BMJ Public Health

Challenges and enablers for scaling up interventions targeting non-communicable diseases: a qualitative study applying the Consolidated Framework for Implementation Research to 19 research projects worldwide

Anusha Ramani-Chander ,[1,2] Amanda G Thrift,[1] Josefien van Olmen,[3] Edwin Wouters,[4] Peter Delobelle,[5,6] Rajesh Vedanthan,[7] J Jaime Miranda,[8,9] Stephen Sherwood,[10,11] Helena Teede,[2] Rohina Joshi ,[12,13] On behalf of the Global Alliance for Chronic Diseases Upscaling Working Group

To cite: Ramani-Chander A, Thrift AG, van Olmen J, *et al*. Challenges and enablers for scaling up interventions targeting non-communicable diseases: a qualitative study applying the Consolidated Framework for Implementation Research to 19 research projects worldwide. *BMJ Public Health* 2024;**2**:e000710. doi:10.1136/bmjph-2023-000710

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/bmjph-2023-000710).

Received 30 October 2023
Accepted 13 March 2024

For numbered affiliations see end of article.

Correspondence to
Dr Rohina Joshi;
rohina.joshi@unsw.edu.au

ABSTRACT

Introduction Scaling up interventions targeting non-communicable diseases (NCDs) is a global health priority, and implementation research can contribute to that effort. In 2019, the Global Alliance for Chronic Diseases funded 27 implementation research studies to improve evidence for scaling up interventions targeting prevention and/or control of hypertension and/or diabetes in low-resource settings. We examined these studies to improve the understanding of the implementation factors, including challenges and facilitators, that influence the early implementation phase of scale-up research projects targeting NCDs.

Methods This qualitative study was undertaken between August 2020 and July 2021. 43 semi-structured interviews were conducted with project investigators, implementers and policymakers, across 19 diverse scale-up projects, being implemented in 20 countries. The transcripts were inductively, open-coded using thematic analysis. Generated themes were mapped systematically to four out of five domain categorisations of the Consolidated Framework for Implementation Research (CFIR); the innovation domain fell outside the scope of this study.

Results Highlighted findings using CFIR are: (i) outer setting: influence of politics, lack of coordination between government departments and differing agendas towards NCDs hindered implementation while reliable and trustworthy government connections proved useful; (ii) inner setting: commitment of resources for implementation was a challenge while research capacity, work culture and trustworthy networks facilitated implementation; (iii) individuals: high-level stakeholder support and leadership was essential; (iv) process: extensive time and efforts required for stakeholder engagement towards local contextualisation was challenging, while collaborating, joint reflection, effective communication and adaptation facilitated. COVID-19 provided both challenges and opportunities and these varied depending on the intervention characteristics and study objectives.

Conclusion Researchers supporting the scale-up of complex interventions targeting NCDs need to leverage on existing trusting relationships and foster equitable stakeholder partnerships through research. Interpersonal skills and good communication are essential complements to research expertise and must be considered during capacity building.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ While it is known that implementation research can assist in the effective and efficient scaling up of health interventions, a better understanding of how non-communicable disease (NCD) scale-up can be supported by researchers, particularly in low/middle-income countries, is necessary to close gaps in NCD prevention and control globally.

WHAT THIS STUDY ADDS

⇒ We present novel findings on the challenges and facilitators to undertaking implementation research studies that support the scale-up of interventions targeting NCDs. Our findings are presented from the collaborative examination of 19 diverse scale-up studies funded by a single funding mechanism and implemented in 20 countries.

⇒ The application of the Consolidated Framework for Implementation Research efficiently synthesised implementation challenges and facilitators across diverse settings. We identified that the outer setting presents most challenges, but the inner setting and process domains contain constructs that can facilitate scale-up.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study highlights the essential skills required by implementation researchers when undertaking research studies that support the scale-up of evidence based NCD interventions.

⇒ The findings demonstrate the critical role of building trusting relationships, developing equity in partnerships and focusing on stakeholder engagement in global health research.

INTRODUCTION

Scaling up interventions to prevent and control non-communicable diseases (NCDs) is a priority.[1 2] Scaling up is defined as 'deliberate efforts to increase the impact of innovations successfully tested in pilot or experimental projects so as to benefit more people and to foster policy and programme development on a lasting basis'.[3] Implementing at scale is a complex process that requires consideration of contextual factors that impact the uptake and sustainability of evidence-based interventions.[4 5] Implementation researchers can contribute to these efforts by providing evidence to develop effective scaling up strategies, and thereby accelerate government efforts towards Sustainable Development Goal 3.4 which targets a one-third reduction in premature mortality due to NCDs by 2030.[6–11]

Research on scaling up interventions is complex and must consider several factors, including the political, health and social contexts, that shape and determine outcomes of interventions.[12–14] Barriers to implementation of NCD interventions in low/middle-income countries (LMICs) include health system related challenges, such as lack of workforce and poor medicine supply chains.[15–19] A systematic understanding of the contextual factors, facilitators and barriers in the scale-up process is timely and necessary. This will provide important information to academics, health professionals, policymakers and implementers on how implementation research can better support the scale-up of evidence based NCD-interventions.

In 2019, the Global Alliance for Chronic Diseases (GACD) funded 27 research projects with a total investment of approximately US$50,000,000.[20 21] The aim of the call was to improve scientific knowledge for scaling up evidence-based interventions to prevent and/or control diabetes and/or hypertension in low-resource settings.[22] These projects were funded an average of 4 years between 2019 and 2024.

This study focuses on determining the implementation factors that influence the early implementation phase of scale-up research projects targeting NCDs. We address the following research questions:

1. What were the major challenges faced during the early-implementation phase of scale-up research studies?
2. What strategies enabled the research teams to address these implementation challenges?

MATERIALS AND METHODS

Study setting and design

This study was undertaken by members of the GACD upscaling working group[23] (see online supplemental file 1). This platform provided us the opportunity to examine the research projects funded through the call. The projects included different research collaborations, were implemented in different countries, and included diverse interventions.[24] This qualitative study focuses on stakeholder experiences in the early-implementation phase of these scale-up projects.

Data collection

Four semi-structured interview guides targeting the stakeholder groups involved in the implementation of the studies were developed (see online supplemental file 2). These groups were: 1) principal investigators (PIs) who led the research; 2) other research investigators who were responsible for specific components of the research; 3) implementers and project staff, and 4) government representatives.

We invited all PIs to be interviewed, with participation being voluntary. PIs served as the primary contacts and were asked to identify suitable stakeholders from their respective research teams for potential interviews.

Semi-structured interviews were conducted by AR-C between August 2020 and July 2021, using Zoom (Zoom Video Communication, California, USA). AR-C (lead researcher/author), RJ (senior author/researcher 1) and AGT (senior author/researcher 2) comprised the core research team who worked collaboratively throughout this study. AR-C undertook debriefing sessions with RJ and AGT after each interview, to allow for reflection on the obtained data and consider refinement of follow-up questions with other project stakeholders.[25]

Interviews were audio recorded and transcribed verbatim using professional transcription services. AR-C cleaned all transcripts by cross-referencing with recordings. Transcripts were deidentified to maintain confidentiality.

Data analysis

The core research team met weekly throughout the analytical process. A two-step analytical approach was adopted to retain the richness of data and systematically present the findings.[26]

Step 1: thematic analysis

All transcripts were open coded using thematic analysis, facilitated by NVivo software (QSR International Pty. Ltd., V.12).[27] Thematic analysis provided the necessary flexibility to analyse without being prescriptive about the emerging patterns.[28–31] AR-C coded all data while RJ independently coded 10% of the transcripts.

