


# Understanding and Bridging Gaps in the Use of Evidence from Modeling for Evidence-Based Policy Making in Nigeria's Health System

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Chinyere Mbachu, Prince Agwu , Felix Obi, and Obinna Onwujekwe

## Abstract

**Background.** Modeled evidence is a proven useful tool for decision makers in making evidence-based policies and plans that will ensure the best possible health system outcomes. Thus, we sought to understand constraints to the use of models in making decisions in Nigeria's health system and how such constraints can be addressed. **Method.** We adopted a mixed-methods study for the research and relied on the evidence to policy and Knowledge-to-Action (KTA) frameworks to guide the conceptualization of the study. An online survey was administered to 34 key individuals in health organizations that recognize modeling, which was followed by in-depth interviews with 24 of the 34 key informants. Analysis was done using descriptive analytic methods and thematic arrangements of narratives. **Results.** Overall, the data revealed poor use of modeled evidence in decision making within the health sector, despite reporting that modeled evidence and modelers are available in Nigeria. However, the disease control agency in Nigeria was reported to be an exception. The complexity of models was a top concern. Thus, suggestions were made to improve communication of models in ways that are easily comprehensible and to improve overall research culture within Nigeria's health sector. **Conclusion.** Modeled evidence plays a crucial role in evidence-based health decisions. Therefore, it is imperative to strengthen and sustain in-country capacity to value, produce, interpret, and use modeled evidence for decision making in health. To overcome limitations in the usage of modeled evidence, decision makers, modelers/researchers, and knowledge brokers should forge viable relationships that regard and promote evidence translation.

## Highlights

- Despite the use of modeling by Nigeria's disease control agency in containing the COVID-19 pandemic, modeling remains poorly used in the country's overall health sector.
- Although policy makers recognize the importance of evidence in making decisions, there are still pertinent concerns about the poor research culture of policy-making institutions and communication gaps that exist between researchers/modelers and policy makers.
- Nigeria's health system can be strengthened by improving the value and usage of scientific evidence generation through conscious efforts to institutionalize research culture in the health sector and bridge gaps between researchers/modelers and decision makers.

## Keywords

evidence-to-policy, EBDM, knowledge translation, modeling, modeled evidence, policy making

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## Corresponding Author

Prince Agwu, University of Nigeria, Health Policy Research Group, Department of Pharmacology and Therapeutics, College of Medicine and Department of Social Work, Nsukka 410001, Nigeria; (prince.agwu@unn.edu.ng).



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Ensuring that careful and effective decisions are made in the health sector requires that decisions are based on evidence that is generated from well-conducted research, routine administrative data, and modeling. This process is referred to as *evidence-based decision making* (EBDM). EBDM ensures that health system governance decisions do not emerge from guesses or subjective feelings.<sup>1</sup> Sources from where evidence can be drawn include surveys, interviews, group discussions, meta-analysis of the literature, ethnography, reconnaissance exploration, stakeholders' engagements, and modeling (modeled evidence), among others. The use of empirically asserted facts that guide the identification of needs and scenarios yearning for policy directions, including developing, implementing, and evaluating policies and programs, is referred to as EBDM.<sup>2</sup> Simply, EBDM in health is the use of data, whether quantitative or qualitative, to inform decisions about policies and programs in the health sector.

There have been recommendations for Nigeria to invest more in research, as it currently spends less than 0.5% of its gross domestic product on research, which is among the lowest in the world, compared with the more than 2% spent by countries such as China and the United Kingdom.<sup>3</sup> The implication of this is that value for research in Nigeria is still too low, and funding for research is almost completely reliant on external actors.<sup>4</sup> While this may affect available robust health and population data in Nigeria, it is a reminder of the complementary significance of modeled evidence in harnessing and making more sense of available data, even when not robust.<sup>5</sup>

Modeled evidence, although very important, is underexplored in low-income regions. They are a set of mathematical and economic computations that are used to simulate real-life behaviors, specifically answering questions within policy terrains about "what is?" "what works?" "what could be?" and "how can actions be taken?"<sup>1</sup> The opportunity provided by modeled evidence in comparing scenarios by laying out trajectories of actions and their implications is critical to making

informed decisions. For instance, modeled evidence was used to determine and decide lockdown and other non-pharmaceutical preventive strategies during the pandemic as well as the trajectory of COVID-19 vaccination campaigns.<sup>6</sup> Also, this evidence has been used in understanding the dynamics around the flow of patients in health facilities for the purpose of improving the uptake of health services.<sup>7</sup>

