill &amp; Melinda Gates Foundation</li> <li>• European Union</li> <li>• Foreign, Commonwealth &amp; Development Office</li> <li>• United States Agency for International Development</li> <li>• National Institute for Health Research, UK</li> <li>• Government of Netherlands</li> </ul>	<ul style="list-style-type: none"> <li>• Center for Epidemiological Modeling &amp; Analysis based at the University of Nairobi</li> <li>• KEMRI-Wellcome Trust</li> <li>• Strathmore University</li> <li>• Jomo Kenyatta University of Agriculture &amp; Technology</li> <li>• Moi University</li> <li>• Qhala</li> </ul>	<ul style="list-style-type: none"> <li>• The Ministry of Health, with the support of:               <ul style="list-style-type: none"> <li>• Taskforces</li> <li>• Technical Working Groups</li> <li>• Other formal research partnerships</li> </ul> </li> <li>• The Ministry of Education</li> <li>• The Presidency</li> </ul>

## Mechanisms that enable exchange between modelers and decision-makers

### Specialized committees

Specialized committees include taskforces, technical working groups, committees of experts, and research sub-committees that draw their membership from various stakeholders, including the Ministry of Health, research institutes, and the private sector. Each of these mechanisms is described briefly below.

Ministry of Health task forces, like the National COVID-19 Task Force and its COVID-19 modeling review team, are specially organized around a specific task – in this case producing, reviewing, and synthesizing data to inform the government’s response to the pandemic. The COVID-19 modeling team draws its membership from the Ministry of Health (conveners), WHO country office, US CDC, organizations that produce modeled evidence such as CEMA at the University of Nairobi, Jomo Kenyatta University of Agriculture and Technology, KEMRI-Wellcome Trust, and private sector organizations. CEMA serves as the Secretariat for the team.

Technical working groups also facilitate the exchange of information between the producers of modeled evidence, researchers, and decision-makers. Technical working groups are a commonly used mechanism in the Ministry of Health for gathering research or other data inputs to inform a particular health issue, such as the working group formed by the Ministry of Health to examine costing for malaria patients enrolled in the National Hospital Insurance Fund (NHIF), as mentioned by a representative of a modeling organization.

*“Another time, I was involved in the costing...like looking at the net sizes, mosquito nets, so we were busy with the technical group meeting and saying this is the type of net which is supposed to be used because of A, B, D is cheaper” -- Modeling organization representative*

Departments within the MOH can also form research sub-committees or committees of experts to guide the design and conduct of research studies, usually specific to a particular health issue. For instance, within the National AIDS and STI Control Program (NAS COP), there are research committees that evaluate the data that is used to inform decision-making. And in the HIV/AIDS program department, there are three committees of experts, one on HIV/AIDS prevention, one on HIV treatment, and a third on strategic information on HIV.

*“We need first look at the research, look at the quality for the work that was done because not everything that is published is correct. We have research sub-committees that have to sit down and weigh the data that we utilize for decision-making...[we have three] committees of experts on prevention of HIV, treatment of HIV, and strategic information on HIV.” -- Ministry of Health official*

### **Partnerships to facilitate joint production of evidence**

The MOH can establish formal partnerships as needed with organizations that develop models to jointly explore key research questions, as explained below by an official from the MOH.

*“In other cases where maybe we want to do some specific things to do with data, we partner with organizations and then we work towards some objectives. For example, if we want to create some reports, or something, we work with a partner or an organization to do that as a team. We will have, like, a working team, and you will have these meetings where we have the task, then we discuss how to do it. For example, with [a modeling organization] team, we were working on some reports on the effect of COVID on essential services and they were kind of mapping these charts, maps and trends and basically visualizations of those.” -- Ministry of Health official*

### **Learning from mechanisms that enable the exchange of modeled evidence**

There are no systematic efforts to document lessons about engagement mechanisms that promote the use modeled evidence in Kenya. Further, modeling activities appear to be siloed – for example, malaria modelers have limited engagement with modelers working on other health issues. A representative from an organization that develops models noted how, even before COVID-19, modeling groups were modeling for their own specific health concerns with no engagement or collaboration with other modelers.

*“In that context, what I think is critical here is that we had developed these skills for different things. So, like, my team had developed the skills of modeling while modeling rabies – a neglected tropical disease. The team at Kilifi had been using that for another influenza virus. The team at Strathmore had developed their work around HIV. So, what happened was that there had been modeling capacity built for other things that when the pandemic came, we were able to redirect our efforts to this new thing.” -- Modeling organization representative*

Although the use of modeled data in Kenya has not fully evolved, there is a general and growing recognition of the value of using modeled evidence to inform health decisions.