Step 2: framework mapping

The updated Consolidated Framework for Implementation Research (CFIR), a determinant framework that

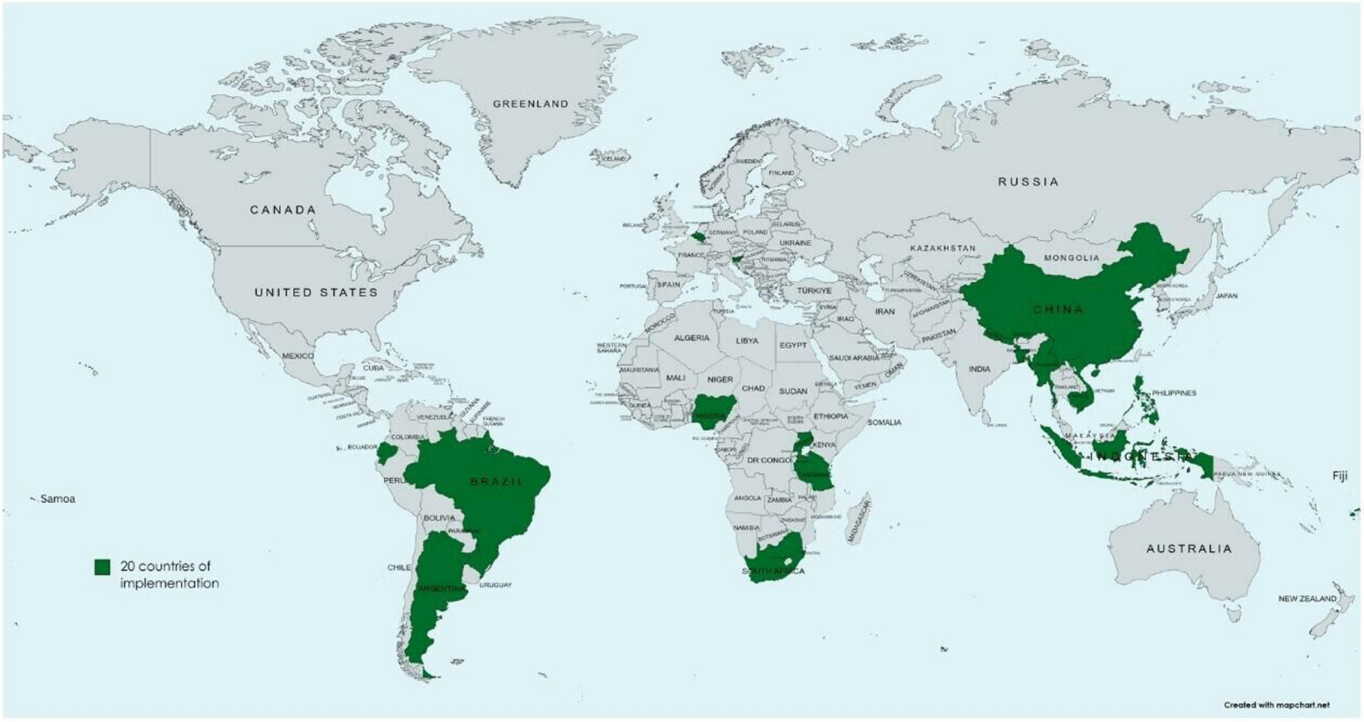

Figure 1 Map showing the 20 implementing countries from the 19 scale-up projects that participated in this study.

was developed through the analysis of various published theories on implementation, was used to analyse and present the findings.[32] CFIR comprises five domains that interact to influence implementation effectiveness: (i) innovation; (ii) outer setting; (iii) inner setting; (iv) individuals and (v) implementation process (see online supplemental file 3 for detailed methodology used).

RESULTS

A total of 43 interviews (24 with females; 19 with males) were conducted across 19 funded studies (figure 1).

26 interviews were conducted with stakeholders located in 13 LMICs across Asia (five countries), Africa (four countries), South America (three countries) and Oceania (one country; table 1). The remaining interviews were conducted with project investigators located in high-income countries (HICs)—Australia, USA, UK, Canada, Japan, Belgium, Germany and The Netherlands.

We identified 186 codes from the interviews, comprising 50 subthemes of challenges and enablers which were grouped into 28 themes (see online supplemental file 4). These were subsequently categorised into four of the five CFIR domains (figure 2).

We present the common challenges and facilitators across studies, which include a combination of experienced and anticipated factors. COVID-19 was a cross-cutting theme and its impact is discussed across the domains.

To structure reporting, we first summarise the findings under each domain, followed by more detailed discussion of relevant constructs supported by specific exemplar quotations.

Outer setting domain

This domain presented the most challenges. Having strong partnerships enabled implementation, while policies and laws supported and, sometimes, hindered implementation.

Critical incidents

The pandemic coincided with the implementation of these projects affecting implementation to varying degrees. Routine government activities were disrupted as resources were redirected towards COVID-19 responses.

Table 1 Stakeholders interviewed according to country income-level*

	Country income level		
	LMIC (n=26)	HIC (n=17)	Total (n=43)
Principal investigators	10	9	19
Other lead research investigators	8	7	15
Implementers and project staff	6	1	7
Government representatives	2	0†	2

*Only one of the 19 included projects had implementation sites in two HICs, and no policymakers from these sites contributed due to a COVID wave occurring at the time interviews were being conducted.
†World Bank categorisations based on income-level[60] and adopted by the Global Alliance for Chronic Diseases.
HIC, high-income country; LMIC, low/middle-income country.