Further emphasizing the importance of modeled evidence, especially in high-income countries, is the fact that modelers are deliberately and strategically commissioned by government actors to design models to inform decisions about governance.<sup>6,8</sup> Notwithstanding the usefulness of models, especially in predictions and informing proactive measures, some scholars are of the view to complement knowledge derived from models using other research approaches.<sup>9,10</sup> They argue that models could be subject to uncertainties, which can be catered to with insights from other complementary research methods such as interviews, observations, and surveys. Yet they strongly recommend the use of models especially in predicting future outcomes of decisions and preparing the necessary responses to such outcomes.

Generally, studies have pointed to suboptimal utilization of research evidence in policy making in the health sector of Nigeria.<sup>11,12</sup> A broader study on EBDM reported that policy makers are aware of the need for evidence to guide them in performing their duties but that they are challenged in areas of access, comprehension (especially when it involves mathematical computations), timeliness, and operationalization of evidence.<sup>2</sup> This issue is not just peculiar to Nigeria, as a systematic review on the utilization of models in 5 continents of the world reported limitations in utilizing models in making decisions in the health sector, which included user-related and technical/application-related limitations.<sup>13</sup> In addition, an Australian study mentioned the expensiveness of continuous funding of the generation of modeled evidence for diverse actors.<sup>1</sup> It is in a similar vein that the current study seeks to identify and analyze constraints to the use of modeled evidence in health decision making in Nigeria and what can be done to enhance its generation and use, going forward. Given that this issue is not unique to Nigeria, the study has the potential to affect similar countries facing this same challenge of effectively mainstreaming modeled evidence in decision making for health.

## Conceptual Framework

The evidence to policy framework by Mirzoev et al.<sup>14</sup> and the Knowledge to Action (KTA) framework were

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Health Policy Research Group, Department of Pharmacology and Therapeutics, College of Medicine, University of Nigeria Enugu-Campus, Enugu, Nigeria (CM, PA, OO); Department of Community Medicine, College of Medicine, University of Nigeria Enugu-Campus, Enugu, Nigeria (CM); Department of Social Work, University of Nigeria Nsukka (PA); Results for Development Institute (R4D) Abuja, Nigeria (FO); Department of Health Administration and Management, College of Medicine, University of Nigeria Enugu-Campus, Enugu, Nigeria (OO); School of Humanities, Social Sciences, and Law, University of Dundee (PA). The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors received no financial support for the research, authorship, and/or publication of this article.

used to conceptually guide the study. Mirzoev et al.<sup>14</sup> identified the roles actors such as international agencies, civil societies, and funders can play in scaling up decision making based on evidence. KTA, on the other hand, discusses the procedures for effective use of evidence in governance<sup>15</sup> and argues that knowledge and its processes of production must be an integral part of societies, which they identified as 1) identifying the problem; 2) adapting knowledge to the local context; 3) assessing barriers and facilitators to the use of knowledge; 4) selecting, tailoring, and implementing interventions; 5) monitoring knowledge use; 6) evaluating outcomes; and 7) sustaining knowledge use. For an effective application of evidence in societies, each of these processes must in themselves be effective, which also reflects the need to have efficient actors that will champion their application. Weak EBDM is most likely to manifest when any of the actors (funder, knowledge broker [the connecting actor between researchers and policy makers], modeler [researcher], decision maker, etc.) is ineffective.

## Methods

### *Study Area and Design*

A national outlook was adopted in examining the issue in Nigeria and was implemented in 3 phases comprising 1) mapping of stakeholders, 2) an online survey, and 3) key informant interviews (KIIs).

*Mapping of stakeholders.* In the first phase, an initial list of stakeholders in the modeling to decision-making ecosystem in Nigeria was identified through brainstorming sessions. The list was expanded with input and suggestions from a technical working group comprising national health systems experts. The stakeholders were categorized based on their roles in the modeling to decision-making ecosystem that include modeling, knowledge brokering, and decision making. Modelers were defined as researchers or organizations who produce modeled evidence. Knowledge brokers were defined as individuals and organizations that help to translate evidence, distill findings, and foster dialogues that affect policy and practice. Decision makers were defined as the users or potential users of modeled evidence and those who participate in health policy making in Nigeria. Funders were mainly those with international agencies that provide funds for research. Most of the modelers and knowledge brokers were individuals in academia and nongovernment organizations. Decision makers work in government health ministries, departments, and

agencies, whereas the funders work with international organizations.