*“Yeah, I (unclear), we know that we have COVID, as we’ve learned lessons from COVID-19. I think now people are more aware of the need for modeling and it has also sort of piqued interest in people, especially scientists, to work with different programs so that they*

can use that modeled data to better prepare for different scenarios in management of different cases.” -- Ministry of Health official

*“I feel like the push is not even from outside. Even from our own, and I am Kenyan and so I can speak as a Kenyan. We have been very fortunate with our current technical people within the MOH because there has been a hunger for data and insights from data that we possibly have not seen before and maybe that is an offshoot benefit of the pandemic, because no one really knew how to deal with it. We are now engaging with the MOH in a stronger way. So, for instance, out of COVID we have drawn an agreement between the university...that the university can use its resources of academicians and intellectuals to influence the way we analyze the new data to understand the best policy decisions.” -- Modeling organization representative*

*“No [I am not aware of any campaign to promote the use of data for decision-making], But I know that data demand and use is a key priority.” -- Ministry of Health official*

*“I think everybody has been doing that. It is actually the cliché, the “in” thing, there is nothing you can do without the use of data. So, when you are doing interventions like Global Fund applications, any whatever, they ask you, ‘So, what does the data say based on...’. They will look at the application of the Global Fund, it was about the epidemiological country context in that regard. So, use of data is key, but the problem is at the lower level there is very little evidence to show that data is being used to make decisions.” -- Ministry of Health official*

## **Facilitators and inhibitors of exchange between modelers and decision-makers**

### **Factors that facilitate exchange**

The most significant enabling condition for interaction and exchange between modelers and decision-makers in Kenya are the formal structures and processes led by the Ministry of Health and their direct linkages to high levels of decision-making at both the political and technical levels of the government. These structures include taskforces, technical working groups, research sub-committees, and committees of experts, as described earlier.

*“We have appointments within the Ministry’s taskforce. So, the people to feedback information to are the people who draft advisories that can be considered by the President and his office. So, we are in direct connection with the MOH at the directorate level. We also sit sometimes with the Cabinet Secretary of Health and team, and he also calls and asks for a meeting, and we meet with other ministry directors, and we have access to the Permanent Secretary as well. Sometimes, they want to know what is happening and so we get to speak. So, basically we have a link with the political arm of decision-making and also the technical arm of decision-making through the Ministry.” -- Modeling organization representative*

One informant described the MOH’s leadership in convening and facilitating different engagement and partnership mechanisms as being a key factor of their success. The Ministry uses these mechanisms to invite collaboration from experts in different fields to achieve public health objectives. The diversity in membership and the Ministry’s oversight role help to prevent sectarian interests from controlling the research agenda and adversely influencing health policy and practice decisions.

*“So, that was a bit confusing at the beginning and I think maybe the way we were able to overcome that was to have this convening power to bring people together, so that if there was a big consultancy group from wherever that had done some modeling work for Kenya, we would subject that into discussion within the modeling committee.” -- Modeling organization representative*

Modeling expertise and capacity in Kenya also facilitates the exchange of information between modelers and decision-makers.

*“So, currently, the work that am assigned to do there is called health economics. Though, at a personal level, I am a modeler, I am trained also in mathematical and statistical modeling, and now am also with econometric modeling....and so now I also do health system modeling.” -- Modeling organization representative*

In the context of recent COVID-19 modeling activities, a culture of transparency and data sharing between modelers and users of modeled evidence has helped to facilitate partnerships and the exchange of information. When modelers share their codes along with the reasoning and assumptions behind the models, it builds trust and increases the likelihood that decision-makers will use the evidence that is produced to make informed decisions.

*“There is a nice way of addressing transparency now, practically; we address most of the black box issue through these presentations. Initially, we were doing them twice a week – Mondays and Wednesdays. As we got better with it, we now meet on Mondays. The meetings are helpful because we can interrogate each model properly. That is one way – that kind of forum where there is proper discussion in detail.” -- Modeling organization representative*

*“The second one is... a lot of modeling work that was happening was happening with open-source software, which meant not much of a black box and therefore codes could be shared across teams. And a lot of codes are made available, and you can actually go in and see what people did and that has in a great way improved transparency.” -- Modeling organization representative*

Another recent factor that has facilitated the sharing of modeled evidence is the availability of the pre-print facility that enables modelers to rapidly share findings in pre-print journals without having to wait for publication in academic journals, which can take a long time.