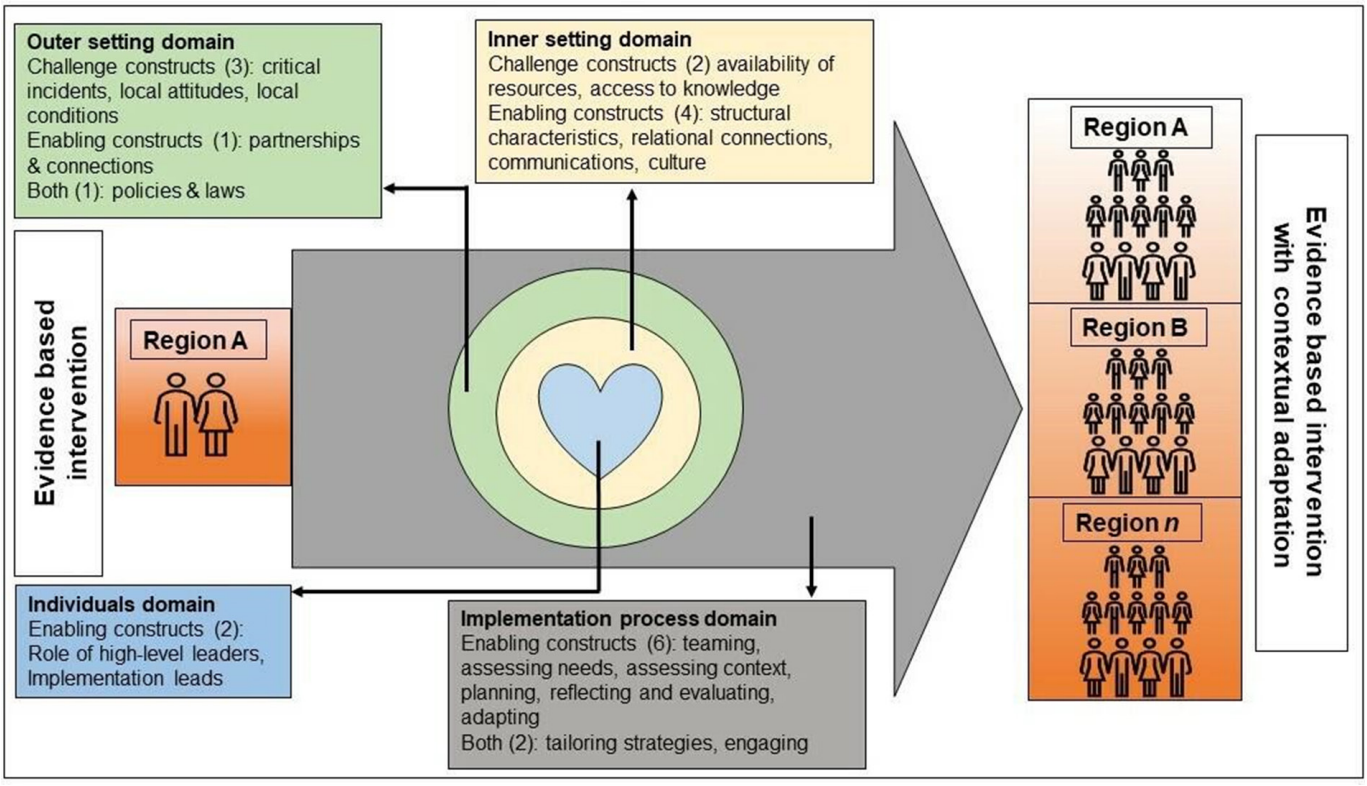

Figure 2 Summary of challenges and enablers from the application of Consolidated Framework for Implementation Research during early implementation of scale-up studies. The innovation domain falls outside the scope of this study.

Communication broke down between the research teams and policymakers, affecting the early engagement efforts. Lockdowns and travel restrictions hindered patient access to clinics to receive the intervention.

Civil unrest and political turmoil, reported in some countries, also disrupted implementation. Researchers expressed grave concern about the uncertainties and potential impacts on the short-term and long-term outcomes for their studies due to these incidents.

> And of course, we are working in [name of implementing country] so the present military coup gives us a lot of concerns if we can continue at all there. (PI1, HIC)

Local attitudes

Most PIs recognised policymakers' genuine concern for improving NCD health in communities, though there were some examples of policymakers' limited understanding of the contribution of research in the scale-up process which proved challenging for securing commitment. This was a problem because the GACD call only funded the research, while government, or other agencies, were responsible for funding the implementation.

> The ministry is not prioritising this study really … they are the ones who are supposed to provide the drug and the equipment … if they do not have those things, then the study cannot move forward. (Implementer1, LMIC)

Researchers shared that non-researchers sometimes did not fully appreciate the stringent guidelines and protocols necessary to maintain robust scientific conduct. This caused some concerns about sampling strategies or reorganisation of activities to address the practical requirements of policymakers.

> If government has a new [modified intervention to trial], the [original] trial is no longer feasible … we don't have the impact to measure. And now government says look, it is fantastic, it works, that is all I need to know. Thank you, scientists. (PI2, HIC)

Local conditions

This construct included four challenges outlined in the following sections.

Power issues

Researchers shared that policymakers had the ultimate power on decision-making for implementation, so changing government priorities posed significant challenges to maintaining implementation plans. Policymakers sometimes expected quick evidence to make decisions regarding scaling-up which was either infeasible or undermined the fidelity of implementing interventions.

> Because at the end what the ministry wants the ministry gets (Implementer1, LMIC)

Having a good understanding of power dynamics, and knowing the internal influence of different policymakers, required extensive local experience and assisted researchers to navigate such challenges.

> … close ties of (name of PI, LMIC) with local decision-makers and an understanding of who were the people responsible for decision-making … It definitely built on previous trust and previous work. (PI3, HIC)

The influence of lobbying by private corporate interests on governments was a source of tension in some studies, as it undermined the ability of research to inform the scale-up of effective interventions.

Political influence on health

Researchers discussed how workflow was interrupted, and project timelines compromised, by political changes or newly elected governments, with several examples of changed priorities or recommencing conversations with a new set of policymakers.

> … but one of the huge challenges is high turnover of government officials, and including ministerial changes, which, when you are trying to effect policy, that can set you back a long, long time. (PI4, LMIC)

Decentralised health system

While decentralised health systems improved accountability for health outcomes and offered greater localisation benefits, some researchers had to navigate differences between national policy commitments and local implementation commitments. This resulted in differences between committed and available resources for implementation, with variability across regions.

> Fragmentation of a healthcare system is one of the big issues that we have as a problem. You can have a national policy but then you must be sure that that national health policy is implemented at the provincial and local level (PI4, LMIC)

Coordination

Researchers discussed the effect of weak coordination or conflicts between government departments during implementation.

> Sometimes one ministry thinks it is the other ministry's job to do this. (Project member1, HIC)

This was particularly challenging in studies where interventions staggered health departments, for example, integrating NCD care with another disease, or required multi-sectoral action for scaling up, for example, interventions targeted at addressing food policy as part of NCD prevention. This resulted in researchers allocating more time towards establishing communication channels between departments for encouraging concerted action.

Partnerships and connections

Trusting networks between research partners, implementers, governments and community organisations provided a solid foundation to undertake large-scale work. These partnerships, established through past research studies, provided the institutional and researcher credibility essential to win the faith and trust of policymakers.

> Because we already had a relationship with the government, getting them to understand this scale up project on [name of intervention] wasn't too difficult.(PI5, LMIC)

Some PIs highlighted how involving organisations, like the WHO or World Bank, provided additional credibility to the research team. During the pandemic some researchers provided timely research support to government policymakers, strengthening their relationships, and paving the way for future collaborative efforts.

Policies and laws

The presence of national health agendas and NCD action plans allowed researchers to align their research outcomes within government targets, thereby promoting buy-in.

> Because now it is a priority for them … But they have no idea that how they can address these issues in the ground. So that is why I think we are there to support them, and provide the technical support. (PI6,HIC)

In practice, there were challenges in enforcing these health regulations or in maintaining coherence across sectors. For instance, in one country, there was inconsistent adherence to mandated food labelling regulations in supermarkets, with many products inadequately labelled.

Inner setting domain

The inner setting had four enabling constructs, while challenges included limited resources and limited access to knowledge.

Structural characteristics

Research collaborations augment the breadth of skills required for multidisciplinary research. Researchers discussed the importance of research plans with work packages and local teams allocated for each objective. Several PIs acknowledged how equal partnerships within the research consortia, with LMIC teams independently leading components of work, provided immeasurable strength.

> (Name of LMIC PI) is a great collaborator and a generous partner … brings the team along … We have people who are pharmacists, nutritionists, physicians … involved in public health … he is great at taking both responsibility but also delegating with authority to his team and really encouraging them. (Project member2, HIC)

The presence of local research expertise enhanced implementation, promoted sustainability, and proved particularly useful during COVID-19 when research partners were unable to travel.

Relational connections

Formal and informal relationships, and trustworthy connections within the research team, implementers and communities, was crucial for implementation. PIs emphasised how developing networks and partnering

with established and reputable stakeholders possessing strong networks at the policy, health system and community levels, were critical to influence decision-makers for scale-up.