*Online survey.* In the second phase, a targeted online survey was deployed to 38 stakeholders who were identified through the mapping exercise. There was a purposive selection of participants (for representation and diversity). A total of 38 responses were retrieved after 2 mo of deploying the survey, from 14 modelers, 7 knowledge brokers, and 17 decision makers. The online survey had both closed- and open-ended questions that examined participants' views about the usefulness of modeled evidence in decision making and the major barriers and enablers to promoting the use of modeled evidence in health policies and programs in Nigeria. The development of the survey questionnaire was collaboratively undertaken and reviewed by the research team from the University of Nigeria and the research team from Results for Development. The statements on facilitators and barriers represent desirable characteristics that promote or hinder the use of modeled evidence for decision making and not necessarily the situation or reality in Nigeria. These statements were generated from the literature and expert contributions, and participants were asked to select the 3 biggest facilitators and the 3 biggest barriers from the statements. The survey data were managed using Open Data Kit software. Interviewees provided written consent, and direct identifiers were removed from the data set to maintain anonymity.

*Key informant interviews.* In the third phase of the study, KIIs were conducted with a subset of participants in the online survey and some key people who were unable to respond to the survey. The purpose of the KIIs was to explore in more depth the factors that were identified from the survey that enable or constrain the use of modeled evidence in decision making. The KIIs were conducted virtually through telephone calls and Zoom meetings to reduce the risk of contracting COVID-19. A total of 24 people were interviewed using a pretested interview guide. The respondents were composed of 6 modelers, 4 knowledge brokers, 11 decision makers, and 3 representatives of funding organizations. We collected written informed consent before appointments. Table 1 shows the distribution of participants.

### *Data Analysis*

For quantitative data, descriptive analysis was performed. Participants' responses were disaggregated by

**Table 1** Category and Distribution of Participants in the Survey and Key Informant Interviews

Respondent Category		Key Informant Interview ( <i>n</i> = 24)		
		Online Survey ( <i>n</i> = 38)	Participated in the Survey	Did Not Participate in the Survey
Type of organization	Decision making	17	5	6
	Modeling	14	2	4
	Knowledge brokering	7	4	0
	Funding	0	0	3
Level of work	Local/regional	10	2	1
	National	27	10	8
	International	1	0	3
Gender	Female	8	2	2
	Male	30	10	10

the type of respondent: modeler, decision maker, and knowledge broker. For the qualitative data from KIIs, audio recordings were first transcribed verbatim. The transcripts were coded deductively in NVivo using a set of predefined codes that represent key concepts. To ensure rigor and coherence, transcripts from the initial interviews were double coded by 2 independent researchers, and their coding outputs were compared and discussed during the research team meeting in line with observer triangulation and peer debriefing.<sup>16</sup>

## Results

The qualitative and quantitative results are structured into 3 subsections: 2) decision makers' perception of modeled evidence, 2) facilitators to the use of modeled evidence in decision making, and 3) inhibitors to the use of modeled evidence for decision making. Both results are presented together under each theme to achieve triangulation.

### *Decision Makers' Awareness and Views about Ease of Access and Value of Modeled Evidence*

Of the 17 decision makers who participated in the survey, 6 (35.3%) responded in the affirmative that it is easy to find modeled evidence in their area of work. However, of the 6, only 5 (29.4%) were of the view that modeled evidence is an effective tool for policy and programmatic decisions in the context of their work. These findings were corroborated in the responses of key informants.

We try to secure the buy-in of the policy makers at the ministries, departments, and agencies. Not many of them understand the importance of models and how it is being used

[but] when we show them how it works, they get interested. (Knowledge broker)