*“The third thing, which is a good result of COVID-19, [is] that there was a lot of pre-print work. So, now when we do our work, we don’t have to wait for journals to keep hiding it until the day they publish it...go ahead and make the results available immediately and keep improving them over time.” -- Modeling organization representative*

Funding from external partners has been critical in helping to build capacity for producing and using modeled evidence. While there were prior modeling activities and an existing level of capacity in the country, the pandemic brought additional funding for COVID-19-specific modeling. A representative from an organization that develops models noted that the modeling work they were doing during the pandemic came to the attention of BMGF and resulted in additional funding to sustain and expand activities.

*“Yeah, I think the case of COVID-19 for us here, funding found us along the way. We did not start with funding from Gates Foundation, in fact Gates Foundation saw we were doing this and knew that we were an additional boost [resource].” -- Modeling organization representative*

## **Factors that inhibit exchange**

The lack of quality data inputs and the complexity of mathematical models and the results they generate can be hard for decision-makers to understand and translate to the specific issues they are addressing. This can challenge researcher-decision-maker engagement and relationship building efforts.

*“So one of the toughest things we faced was...you know we present to them results and uptake sometimes is very low because of the complexity of the results and, number two, the challenge is that the policy makers do not understand the complexity of what you have done...they would like you to put that thing in a very lay language and many times, [if] you do that, you also lose the gist of what you have done” -- Modeling organization representative*

*“Ah, that data, yes, that data exists, poorly labelled. There is no dictionary in some of these data sets, the answers to some of the questions, like, for example, if we are using reporting tools, the reporting tools could be saying people are answering the questions in two different ways and that also affects the...and we also have to do a lot of, ‘What do they mean by this? What do they mean by that?’ and following up. So, the data that you are working with and [it] not being great is a reality.” -- Modeling organization representative*

*“The other alternative is to model the data, but you see now if you model data based on what you have, if you start with nothing, if you start with very poor-quality data then your models will be as bad as the data you have, because for mortality data we only register like 40% of the deaths that occur. So, there is that gap.” -- Ministry of Health official*

The timeliness of the underlying data is also key, as it informs the timeliness of modeled outputs and the ability of decision-makers to access the information they need for a decision.

*“So, if...the modeled data is availed on time, then it would enable...a better response.” -- Ministry of Health official*

Limited capacity among decision-makers to make sense of modeled evidence and limited awareness of the value of modeling also limit exchange.

*“So, we have a good understanding of the challenges in terms of ability to understand data, for most of them (Ministry staff)...We know we bring down whatever we need to...to that level...and we know, okay, this is not for this level, so we reduce it. And we are extremely focused on what is the decision we want them to do...So, will not show you a model saying, ‘Oh, this is the model,’ unless we are sure that you are able to ...understand...”. -- Modeling organization representative*

*“So, just ensuring that we continue to capacity build to understand our data, so that when you are documenting right from the source and you are able to consume that data.” -- Ministry of Health official*

Competing interests limit the time and attention decision-makers can dedicate to engaging with modeled evidence.

*“And, thirdly, is that there are so many competing interests within the Ministry.” -- Modeling organization representative*

There is limited funding to sustain regular development of models. Informants contrasted the funding landscape in Kenya, which they described as being less predictable, to Europe, where they understand funding for modeling to be well-established.

*“If we take an example of the UK, you can count major groups that are funded for long-term to deal with modeling and modeling questions, for instance, the London School. And you can see when the epidemic/pandemic started, they were able to put 100 researchers in this thing.” -- Modeling organization representative*

*“The first question you asked me was how many people are working on this. I only have eight people and they are working part time because there are other duties that they have. The kind of long-term funding that organizations out there enjoy, like the London School, the Imperial College, is what enables them to also constantly be able to influence policy. I think that is a major shift. If you are funded based on a small project, then we don't grow enough capacity like what you have heard now.” -- Modeling organization representative*

When modelers refuse to share information about how they develop their models and the underlying assumptions, it creates what one informant referred to as a “black box” issue. The absence of transparency limits decision-makers’ ability to engage with models and accept their outputs.