> … Because you are affiliated with (name of implementing agency) everything is very easily done. They are very well respected, that is the thing. (PI7, LMIC)

Communications

Collaborative research was encouraged through study-specific governance structures that facilitated communication, information sharing and decision-making among work-package teams. Separate operational and decision-making roles were identified for steering committees and country-level committees, enabling open discussions about research challenges and tensions, including publications.

Culture

Cultivating respectful work culture within research collaborations was essential during implementation. This was enabled through fair sharing of responsibilities, focusing on collective learning, developing respectful relationships with equality in decision-making, supported by good communication. A positive culture of equitable and reciprocal partnerships provided a level playing field for undertaking collaborative research, set the tone for other stakeholder relationships, and promoted a conducive environment for research.

> We don't just make decisions and tell everyone what to do … we discuss … have meetings all the time and think through things and listen to one another and I think that makes it really useful. (PI1, HIC)

Available resources

Stakeholders across almost all projects discussed the challenges arising from limited funding towards implementation. While federal policies were designed to support NCDs, gaps in availability of medicines, medical equipment and inadequate budget allocation posed challenges.

> We are all saying NCDs prevalence is on the rise. But the resources are not enough to the way we are seeing the prevalence and the complications … the prevalence is not translating to availability of resources. [There is] a mismatch. (Government representative1, LMIC)

Researchers reported that the quality of delivery of the intervention was affected by a lack of human resources, including understaffed centres, poorly trained staff, missing or non-functional basic medical equipment, such as blood pressure monitors, and lack of materials, such as medications.

Implementers who used digital health innovations struggled with practical challenges, such as internet availability and availability of electricity to charge devices in remote areas. COVID-19 exacerbated problems as all funding allocated for implementation was diverted to the pandemic response. On the positive side, complications due to COVID-19 and diabetes raised NCD awareness among policymakers and community members.

Access to knowledge and information

Frequent turnover of trained frontline staff was a concern for assuring the fidelity of intervention and sustainability. While technology-related innovations featured in several studies, frontline staff, particularly older staff, were often unfamiliar with the use of gadgets, such as tablets and smartphones, and consequently reluctant to adopt these technologies.

> But these people just get minimum training on how to screen or use (the tablet) … these (frontline workers) are like grandmothers in the rural areas who might not even know how to use the smart phone. (Implementer1, LMIC)

Some project members discussed the inadequacy of relying solely on online training programmes or manuals and that supplemental hands-on training was required to ensure thorough training of frontline workers.

COVID-19 provided an impetus for acceptance of technology, and many study teams adapted their interventions to use online resources.

Individuals domain

Our findings reveal the pivotal role of leadership across all stakeholder groups.

Role of high-level leaders

PIs played a crucial role during implementation and in setting the culture within the collaboration.

> You don't have a good project if you don't have a good leadership. That's it. Because you need to pursue it, you need to put in effort, you need to share it, you need to communicate, then you need to have to be convinced of something, believe in something, and then share. And it is done. (PI4, LMIC)

PIs from the implementing country had extensive responsibilities requiring a diverse skill set. The roles and attributes that we identified included having research expertise, local experience, personal high-level connections, project management skills, problem-solving skills, communication, leadership and having a clear vision and passion for improving NCD prevention and control.

Investigators respected their counterparts for their research achievements, integrity and for expressing genuine concern for the well-being of team members. Experience in the implementing country was perceived to be an asset as it provided knowledge of local context, respect for culture and traditions, and an understanding of field realities.

PIs identified that it was critical to identify a suitable high-level policymaker, with power and authority, early in the process.

> There are gatekeepers that you need to go through. And sometimes for whatever reason, the gatekeepers decide that they don't want you going through, and this type of research cannot proceed (Project member1, HIC)

These identified leaders were typically influential decision-makers who were willing to use their power to champion the research within the government and were keen to actively collaborate with researchers during implementation.

Implementation leads

Implementation leads, who were responsible for driving the implementation, varied across studies and included government health representatives, healthcare providers and non-government organisations (NGOs). Important qualities for implementers included progressive thinking, leadership, enthusiasm and ability to drive and effect behaviour change in the frontline staff. Some researchers reported challenges when implementation was not fully supported by leaders.

> … because if you want to change, like reorganise some services, you need to involve the leader. They are the ones who make decisions … And if they are not supporting on you, it is likely to fail. (PI8, LMIC)

In studies where adoption varied across regions, researchers facilitated communication between early adopters of the innovation, that is, 'successful' centres, with other centres that demonstrated reluctance to implementation. This sharing of experiences encouraged broader uptake of the intervention.

Implementation process domain

This domain included six enabling constructs and two constructs, tailoring strategies and engaging, both facilitated and challenged implementation. These corresponded to themes of contextualisation, consultation, communication and stakeholder networking.

Teaming

PIs indicated that most policymakers were genuinely interested in local evidence to improve population health, and this positive attitude facilitated government-level engagement. Early contact with policymakers, often prior to applying for funding, was essential to bring clarity to the goals of research, gain support required from the government and discuss ownership for sustainability of the programmes.

> Even though you are working with the university … always we wanted to bring the government on board. Because we will implement this project there for 3 years, 4 years … 5 years. But ultimately what will remain there is the government … the health system is run by the government. So, if you don't bring the government on board, who will buy your … evidence base? (PI6, HIC)

Assessing needs

PIs stressed the importance of understanding the needs of all stakeholders. Learning the needs of frontline health workers was crucial to implementation as they often had multiple responsibilities limited skills and received minimal payment for their work.

> I know that people that work in the healthcare facility … they like to work … and when you go there, they didn't do anything. They don't want to do it. And just because the payment or the salaries are small, they are little, not enough (PI4, LMIC)

Understanding community needs and prevailing socio-cultural norms was essential to tailor the interventions for better acceptability. For example, in some contexts, men and women did not mix in public spaces, so interventions had to be tailored to accommodate this practice. Researchers suggested that a formative or pilot phase of community engagement was important for understanding needs and developing acceptable interventions.

Assessing context

PIs discussed the importance of understanding the local context and considering regional differences in community sociodemographics or availability of health system resources when tailoring interventions for greater impact and sustainability.

> … the previous [similar] studies basically tried to implement a unified [countrywide] strategy rather than to actually be tailored into the local context … now they have the different focus on different provinces about how they are implemented. (PI9, LMIC)

Understanding this context through widespread consultation required time and effort.

Planning

Comprehensive planning was viewed as being essential for collaborative research as it provided the structure and methodological rigour to research. As the funded studies included multidisciplinary international teams with multiple parallel workstreams, planning was necessary to ensure that governance structure aided collaborative research, information sharing, decision-making for operational and research decisions, and for training and capacity building.

Tailoring strategies

Maintaining research rigour while addressing local needs was sometimes challenging and required researchers to be flexible and adaptable. Additionally, researchers discussed challenges related to managing the theoretical side of research with the operational and implementation realities.

> Yeah, I would say that basically on paper you know all looks super nice and exciting and perfect and that is also why they really engaged and motivated the field actors originally. But then in the whole implementation process it is not just as easy as it is to write it out on paper. (Project member3, HIC)

Engaging

Researchers recognised that mplementation requires communication, participation and contribution from different stakeholders to ensure that the intervention addresses their needs thereby improving acceptance, and sustainability. Researchers based in the country of implementation were responsible for leading the engagement activities. They described the process as being continuous throughout the early implementation phase with frequent conversations with policymakers to keep them updated about the study. Policymakers were busy people with multiple responsibilities and these conversations helped to keep the programme 'on their radar' (PI6, LMIC) and ensure their continued support. For frontline workers and community, providing early practical and tangible benefits such as simplifying work protocols or improving screening, respectively proved useful.