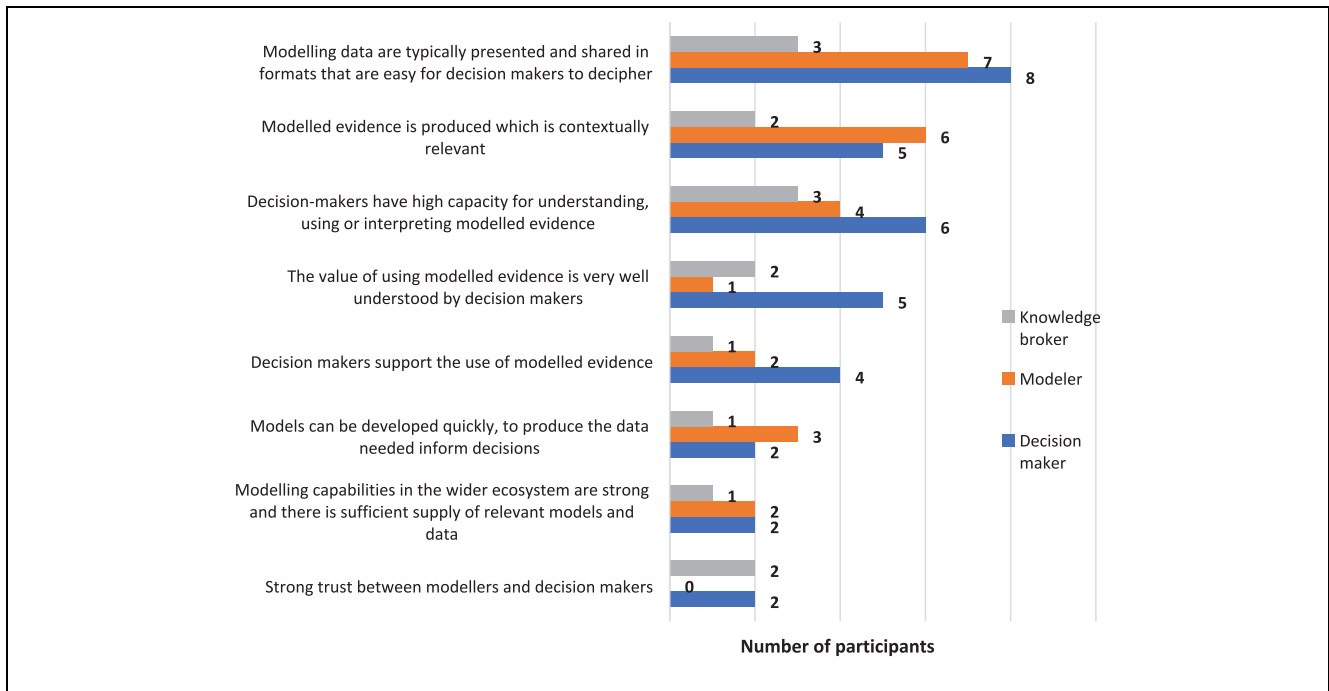
Although the awareness of modeled evidence was low among decision makers, their appetite for it was enhanced when they were made to understand how it works. Moreover, it was reported that modeling is relatively new in the Nigerian health system. It is complex, and policy makers have only recently become aware of its value in decision making due to its usefulness in the COVID-19 pandemic response by the Nigeria Centre for Disease Control (NCDC).

Modeling is . . . a new process as far as health care in Nigeria is concerned. . . . The other thing is that modeling is complex [and] it becomes a challenge to policy makers [to understand]. (Decision maker)

To some of the respondents, decision makers appear not yet convinced in modeled evidence, which they attribute to reasons around the low prevalence and usage of models within the health sector. A knowledge broker said, "getting their [decision makers] trust and confidence in the first instance in the model output is often what one needs to overcome." We found evidence that in some of the agencies such as the NCDC, where trust in modeled evidence has been built, there is value for it already, and modelers are invited by policy makers to discuss modeled evidence.

### *Facilitating Factors to the Use of Modeled Evidence in Decision Making*

The results of the quantitative survey highlight the factors that respondents considered to be the biggest enablers to promoting the use of modeled evidence to



**Figure 1** Number of participants who agreed that the characteristic stated is an important factor facilitating/enabling the use of modeled evidence for decision making.

inform health policy and program decisions. Figure 1 shows the number of people that agreed with each statement, disaggregated by respondent type, that is, decision maker, modeler, and knowledge broker. The top 3 options that respondents selected as the biggest facilitating factors to the use of modeled evidence for decision making were 1) modeling data are typically presented and shared in formats that are easy for decision makers to decipher, 2) contextually relevant modeled evidence is produced, and 3) decision makers have high capacity for understanding, using, or interpreting modeled evidence.

Findings from the KII were used to triangulate the responses presented in Figure 1. We present the findings under 3 levels of factors: individual, organizational, and environmental levels.