*“I think the biggest challenge has been the ‘black box’ issue. For groups that we work with that are open to sharing their code and reasoning behind the model structures up to the point about what assumptions they have made...that kind of transparency is great. I think the challenge has been when you have other modeling groups that are not being transparent, and they are feeding information straight to the policy makers in the absence of that transparency or critical review. Then you can end up with conflicting messages and you cannot tell when, where the problem is coming in, because it is a black box. That has been the main challenge, particularly at the start of the pandemic, before we were able to bring most of the groups together.” -- Modeling organization representative*

The proliferation of modelers from outside the country who are competing to get their modeled outputs with conflicting messages in front of Ministry staff (who a previously mentioned participant called “parachute modelers”) causes confusion that also challenges decision-maker engagement.

**Table 2: Summary of factors that enable and inhibit exchange between modelers and decision-makers in Kenya**

Enablers & Inhibitors of Exchange	Present Among Modeling Organizations	Present Among Decision-Makers
Individual & Interpersonal Factors	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Modeling experience and capacity</li> </ul> <p><b>Inhibitors:</b></p> <ul style="list-style-type: none"> <li>Lack of training/capacity to communicate with non-scientific audiences</li> <li>Lack of transparency from modelers on model codes, assumptions and data used to develop the models</li> </ul>	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Decision-makers with modeling experience or knowledge</li> </ul> <p><b>Inhibitors:</b></p> <ul style="list-style-type: none"> <li>Lack of training/capacity to understand models</li> </ul>
Organizational & Inter-Organizational Factors	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Departments dedicated to communicating models to different decision-making audiences</li> <li>Presence of direct lines of communication between modelers and high-level decision-makers</li> <li>Informal agreements between modeling organizations to share data and make the modeling process transparent during COVID-19</li> </ul>	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Presence of direct lines of communication between modelers and high-level decision-makers</li> </ul> <p><b>Inhibitors:</b></p> <ul style="list-style-type: none"> <li>Lack of dedicated or targeted strategies for engaging in knowledge translation</li> </ul>
Environmental Factors	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Several fields, including HIV/AIDS, malaria and neglected tropical diseases have a history of working with models and have built modeling capacity over time</li> <li>Availability of funding from donors to develop models</li> <li>Pre-print facilities allow for greater and more efficient transparency and model sharing</li> </ul>	<p><b>Enablers:</b></p> <ul style="list-style-type: none"> <li>Presence of a crisis (COVID-19) driving demand for models to compensate for lack of empirical evidence</li> <li>Taskforces convened by the MOH benefit from input of various health sector stakeholders</li> <li>Research sub-committees that provide technical assistance in design and conduct of research for health issues</li> </ul>

	<p><b>Inhibitors:</b></p> <ul style="list-style-type: none"> <li>• Lack of donor support for long-term modeling capacity development</li> <li>• Lack of high-quality data to inform models</li> </ul>	<ul style="list-style-type: none"> <li>• Technical working groups that advise the Ministry of Health in particular health programs</li> <li>• Committees of experts that provide technical guidance on addressing specific health concerns</li> </ul> <p><b>Inhibitors:</b></p> <ul style="list-style-type: none"> <li>• Lack of government funding to develop models</li> <li>• Competing interests within the MOH and from other stakeholders e.g., business interests</li> <li>• Proliferation of foreign “parachute” modelers who provide conflicting and confusing information to the government</li> </ul>
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## Emerging Observations

### Capacity development is needed to strengthen the production of modeled evidence

Several informants pointed to a need for capacity strengthening support on two levels. First, to strengthen the capacity of organizations and research partners that develop models and, second, to strengthen the capacity of decision-makers to understand and appreciate the value of modeled data in decision-making.

*“I think, to be fair, there is almost no kind of organized capacity building within our region.”  
-- Modeling organization representative*

*No [I have not been offered academic or professional training in statistical modeling]. I know there is a [virtual Institute for Health Metrics and Evaluation] training that people usually undertake for modeling, which is really good, so if you have an offer for us to be trained, why not?” -- Ministry of Health official*

### Capacity strengthening for modeling requires long-term funding

Long-term institutional funding is critical to ensuring the availability of timely and relevant evidence for MOH decision-making.

*“I think anyone interested in making a significant change in this sector will need to make big investments around capacity building, not in a hit-and-run way, but in a sustained, deliberate way. So that there is genuine capacity building at [the] local level...I think the big difference between productivity in our continent and productivity on the other side is a time issue like how long has there been deliberate funding and investment in this area, and it is also a current capacity issue like how many people can I make available to deal*



*with a question on a malaria outbreak right now? The funding ought to think long term in an infrastructural, structural way and build sustainable capacity to respond to outbreaks and endemic diseases in the continent.” -- Modeling organization representative*

## **Quality data are necessary inputs for models**

Models based on low-quality data produce inaccurate results that result in poor decision-making.