COVID-19 impacted most engagement activities. Interventions that addressed treatment could not be continued because patients stopped visiting medical centres, while. meeting restrictions significantly affected interventions delivered using community participatory approaches or those focused on community education. Projects in which healthcare staff implemented the intervention were also affected because of diversion of responsibilities. However, rapid proliferation and acceptance of online communication platforms helped resume consultation. In some studies, this resulted in researchers considering implementation in new, remote regions which had not been considered previously.

Reflecting and evaluating

Continuous feedback within the research collaboration facilitated joint reflection, and governance structures supported this process through regular meetings. There were several examples on the benefits of keeping the policy-makers involved and updated about study progress. Researchers identified that discussions using simple and clear language facilitated sharing of progress and early results with policymakers and other stakeholders.

> … based on the preliminary result we are doing a stakeholders' meeting involving manufacturers and involving regulatory bodies … hosted jointly by my institution. So, we get our chief executive involved so that the community can buy-in more and the chief executive of the [another government agency] So, when we get them we show them this is your results. (PI5, LMIC)

Alongside individual interactions, researchers organised group-based, joint stakeholder workshops to promote interaction between the different stakeholder groups. Such platforms encouraged sharing of evidence, promoted joint problem-solving and helped develop networks for cohesive action.

Adapting

Project PIs suggested that being responsive, flexible and adapting to implementation challenges was critical for implementation research. This was exemplified during the COVID-19 pandemic when researchers across all projects had to alter their original plans. Minor changes included reallocation of budgets or adjusting timelines. More extensive changes included reprioritising tasks, spending more time developing protocols and data collection tools, and capacity building.

Aside from the pandemic, there were other challenges which required design changes. Some examples of project adaptation included consideration of dropping countries from the plans because of limited government commitment or changing implementation partners due to identified power-related issues.

In one example, the PIs had to consider modifying the study design to accommodate policymaker requirements.

> That [The original plan] would have been too complex and not feasible anymore because of the lack of financial support. But then that is how we came to this other reform where they were very happy to collaborate basically. (PI2, LMIC)

DISCUSSION

We sought to identify factors that influence the early implementation phase of research studies funded to scale-up hypertension and/or diabetes interventions in low-resource settings.

There existed significant challenges in the outer setting domain of CFIR including COVID-19, political unrest, some difficulties of implementation within decentralised health systems, and power-related issues which hindered commitments to implementation. Additional challenges included quality of resources (inner setting domain), and the time and effort required for stakeholder consultations (process domain). COVID-19 presented a common challenge, requiring adaptability and flexibility of the research team. Importantly, the pandemic highlighted the need to address the burden of NCDs at the policy, health system and community levels. It facilitated the acceptance and use of online communication platforms, creating opportunities for future implementation and scale-up.

The application and suitability of the CFIR domain and construct categorisations for use in LMIC settings has been discussed previously.[33] The framework provided us with a comprehensive structure to systematically map the inductively identified challenges and facilitators faced during the early implementation phase of scaling up.

Three groups of strategies were identified as being critically important for implementation across projects and contexts: (i) trust and personal connections; (ii) stakeholder engagement; and (iii) researchers' interpersonal skills. Trusting relationships, connections and networks were considered fundamental for implementation research and for scaling up. Coproduction of knowledge and local contextualisation requires strong relationships and time.[34] Respectful relationships set a 'climate of trust'[35] and serve as a foundation for collaborative

scale-up activities.[36] Policymakers trust researchers with a proven track record of undertaking robust research in the implementing country.[37–39] Similarly, trust between implementers and community members is essential for successful implementation.[26 40–42] These strong, trusting relationships were leveraged by researchers and operational team members, to gain access to decision-makers, secure commitments and facilitate ongoing engagement between the inner setting and the outer setting stakeholders.[43 44]

Our findings support the notion that networks between team members and stakeholders enhances the research team's ability to navigate implementation challenges in the field. During COVID-19, projects with existing strong relationships were able to maintain communication with decision-makers to jointly solve problems and consider how project work could be supported or adapted under challenging circumstances. Stakeholder consultation plays a vital role in implementation science research, enabling coproduction and local contextualisation.[45–47] However, this study highlighted the importance of building stakeholder networks that connect local organisations, communities, non-governmental organisations, private sector, health industries, food and drug industries, and different government bodies to support scale-up of interventions targeted at NCDs.[48] These networks foster a collective stakeholder voice and create a web of influence to drive policy level changes.[49]

Our findings underscore the role of interpersonal communication, negotiation and leadership skills to secure commitments and encourage policy and practice changes. While robust, scientific evidence and contextual knowledge are vital, they may not be sufficient to drive policy and practice.[49–51] Facilitating coproduction and leading stakeholder consultation require specific skills and dedicated time from researchers and operational staff.[52–56] These critical skills are not routine in research training, so are not common among researchers.

Collaborative research partnerships help to provide the balance of skills that can inform and support scaling up interventions. Interpersonal skills and respect are fundamental to establishing intellectual relationships that encourage cross-fertilisation of knowledge across contexts and promote health equity while also building global capacity in implementation research.[36 57 58]

The head-heart-hands model, based on the three domains of knowledge found in classical education theory, and referring to cognitive, psycho-social and psycho-motor skills can also be applied to understand the skills required by researchers for supporting meaningful engagement during scale-up. Researchers shared examples of stakeholder conversations that addressed the head (explaining the research's benefits), the heart (articulating the long-term goal of genuinely improving people's health and well-being) and the hands (encouraging commitment and active involvement from stakeholders). This insight demonstrates that policy and practice change is primarily powered through personal interactions,[59] and underscores the importance of leadership to spearhead the process.

Strengths and limitations

The strength of this study is the collaborative examination of stakeholder experiences from 19 diverse funded scale-up projects in global health. Second, by including the perspectives of different stakeholders who contributed to the research projects in different ways, we captured the views of a range of sectors, disciplines and geographies. Third, the timing of this study provided the opportunity to reflect on the impact of COVID-19 during the early implementation phase.

There are limitations that must be acknowledged. First, while we had good participation (19 out of 27 study teams) not all the study teams participated and we could not interview stakeholders from all implementing countries, potentially compromising the transferability of our findings. Since the PIs provided provisional lists of participants to be interviewed there is some possibility that we did not capture a fair representation of all viewpoints within each study. Second, due to limited representation of government representatives, this paper mainly presents the perspectives of researchers. Third, the impact of the pandemic may have overshadowed any other implementation challenges that might have been encountered under normal circumstances. Fourth, this study was focused on the early implementation phase, and limits our ability to assess the adaptation resulting from COVID-19 and subsequent impact. Therefore, the lessons learnt from this study are more related to the conduct of the implementation research than on being able to reflect on other challenges such as the sustainability of the intervention. Further, the study's findings may be influenced by specific research projects and contexts included in the analysis, potentially limiting generalisability to other NCD scale-up initiatives.

CONCLUSIONS

This study presents lessons from GACD-funded hypertension and diabetes scale-up research studies in global health. Trustworthy relationships and existing linkages between the research consortia members and stakeholders in the implementing country are vital prerequisites for conducting research on scaling up interventions. Researchers must strategically consider these linkages when planning studies and strengthen them during implementation. Encouraging partnerships between stakeholders including policymakers, implementers, NGOs and academia, is crucial for cohesive action and establishes the groundwork for undertaking long-term sustainable transformations. Interpersonal communication, negotiation and leadership skills are as fundamental to implementing research as research expertise and analytical skills, as they drive policy and practice changes. These skills must be considered as essential competencies for scale-up research.