*Individual-level facilitators of the use of modeled evidence in decision making.* Like the survey, the capacity to understand and use modeled evidence and the presentation of models using simple (nontechnical) language and formats to decision makers were the most recurrent individual-level facilitators identified from the KIIs.

Getting their [decision makers'] trust and confidence in the first instance in the model output is often what one needs to

overcome. But when we interpret through the models in a very clear way that will enable them to see through empirical evidence of what is happening in the sector, it usually proves profoundly successful. (Knowledge broker)

*Organizational-level facilitators of the use of modeled evidence.* At the organizational level, we found that organizations that have as a part of their work culture to pay attention to research evidence, which included modeled evidence, responded better to the use of modeled evidence. However, this was influenced by those in the top hierarchy of the organizations and the perceptions they hold about research evidence in general.

The current executive director shortly before I left was already encouraging us to pay attention to research and use research evidence in making decisions. (Decision maker)

More so, health organizations with an existing research culture found it easy to understand, fund, and use modeled evidence for decision making. The NCDC and National Primary Health Care Development Agency were mentioned as such organizations.

Like the ones I know about so far, they are funded by internal funding mechanisms of the NCDC. The federal

government committed funds to research through the NCDC, and it caused the NCDC to commission modelers to work. (Modeler)

A staff from the NCDC corroborated:

We collect a lot of data, such as surveillance and process data. . . . We are implementing our National Action Plan, which is data driven. We are nowhere near perfect, but we are translating a lot of data (even from models) into policy. (Decision maker)

*Environmental-level facilitators of the use of modeled evidence.* Although not captured among the top responses in the quantitative survey, the qualitative findings showed that environmental factors such as the availability of modelers and structures to incentivize modelers can facilitate the value and utilization of modeled evidence in decision making. During the mapping stage of the study, we found several existing structures in Nigeria that are supportive to the use of modeled evidence. They included the Nigeria Academy of Science, Health Sector Reform Coalition, Nigeria COVID-19 Research Coalition, Primary Health Care Top Management Team, and so forth. Respondents were of the view that these structures with an established research culture can be leveraged to facilitate the use of modeled evidence in decision making, especially as some of them are also politically influential and can organize discussions with policy makers.

The approach [we used] really was to co-produce models with the actors . . . every Tuesday evening, the modelers were meeting with policy makers and the programmatic people. I think that was definitely one strong strategy. (Decision maker)

Another departure from the quantitative result is the funding of modelers. Funding was raised during the interviews as an important facilitator, given how expensive designing models can be.

Models that are used for the purpose of medium-term plans are very sophisticated, complex, and require a lot of resources. The highest model I built for the Ministry of Finance, Budget, and National Planning involved a partnership with the Office of the Special Assistant to the President, as well as UNDP [United Nations Development Program]. They commissioned the development of that model. (Modeler)

Still on funding, respondents said that funders can create the environment for modeled evidence to thrive by listing

clear rules on paying heed to EBDM as part of the requirements for funding.

World Bank provided grant for the Nigeria Primary Healthcare Development project, and there were a number of funding decisions that were taken based on our capacity to design and use models. (Decision maker)

Furthermore, global movements and crises that yearn for evidence gathering, knowledge sharing, knowledge translation, and EBDM also inspire value and use of modeled evidence.

Actually, this is the current instance now. In the COVID-19, Lagos state has used modeling most . . . even more than the federal government to project where things might go. (Broker)