*“Just good data, good analytical skills of people or platforms. Nowadays I do not think we need so many people to analyze [non-modeled data]. We can automate a lot of analysis. So sometimes just automating these analyses would be important. And, of course, starting with good quality data. Because if the data is bogus, no matter how many acrobatics you do with the data, and if people know the quality is bad, even if you present very nice charts and they know the quality of the source is bogus, they will not accept it.” -- Ministry of Health official*

*“Have the right data. Ensure your tool has been tested, able to give you correct results, because we share data globally, across various countries. You have to ensure that your model is watertight.” -- Ministry of Health official*

## **Accessible and clear communication facilitates the use of modeled evidence**

To increase the likelihood that modeled evidence is used in public health decision-making, decision-makers need to understand the value of using evidence, where to find it, and how to use it. KEMRI-Wellcome Trust has a policy translation unit that is solely dedicated to ensuring that modeled evidence is translated in forms that can be easily consumed by decision-makers, such as policy briefs and health advisories.

Organizations like CEMA convene both physical and virtual meetings with decision-makers to present results of models and their implications for policy and other health decisions in easy-to-understand formats. CEMA also develops policy briefs and shares modeled evidence using website visualization dashboards. CHAI presents simplified messages from their statistical models depending on the cadre of staff they are engaging to ensure that even lower cadres of health care staff understand the models and the implications for practice and decision-making.

*“Our recipients of our information are varied and, when you are looking at governments, there are people who are comfortable with advanced analytics. If you are talking to people at KNBS [Kenya National Bureau of Statistics], they are comfortable with anything we are able to do and probably even have higher skills in some areas compared to us. However, when you come to MOH, at the top level you might have people who are comfortable with advanced analytics, but when you go lower, you keep losing people. The analytics we are talking about is dependent on the level.” -- Modeling organization representative*

## **Recommendations**

This study aimed to better understand the research-to-policy engagement mechanisms that are used in Kenya to promote the use of modeled evidence in public decision-making. We offer the following recommendations for consideration to strengthen the policy impact of modeled evidence.

## Decision-Makers

1. Build on the momentum of COVID-19 modeling activities and carry lessons learned to other disease areas such as HIV/AIDS, tuberculosis, and malaria. Work with academic and research partners to reflect on the engagement mechanisms that work well, those that are not effective, and changes to make going forward. Identify the capacity support needed to help Ministry staff develop and interpret models.
2. Consider a community of practice in the Ministry to support staff learning and exchange on the use of modeled evidence.

## Funders

3. Explore a coordination mechanism to avoid duplication of efforts, ensure models are aligned with government priorities, and reduce competition for the limited attention of decision-makers.
4. Focus funding for modeling on long-term capacity strengthening and institution building.
  - a. Consider funding for building mathematical modeling training centers/programs in country that could be affiliated with the academic institutions that are prominent in country.
  - b. Consider funding [innovative capacity strengthening programs](#) such as twinning arrangements designed to develop the capacity of modelers and decision-makers, and support collaboration and co-creation in modeling to align with decision-maker priorities.
5. Invest in the partnership building or knowledge translation aspects of organizations that develop models.
  - a. Consider flexible / core support for the relationship building aspects of policy translation or flexible budget lines that can be used to support modeling activities as policy windows open.

## Organizations that do Modeling

6. Draw on lessons from existing mechanisms like the COVID-19 Task Force and its model review team to build a plan for evaluative learning aimed at better understanding which engagement practices – for example, dissemination and communication strategies, capacity strengthening activities, or collaborative research efforts – are most effective in promoting the use of modeled outputs in decision-making.
7. Consider a community of practice for public health modelers to support learning and exchange on how to engage with decision-makers in defining research questions and iterate on the development of models or how to communicate modeled outputs.
8. Consider implementing a training program for Ministry staff to help them better understand modeled outputs.

## Conclusion

Our findings suggest a modeling ecosystem in Kenya that is developing. Key actors in the ecosystem include academic institutions and research organizations that produce models for addressing HIV/AIDS, rabies, tuberculosis, malaria, and other infectious diseases. Experts from these institutions helped to inform the government's response to COVID-19. In doing so, they drew on modeling capacity and skills developed previously to inform policy- and practice-level decisions in other infectious disease areas.