Author affiliations
[1]Department of Medicine, School of Clinical Sciences at Monash Health, Monash University, Clayton, Victoria, Australia
[2]Monash Centre for Health Research and Implementation (MCHRI), Monash University in partnership with Monash Health, Clayton, Melbourne, Victoria, Australia
[3]Department of Family Health and Population Medicine, University of Antwerp, Antwerpen, Belgium
[4]Department of Sociology, Centre for Population, Family & Health, University of Antwerp, Antwerpen, Belgium
[5]Chronic Disease Initiative of Africa, University of Cape Town, Rondebosch, South Africa
[6]Department of Public Health, Vrije Universiteit Brussel, Brussel, Belgium
[7]Department of Population Health, NYU Grossman School of Medicine, New York, New York, USA
[8]CRONICAS Center of Excellence in Chronic Diseases, Universidad Peruana Cayetano Heredia, Lima, Peru
[9]Sydney School of Public Health, Faculty of Medicine and Health, University of Sydney, Sydney, New South Wales, Australia
[10]Fundacion Ekorural, Quito, Ecuador
[11]Technology and Innovation, Wageningen University, Wageningen, The Netherlands
[12]School of Population Health, University of New South Wales, Sydney, New South Wales, Australia
[13]The George Institute for Global Health, Delhi, India

X Anusha Ramani-Chander @AnushRC and Peter Delobelle @PDelobelle

Acknowledgements First, we would like to acknowledge all the GACD Upscaling Working Group members for their contributions at all stages of this study. A study of this scale would not have been possible without their ongoing commitment and support. We extend our heartfelt gratitude to all the lead investigators and team members who generously shared their confidential study data with us through this research process. Their collaboration and contributions have been vital to the accomplishment of this large-scale undertaking. We would like to also express our profound gratitude to all the interview participants including the investigators, policymakers, implementers and staff members. Their willingness to allocate valuable time and provide insightful input has played a central role in the completion of this study. Their expertise and experiences have significantly enriched our understanding and findings and we are thankful for this. We would like to express our sincere appreciation to the GACD Secretariat and its dedicated staff members for their ongoing assistance in facilitating the coordination of this working group, which has been instrumental in the successful execution of this study.

Collaborators Gina Agarwal, Department of Family Medicine, McMaster University, Hamilton, Ontario, Canada.Laura Antonietti, Health Sciences Institute, Universidad Nacional Arturo Jauretche, Florencio Varela, Buenos Aires, Argentina; Andrea Beratarrechea, Department of Research in Chronic Diseases, Institute for Clinical Effectiveness and Health Policy, Buenos Aires, Argentina; Josephine Birungi, Medical Research Council/Uganda Virus Research Institute & London School of Hygiene and Tropical Medicine (MRC/UVRI & LSHTM) Uganda Research Unit; The AIDS Support Organisation (TASO) Uganda; Meena Daivadanam, Global Health and Migration Unit, Department of Women's and Children's Health, Uppsala University, Sweden; Jan-Walter De Neve, Heidelberg Institute of Global Health, Faculty of Medicine and University Hospital, Heidelberg University, Heidelberg, Germany; Maria Eugenia Esandi, Epidemiological Research Institute, National Academy of Medicine, Buenos Aires, Argentina; Department of Economy, Universidad Nacional del Sur, Argentina; Pascal Geldsetzer, Division of Primary Care and Population Health, Department of Medicine, Stanford University, Stanford, California, USA; Chan Zuckerberg Biohub – San Francisco, San Francisco, California, USA; Hassan Haghparast-Bidgoli, Institute for Global Health, University College London, United Kingdom; Feng J He, Wolfson Institute of Population Health, Barts and The London School of Medicine & Dentistry, Queen Mary University of London, Charterhouse Square, London, United Kingdom; Mark D Huffman, Cardiovascular Division and Global Health Center, Washington University in St. Louis, St. Louis, USA; The George Institute for Global Health, Faculty of Medicine, University of New South Wales, Sydney, Australia; Vilma Irazola, Department of Research in Chronic Diseases, Institute for Clinical Effectiveness and Health Policy (IECS), Buenos Aires, Argentina; Kerstin Klipstein-Grobusch, Julius Global Health, University Medical Center Utrecht, Utrecht University, Utrecht, The Netherlands; School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa; Jaap Koot, Unit of Global Health, Department of Health Sciences, University of Groningen, University Medical Center Groningen, Groningen, The Netherlands; Maria Lazo-Porras, CRONICAS Centre of Excellence in Chronic Diseases, Universidad Peruana Cayetano Heredia, Lima, Peru; Naomi Levitt, Chronic Disease Initiative for Africa, Department of Medicine, University of Cape Town, Cape Town, South Africa; Yuan Li, Nutrition and Lifestyle Program, The George Institute for Global Health, Beijing, China; Faculty of Medicine, University of New South Wales, Sydney, Australia; Milena Soriano Marcolino, Medical School and Telehealth Center, University Hospital, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; Monika Martens, Department of Public Health, Institute of Tropical Medicine, Antwerp, Belgium; Department of Family Medicine and Population Health (FAMPOP); Faculty of Medicine and Health Sciences, University of Antwerp, Antwerp, Belgium; Sayoki G Mfinanga, National Institute for Medical Research, Muhimbili Centre, Dar es Salaam, Tanzania; Liverpool School of Tropical Medicine, Liverpool, United Kingdom; Violet Naanyu, Moi University & AMPATH Research, Eldoret, Kenya; Keiko Nakamura, Department of Global Health Entrepreneurship, Division of Public Health, Tokyo Medical and Dental University, Tokyo, Japan; Dike Ojji, Department of Internal Medicine, Faculty of Clinical Sciences, University of Abuja and University of Abuja Teaching Hospital, Gwagwalada, Abuja, Nigeria; Brian Oldenburg, Department of Cardiovascular Research, Translation and Implementation, Baker Heart and Diabetes Institute and La Trobe University, Melbourne, Australia; Zulma Ortiz, Epidemiological Research Institute, National Academy of Medicine, Buenos Aires, Argentina; Mayowa Owolabi, Department of Medicine, University of Ibadan, Ibadan, Nigeria; Ari Probandari, Department of Public Health, Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia; Lal B Rawal, School of Health, Medical and Applied Sciences, College of Science and Sustainability, Central Queensland University, Sydney Campus, Australia; Antonio Luiz Pinho Ribeiro, Department of Internal Medicine, Faculdade de Medicina, and Telehealth Center and Cardiology Service, Hospital das Clínicas, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil; Abha Shrestha, Department of Community Medicine, Dhulikhel Hospital Kathmandu University Hospital, Kathmandu University of Medical Sciences, Nepal and La Trobe University, Australia; Kamran Siddiqi, Department of Health Sciences, University of York, York, United Kingdom; Sujarwoto Sujarwoto, Department of Public Administration, University of Brawijaya, Malang, Indonesia; Gindo Tampubolon, Global Development Institute, University of Manchester, Manchester, United Kingdom; National Institute for Health and Care Research (NIHR) Older People and Frailty Policy Research Unit (PRU), University of Manchester, Manchester, United Kingdom; Gade Waqa, C-POND, Fiji National University, College of Medicine, Nursing and Health Sciences, Fiji; Puhong Zhang, The George Institute for Global Health, Beijing, China; Faculty of Medicine, University of New South Wales, Sydney, Australia.