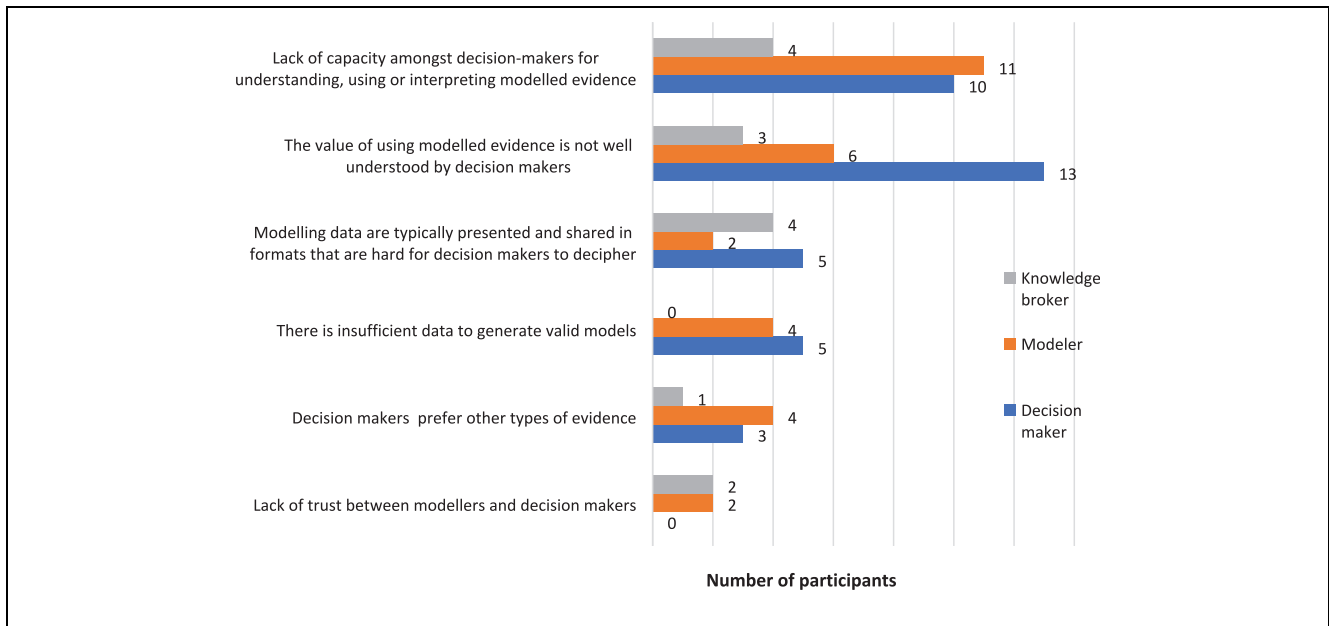
Lastly, on environmental-level facilitators, the availability of data and sharing of data were listed. It was mentioned that availability and access to quality data repositories will facilitate the production of modeled evidence and its usage for decision making.

For the AMR [anti-microbial resistance] work that we do, we have our incident files where we are generating AMR data . . . there is collaboration with NCDC sentinel sites with an understanding that we use the data. (Decision maker)

### *Inhibiting Factors to the Use of Modeled Evidence in Decision Making*

Figure 2 presents results from the survey on the inhibitors of the use of modeled evidence in decision making. Based on aggregated frequencies of responses to the scenarios in the survey tool, the top 3 inhibitors were: 1) lack of capacity among decision makers for understanding, using, or interpreting modeled evidence; 2) the value of using modeled evidence is not well understood by decision makers; and 3) modeling data are typically presented and shared in formats that are hard for decision makers to decipher. Again, we present the qualitative responses at 3 levels of individual, organizational, and environmental.

*Individual-level inhibitors of the use of modeled evidence.* Many respondents reported the apathy of decision makers toward research evidence, which reflects their capacity of understanding and appreciating how research evidence such as models can be used for policy making. Also, it was said that some decision makers that



**Figure 2** Number of participants who agreed that the characteristic stated is an important factor inhibiting the use of modeled evidence for decision making.

may value research evidence, including modeled evidence, may not have the capacity to understand designed models, which are naturally complex.

There were other instances of colleagues that do not have data use as a culture. They do not see the need to reference data in budgeting or planning but rather would rely on historical budgeting. . . . We have always done it this way and so [they] do not listen to signals from modeled evidence. (Decision maker)

Modelers were said to design models without provision for communication in ways that lay persons could understand.

The models are there but [the] challenge is mainly in translation. There is some evidence that came out during the pandemic [COVID] that I even did not understand. If you put me on the spot to engage with policy makers, I will not be able to do that because I don't even understand the models. (Broker)

Another departure from the survey that came out in the KII is the capacity of the modelers themselves. This was spoken about in 2 areas. First is the absence of many modelers in the country, and second is the capacity to build context-specific models.

*Organizational-level inhibitors of modeled evidence.* Some inhibitors were identified at the level of organizational setups. First should be the restrictions that prevent modelers from accessing policy makers with the models they have designed. Respondents narrated how modelers, researchers, and policy makers operate in silos.

The policy makers, some of them put themselves very far so that you will not even see the opportunity to interact with them . . . if you even try to see them, you will not have access to them. (Modeler)

We found some kind of disinterestedness in modeled evidence by the health sector leadership, which manifested in refusal to fund the exercise, absence of coordination of decisions based on modeled evidence, and bureaucracies that could disincentivize modelers.