Engagement mechanisms such as taskforces, technical working groups, formal partnerships, research sub-committees and committees of experts facilitate the exchange of information between modelers and decision-makers working to address public health concerns in Kenya. Several factors contribute to the success of these mechanisms, including the Ministry of Health's leadership, oversight, and consensus building approach that helps to ensure policies are not driven by sectarian interests. Because approaches to modeling, data inputs, and underlying assumptions can vary, ministry-led mechanisms such as the National Task Force for COVID-19 help to ensure that modeled outputs are reviewed, appraised, agreed on, and presented clearly to decision-makers. In the absence of these mechanisms, academic and research partners developing models in Kenya would face challenges in navigating the policy process, including identifying spaces for dialogue and reaching agreement on how to package and communicate outputs. The most common tool used by academic and research partners to ensure modeled outputs are accessible and easy-to-understand for decision processes is a policy brief or advisory.

Funding for modeling in Kenya is project-specific and primarily comes from external partners. The funding does not support long-term capacity strengthening aimed at the individual, organizational, or institutional levels of the modeling ecosystem. While the Kenyan government funds KEMRI and the country's public universities, whether any of these resources are used for modeling activities is unclear. Going forward, the government may wish to explore how to embed partnerships like KEMRI-Wellcome Trust in other institutions to expand and strengthen modeling capacity for public health decision-making.

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## Annex: Detailed Study Methodology

### Study setting and period

This study was implemented in Kenya by a local consultant for Results for Development Institute with funding from the Bill & Melinda Gates Foundation. An initial landscaping of the modeling to decision-making ecosystem in Kenya was conducted through a desk review by R4D staff of gray literature, government documents, and peer reviewed publications in the summer of 2021. Key informant interviews were conducted from November 21 – December 15, 2021. Data analysis and report writing took place from December 15, 2021 to January 31, 2022. This research was part of a larger study coordinated by R4D across Burkina Faso, India, Kenya, Nigeria, and South Africa.

### Study design and sampling

The study used qualitative key informant interviews (KIIs) to gather insights about the modeling to policy ecosystem in Kenya. Altogether, nine key informant interviews out of the planned ten were conducted. Based on the findings of the initial landscaping analysis on the areas where modeling was active in Kenya, the key informant interviews were focused on individuals working in the malaria, HIV/AIDS, or tuberculosis space.

Key informants were purposively sampled, beginning with the identification of relevant individuals through R4D's desk review and the consultant's mapping of people who work with models in the Ministry of Health and organizations that do modeling. The consultant also drew on suggestions made by representatives of the Bill & Melinda Gates Foundation, snowballing (we asked respondents if there were other key informants they felt would be appropriate to interview), and consultations with leadership at the Kenya Ministry of Health.

The interviews were conducted virtually via Zoom using a pre-developed semi-structured interview guide. The interviews lasted 50 minutes on average, ranging from 45 to 70 minutes.

## **Data management**

Qualitative interviews were recorded via the Zoom recording feature and transcribed verbatim. For quality assurance, an R4D member staff from the study team read a sample of the transcripts and compared them to the audio recordings to ensure that they were accurately transcribed.

Audio recordings were labelled, transferred to a secure laptop, shared with R4D study team members and subsequently deleted from the Zoom storage. Reflective interview notes were used to enhance the transcripts. Transcripts were anonymized by deleting any reference to actual persons to safeguard the confidentiality of the participants.

## **Data analysis**

To address reliability and validity, the consultant leading the research in Kenya and an R4D study team member read the first transcript, coded it separately into NVivo Version 12, and proceeded to identify codes, categories, and themes arising from the study. The two then compared the codes, categories, and themes and harmonized them. Both thematic and content analysis were employed across all transcripts (Braun & Clarke, 2006; Vaismoradi et al., 2016).

## **Ethical considerations**

Ethical approval for this study in Kenya was obtained from the Amref Health Africa's Ethical and Scientific Review Committee, approval number P1082/2021, and a research permit was obtained from the National Commission for Science, Technology and Innovation (NACOSTI/p/2114554). Ethical approval in the United States was obtained from the Health Media Lab Institutional Review Board. All participants provided oral consent to participate in the study. Prior to obtaining the consent, all participants were informed of the purpose of the study, benefits, and risks and they were provided with an opportunity to ask any questions before, during, and after the interviews.