Contributors AR-C, AGT and RJ were the core research group and were involved in the design of the work, during data collection, data analysis and interpretation. They were responsible for drafting the original manuscript, collating and reviewing coauthor feedback, finalising the second draft, and preparing the final manuscript. RJ is the guarantor and accepts full reponsibility for the work, the conduct of the study, had access to the data, and controlled the decision to publish. JvO, EW, PD, RV, JJM, SS and HT made substantial contribution to the conception of this work, provided major intellectual input towards the content, and made substantial contribution to the writing of this manuscript. The collaborating author group consist of GA, LA, AB, JB, MD, J-WDN, MEE, PG, HHB, FJH, MDH, VI, KKG, JK, MLP, NL, YL, MSM, MM, SGM, VN, KN, DO, BO, ZO, MO, AP, LBR, ALPR, AS, KS, SS, GT, GW and PZ. These coauthors were involved in the original design of this work. They have provided feedback, intellectual input, and made significant contribution to the writing of the manuscript. We have all coauthor consent for the submitted version.

Funding All studies that were included were funded as part of the GACD 2019 scale-up funding initiative. The GACD secretariat funded the open access publication charges for this research.

Map disclaimer The depiction of boundaries on this map does not imply the expression of any opinion whatsoever on the part of BMJ (or any member of its group) concerning the legal status of any country, territory, jurisdiction or area or of its authorities. This map is provided without any warranty of any kind, either express or implied.

Competing interests AR-C declares funding from Monash University Departmental Scholarship. AGT declares funding from the National Health & Medical Research Council (NHMRC, Australia: GNT1042600, GNT1122455, GNT1171966, GNT1143155, GNT1182017, GNT2015976), and Heart Foundation Australia (VG102282) outside the submitted work. JvO reports Horizon2020 grants (643 692 and 825432) outside the submitted work. HT declares funding

from National Health & Medical Research Council outside the submitted work. RJ declares grant, outside the submitted work, from WHO Geneva, WHO South- East Asia Region (SEARO), Elrha Research for Health in Humanitarian Crises (R2HC) (Wellcome Trust, UK AID and NHS), DBT/Wellcome Trust India Alliance, NHMRC-GACD, DFAT, CDC Foundation, Health Systems Enablement and Innovation Institute, WITS University, South Africa, and Gates Foundation MDH from the George Institute, which Hitchcock has a patent and has received investments for commercialisation of fixed dose combinations for patient with and at risk for cardiovascular disease. I also have a planned patent for heart failure polypills. ALPR is supported in part by CNPq (310790/2021-2 and 465518/2014-1) and by FAPEMIG (PPM-00428-17 and RED-00081-16).

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Ethics approval was obtained from Monash University Human Research Ethics Committee (HREC number 23482). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data sharing not applicable as no datasets generated and/or analysed for this study. Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

ORCID iDs
Anusha Ramani-Chander http://orcid.org/0000-0003-2461-7139
Rohina Joshi http://orcid.org/0000-0002-3374-401X

REFERENCES

1 NCD Countdown 2030 collaborators. NCD Countdown 2030: efficient pathways and strategic investments to accelerate progress towards the sustainable development goal target 3.4 in low-income and middle-income countries. *Lancet* 2022;399:1266–78.
2 Jamison DT, Summers LH, Alleyne G, *et al*. Global health 2035: a world converging within a generation. *Lancet* 2013;382:1898–955.
3 Simmons R, Fajans P, Ghiron L. Scaling up health service delivery: from pilot innovation to policies and programmes. 2007. Available: https://www.who.int/reproductivehealth/publications/strategic_approach/9789241563512/en/ [Accessed Sep 2019].
4 Milat AJ, Newson R, King L. Increasing the scale and adoption of population health interventions: experiences and perspectives of policy makers, practitioners, and researchers. *Health Res Policy Sys* 2014;1478–4505–12–18.
5 Mangham LJ, Hanson K. Scaling up in international health: what are the key issues? *Health Policy Plan* 2010;25:85–96.
6 Bennett JE, Stevens GA, Mathers CD, *et al*. NCD countdown 2030: worldwide trends in non-communicable disease mortality and progress towards sustainable development goal target 3.4. *The Lancet* 2018;392:1072–88.
7 World Health Organization. World health Statistics: monitoring health for the Sdgs. 2020. Available: https://www.who.int/publications/i/item/9789240005105 [Accessed Feb 2021].
8 Atun R, Jaffar S, Nishtar S, *et al*. Improving responsiveness of health systems to non-communicable diseases. *Lancet* 2013;381:690–7.
9 Almas A, Awan S, Bloomfield G, *et al*. Opportunities and challenges to non-communicable disease (NCD) research and training in Pakistan: a qualitative study from Pakistan. *BMJ Open* 2022;12:e066460.
10 Kruk ME, Yamey G, Angell SY, *et al*. Transforming global health by improving the science of scale-up. *PLoS Biol* 2016;14:e1002360.
11 Allen C, Metternicht G, Wiedmann T. Initial progress in implementing the sustainable development goals (SDGs): a review of evidence from countries. *Sustain Sci* 2018;13:1453–67.
12 World Health Organization. Practical guidance for Scaling up health service innovations. 2009. Available: https://www.who.int/reproductivehealth/publications/strategic_approach/9789241598521/en/ [Accessed Sep 2019].
13 Nilsen P, Birken SA. *ProQuest. Handbook on implementation science*. Northampton: Edward Elgar Publishing, 2020.
14 Paina L, Peters DH. Understanding pathways for scaling up health services through the lens of complex adaptive systems. *Health Policy Plan* 2012;27:365–73.
15 van Olmen J, Erwin E, García-Ulloa AC, *et al*. Implementation barriers for mHealth for non-communicable diseases management in low and middle income countries: a scoping review and field-based views from implementers. *Wellcome Open Res* 2020;5:7.
16 Yamey G. What are the barriers to Scaling up health interventions in low and middle income countries? A qualitative study of academic leaders in implementation science. *Global Health* 2012;8:11.
17 Limbani F, Goudge J, Joshi R, *et al*. Process evaluation in the field: global Learnings from seven implementation research hypertension projects in low-and middle-income countries. *BMC Public Health* 2019;19:953.
18 Jackson-Morris AM, Mutungi G, Maree E, *et al*. Implementability' matters: using implementation research steps to guide and support non-communicable disease national planning in low-income and middle-income countries. *BMJ Glob Health* 2022;7:e008275.
19 Dong R, Leung C, Naert MN, *et al*. Chronic disease stigma, skepticism of the health system, and socio-economic fragility: qualitative assessment of factors Impacting Receptiveness to group medical visits and microfinance for non-communicable disease care in rural Kenya. *PLoS One* 2021;16:e0248496.
20 Global Alliance for Chronic Diseases. Scale up call joint release. 2019. Available: https://www.gacd.org/perch/resources/gacd-scale-up-call-joint-release.pdf [Accessed Apr 2020].
21 Global Alliance for Chronic Diseases. List of projects that received research funding in the scale up call. 2019. Available: https://www.gacd.org/research-projects?diseases=scale-up&programme-countries= [Accessed Apr 2020].
22 Global Alliance for Chronic Diseases. GACD 5th UPS^{Ca}LING Call-hypertension and diabetes. 2018. Available: https://www.gacd.org/funding/calls-for-proposals/gacd-scale-up-call/common-call-text
23 Ramani-Chander A, Joshi R, van Olmen J, *et al*. Applying systems thinking to identify enablers and challenges to scale-up interventions for hypertension and diabetes in low-income and middle-income countries: protocol for a longitudinal mixed-methods study. *BMJ Open* 2022;12:e053122.
24 Ramani-Chander A, Thrift A, van Olmen J, *et al*. Prioritising and planning scale-up research projects targeting non-communicable diseases: a mixed-method study by the global alliance for chronic diseases upscaling working group. *BMJ Glob Health* 2023;8:e012804.
25 McMahon SA, Winch PJ. Systematic debriefing after qualitative encounters: an essential analysis step in applied qualitative research. *BMJ Glob Health* 2018;3:e000837.
26 Ndejjo R, Wanyenze RK, Nuwaha F, *et al*. Barriers and facilitators of implementation of a community cardiovascular disease prevention programme in Mukono and Buikwe districts in Uganda using the consolidated framework for implementation research. *Implement Sci* 2020;15:106.
27 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2008;3:77–101.
28 O'Connor C, Joffe H. Intercoder reliability in qualitative research: debates and practical guidelines. *Int J Qual Methods* 2020;19:160940691989922.
29 Joshi R, Lopez AD, MacMahon S, *et al*. Verbal autopsy coding: are multiple coders better than one. *Bull World Health Organ* 2009;87:51–7.
30 National Cancer Institute. Qualitative methods in implementation science 2020. Available: https://cancercontrol.cancer.gov/sites/default/files/2020-09/nci-dccps-implementationscience-whitepaper.pdf [Accessed Mar 2023].
31 Keene D. Spotlight on qualitative methods: do I need multiple Coders? Available: https://iaphs.org/demystifying-the-second-coder [Accessed Mar 2023].