We do not have medium- to long-term blueprint on how things should go. There were modeling that went on for a couple of months and years, and it was not very clear the sort of actions to take to get the desired output. (Decision maker)

We do not have policy directives and blueprint that will guide and enforce actions that should be taken on research evidence to get the desired output. (Decision maker)

Lastly on this, the lack of finance for organizations to fund models means that they will lack the capacity to support researchers to generate modeled evidence or to facilitate meetings where knowledge on modeled evidence can be exchanged.

*Environmental-level inhibitors of modeled evidence.* The lack and poor quality of data, including lack of access to good data by modelers, was mentioned as an environmental-level inhibitor. Some of the respondents discussed the lack of credible population statistics in Nigeria affecting the quality of produced models.

Severally, we do not have enough in-country data; you know, we need access to available in-country data to model efficiently. But the data are usually incomplete, and the concerned agencies and ministries are not doing so much about that. (Modeler)

### *Stated Views on Enhanced Generation and Use of Modeled Evidence*

The interviews generated views that can at least enhance the generation and use of modeled evidence. They include building and strengthening the in-country capacity for model building and interpretation (including among research staff of the departments of planning, research, and statistics in different ministries, departments, and agencies), capacity building of researchers in modeling for EBDM, strengthening data and information systems through digitalization, and making national and subnational data more accessible to modelers.

If I must push for anything else, [it is] about [strengthening] capacities for evidence building and modeling in the country. Together with that is our data. We need concerted efforts to digitalize our data, getting network systems that allow data to be more accessible to people. (Decision maker)

The need for enhanced communication between modelers and decision makers was mentioned remarkably.

We need to reach out to the policy makers and then hold [dissemination] meetings once we have the studies [evidence]. If it is going to be a policy brief, go to their offices and not just dump it on the desk but find time to discuss your findings [with decision makers]. Development partners like WHO [World Health Organization], World Bank, and other international agencies should begin to look at [translating modeled evidence] and put it on their agenda to disseminate [to] stakeholders. (Decision maker)

To enhance the use of modeled evidence, effectively pulling together researchers and policy makers in a sustained collaborative relationship was emphasized by many. This will be supported by more in-country and partner investments (funding) in research to policy.

I would want to see renewed and better partnership between researchers and policy makers—to be expanded, to be sustained. [A situation where] researchers and policy makers are inseparable because they need each other. . . . If government is funding any project within the policy space or by policy makers, there would be embedded researchers. (Decision maker)

### **Discussion**

The key inferences from the study include that modelers of evidence have limited capacity to communicate modeled evidence to decision makers in the health sector, and similarly, decision makers have limited capacity to understand and use modeled evidence in decision making. We found a low level of EBDM culture among decision makers in the health sector. This could be explained by the fact that it is not an explicit requirement for decision making or it could be that decision makers lack the capacity in EBDM. Professional working relationships remain weak between modelers and decision makers, and as such, modelers do not have the experience of the decision-making process, which could be why it is difficult for them to design and communicate models that are unique to diverse decision-making contexts. However, our findings have shown readiness on the sides of modelers to engage decision makers, but that can manifest if decision makers begin to see the need for EBDM and make the use of evidence a practice in decision making. Such change will improve access to decision makers by modelers as well as the relationship that should exist between both.

Despite the usefulness of modeling in optimally driving environmental and health programs in other parts of the world,<sup>6,13</sup> our study discovered that modeling is yet to gain a strong footing within Nigeria. Although we found an exception during COVID-19, which could be because of the global coordination of the pandemic responses, providing for cross-learning, or the dynamics of the pandemic that demanded scientific evidence to predict and provide insights into what can work. Expectedly, the usefulness of models during the COVID-19 pandemic should foster modeling as an indispensable source of evidence for Nigeria's health system.<sup>17</sup> But this has not been so, as respondents reported that modeled



evidence is still relatively new and emerging within Nigeria's health system. Nevertheless, we found that agencies and organizations that had used modeled evidence at any time tend to appreciate how modeled evidence enhanced decision making, and they tried to sustain its usage alongside other research evidence. That means the value placed on modeled evidence by policy makers could be informed by a first and continuous usage of models in decision making.

At the individual level, the capacity to understand models that are typically complex was emphasized. But then this could be the result of the level of attention organizations pay to modeled evidence. The level of attention could be measured by funding and commissioning modelers, inviting modelers and knowledge brokers for dialogs on models, and establishing a research culture within organizations. While attention to scientific evidence should be the first step in scaling up value for modeled evidence, the next should be dialoging with and incentivizing modelers to produce accompanying simplified communication materials to the designed models. This could come in policy briefs, fact sheets, blogs, or any other simplified prose and easy-to-understand diagrams. Overall, scholars have argued that scientific evidence makes sense in settings that have an established research culture and can be introduced and enhanced in settings without an established research culture through research communication that distills complex scientific outputs.<sup>18</sup>

To promote EBDM, project and program funders may begin to consider EBDM as part of the criteria to meet to gain access to funds, because our evidence showed that this stimulated one of the organizations to consider modeling and the use of modeled evidence in making decisions. Evidence from this study shows that when organizations begin to fund research, including modeling, they are most likely to make use of it, at least to ensure they have value for money. In addition, we discovered that during the early days of COVID-19, decision makers, modelers, and brokers met often to look at designed models for the purpose of taking decisions around containment and coordination strategies.<sup>17</sup> Going forward, such practice should be sustained. Importantly, knowledge brokers who expectedly stand in between policy makers and modelers should grow capacities in understanding modeled evidence to enhance communication.

There is a need to sanction the nonuse of evidence for decision making and to infuse knowledge translation as a criterion to meet while applying for funding and ethical approval to conduct research. With this, it will naturally come to the minds of people that research exists for

evidence-based decisions to be made in terms of policies and programs.<sup>19</sup>

Quite frankly, Nigeria has good structures for EBDM in health that should be harnessed, but the country must pay attention to quality and accessibility of data to make modeling seamless as well as to improve the quality of designed models. While models can contribute high-level usefulness to data even when not robust, it still makes sense to ensure robust health data are collected and that they are made readily accessible to modelers.<sup>5</sup> Interestingly, as shown in our study, Nigeria has the local human resource for generating modeled evidence, notwithstanding the calls to increase the number of modelers within the health sector. We are of the view that the locally available human resources in modeling should be harnessed by the health sector alongside making room for the training and utilization of more modelers in future.

Going forward, funders and global policy leaders will need to insist on embedded modelers/researchers in government's projects and programs as well as research-to-policy capacity building for decision makers. Our conceptual framework highlighted the significance of global actors in improving EBDM, one of which could be making such demands from those they fund.<sup>14</sup> As part of funding requirements, trackers for the monitoring of the steps and results involved in research to action should be emphasized, as this will elicit commitment to pursue EBDM. Our KTA framework has shown that it makes no sense for actors to act in silos, even as they must be effective in themselves.<sup>15</sup> Therefore, formalizing and institutionalizing relationships across modelers, knowledge brokers, and decision makers is very vital to achieve EBDM in the health sector. Over time, it will be remarkable to achieve a national framework that will be unique to the Nigerian context on the use of research/ modeled evidence in policy and decision making.

One limitation of this study is the low response to invitations to participate in the survey and KIIs. We encountered cases of being unable to interview several of the key informants that were mapped, which might have added to the quality of our data if otherwise. It is important to state that the respondents for this study are highly specialized, which means that they were mostly busy. We particularly had a very low response rate from women in the KIIs. This could mean that their views were underrepresented.

In conclusion, Nigeria's health sector is not bereft of the structures to enhance and sustain the use of modeled evidence in EBDM. There are quite a number of individual modelers and organizations with high interest in evidence-driven policies and modeled evidence. Some of


these organizations are influential within the country's health sector and can initiate, pursue, and sustain the use of modeled evidence for EBDM. Our study has shown that the value for modeled evidence and other research evidence increases as they are being used by agencies and organizations. We have outlined reasonable approaches that can be applied to introduce organizations and agencies to using research/ modeled evidence, with emphasis on listing EBDM as part of the criteria to access funding and encouraging simple communication of models.

Overall, our study has shown gaps that should be sustainably bridged for EBDM to become a culture in the country's health sector and help to strengthen its health system. Important areas to consider include funding, enhancing research culture of organizations within the health sector, data accuracy and availability, and learning from good practices where models enhanced policy making. In addition, establishing/strengthening relationships across decision makers, knowledge brokers, and modelers through effective and simple research communication as well as national policy frameworks and organizational practices that are supportive of EBDM must be encouraged.

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### ORCID iD

Prince Agwu  <https://orcid.org/0000-0001-9224-7622>

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