32 Damschroder LJ, Reardon CM, Widerquist MAO, *et al*. The updated consolidated framework for implementation research based on user feedback. *Implement Sci* 2022;17:75.
33 Means AR, Kemp CG, Gwayi-Chore M-C, *et al*. Evaluating and optimizing the consolidated framework for implementation research (CFIR) for use in low- and middle-income countries: a systematic review. *Implement Sci* 2020;15:17.
34 Redman S, Greenhalgh T, Adedokun L, *et al*. Co-production of knowledge: the future. *BMJ* 2021;372:n434.
35 World Health Organization. Global status report on non-communicable diseases 2010. 2011. Available: https://www.who.int/nmh/publications/ncd_report_full_en.pdf [Accessed Feb 2020].
36 Oni T, Mogo E, Ahmed A, *et al*. Breaking down the silos of universal health coverage: towards systems for the primary prevention of non-communicable diseases in Africa. *BMJ Glob Health* 2019;4:e001717.
37 Emanuel EJ, Wendler D, Killen J, *et al*. What makes clinical research in developing countries ethical? The benchmarks of ethical research. *J Infect Dis* 2004;189:930–7.
38 Jessani NS, Rohwer A, Schmidt B-M, *et al*. Integrated knowledge translation to advance noncommunicable disease policy and practice in South Africa: application of the exploration, preparation, implementation, and sustainment (EPIS) framework. *Health Res Policy Syst* 2021;19:82.
39 Cooley L, Kohl R. Scaling up—from vision to large-scale change: a management framework for practitioners. 2006.
40 Fazelipour M, Cunningham F. Barriers and Facilitators to the implementation of brief interventions targeting smoking, nutrition, and physical activity for indigenous populations: a narrative review. *Int J Equity Health* 2019;18:169.
41 Gibson O, Lisy K, Davy C, *et al*. Enablers and barriers to the implementation of primary health care interventions for indigenous people with chronic diseases: a systematic review. *Implement Sci* 2015;10:71.
42 World Health Organization. Time to deliver: report of the WHO independent high-level commission on noncommunicable diseases. 2018. Available: https://apps.who.int/iris/handle/10665/272710
43 Firth SM, Hart JD, Reeve M, *et al*. Integrating community-based verbal autopsy into civil registration and vital statistics: lessons learnt from five countries. *BMJ Glob Health* 2021;6:e006760:11:.
44 Edwards A, Zweigenthal V, Olivier J. Evidence map of knowledge translation strategies, outcomes, facilitators and barriers in African health systems. *Health Res Policy Syst* 2019;17:16.
45 Marten R, Mikkelsen B, Shao R, *et al*. Committing to implementation research for health systems to manage and control non-communicable diseases. *Lancet Glob Health* 2021;9:e108–9.
46 Powell BJ, Beidas RS, Lewis CC, *et al*. Methods to improve the selection and tailoring of implementation strategies. *J Behav Health Serv Res* 2017;44:177–94.
47 Peters DH, Adam T, Alonge O, *et al*. Republished research: implementation research: what it is and how to do it. *BMJ* 2013;347:f6753.
48 Hunter RF, Wickramasinghe K, Ergüder T, *et al*. National action plans to tackle NCDs: role of stakeholder network analysis. *BMJ* 2019;365:l1871.
49 Vanyoro KP, Hawkins K, Greenall M, *et al*. Local ownership of health policy and systems research in low-income and middle-income countries: a missing element in the uptake debate. *BMJ Glob Health* 2019;4:e001523.
50 Onwujekwe O, Etiaba E, Mbachu C, *et al*. Does improving the skills of researchers and decision-makers in health policy and systems research lead to enhanced evidence-based decision making in Nigeria?—a short term evaluation. *PLoS One* 2020;15:e0238365.
51 Ghaffar A, Ijsselmuiden C, Zicker F. Changing Mindsets: research capacity strengthening in Low- and middle-income countries. Council on health research for development (COHRED). 2008. Available: http://www.cohred.org/downloads/cohred_publications/Changing_Mindsets.pdf [Accessed Mar 2023].
52 Agyepong IA, Godt S, Sombie I, *et al*. Strengthening capacities and resource allocation for co-production of health research in low and middle income countries. *BMJ* 2021;372:n166.
53 Abraham TH, Stewart GL, Solimeo SL. The importance of soft skills development in a hard data world: learning from interviews with Healthcare leaders. *BMC Med Educ* 2021;21:147.
54 Schleiff M, Hansoti B, Akridge A, *et al*. Implementation of global health competencies: a scoping review on target audiences, levels, and pedagogy and assessment strategies. *PLoS One* 2020;15:e0239917.
55 Beran D, Pesantes MA, Berghusen MC, *et al*. Rethinking research processes to strengthen co-production in low and middle income countries. *BMJ* 2021;372:m4785.
56 Murphy JK. Considerations for supporting meaningful stakeholder engagement in global mental health research. *Epidemiol Psychiatr Sci* 2022;31:e54.
57 Binagwaho A, Nutt CT, Mutabazi V, *et al*. Shared learning in an interconnected world: innovations to advance global health equity. *Global Health* 2013;9:37.
58 Ezeanolue EE, Menson WNA, Patel D, *et al*. Gaps and strategies in developing health research capacity: experience from the Nigeria implementation science alliance. *Health Res Policy Sys* 2018;16.
59 Islam MdA, Haji Mat Said SB, Umarlebbe JH, *et al*. Conceptualization of head-heart-hands model for developing an effective 21st century teacher. *Front Psychol* 2022;13:968723.
60 World Bank. Country classification by income. 2023. Available: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [Accessed Jul 2023].