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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

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ABSTRACT

Introduction There is an urgent need to reduce the burden of non-communicable diseases (NCDs), particularly in low-and middle-income countries, where the greatest burden lies. Yet, there is little research concerning the specific issues involved in scaling up NCD interventions targeting low-resource settings. We propose to examine this gap in up to 27 collaborative projects, which were funded by the Global Alliance for Chronic Diseases (GACD) 2019 Scale Up Call, reflecting a total funding investment of approximately US$50 million. These projects represent diverse countries, contexts and adopt varied approaches and study designs to scale-up complex, evidence-based interventions to improve hypertension and diabetes outcomes. A systematic inquiry of these projects will provide necessary scientific insights into the enablers and challenges in the scale up of complex NCD interventions.

Methods and analysis We will apply systems thinking (a holistic approach to analyse the inter-relationship between constituent parts of scaleup interventions and the context in which the interventions are implemented) and adopt a longitudinal mixed-methods study design to explore the planning and early implementation phases of scale up projects. Data will be gathered at three time periods, namely, at planning (T_p), initiation of implementation (T_0) and 1-year postinitiation (T_1). We will extract project-related data from secondary documents at T_p and conduct

Strengths and limitations of this study

- The Global Alliance for Chronic Disease 2019 Scale-up Call provides a unique opportunity to systematically study up to 27 funded scale-up projects in non-communicable diseases being rolled out in low and middle-income countries and other low-resource settings.
- The study team is independent of the scale-up project teams and this will help minimise any conflict of interest that may potentially exist.
- Feedback about the common challenge due to COVID-19 pandemic may overshadow any other challenges that may have existed in scale-up implementation.

multistakeholder qualitative interviews to gather data at T_0 and T_1. We will undertake descriptive statistical analysis of T_p data and analyse T_0 and T_1 data using inductive thematic coding. The data extraction tool and interview guides were developed based on a literature review of scale-up frameworks.

Ethics and dissemination The current protocol was approved by the Monash University Human Research Ethics Committee (HREC number 23482). Informed consent will be obtained from all participants. The study findings will be disseminated through peer-reviewed publications and more broadly through the GACD network.

INTRODUCTION

Non-communicable disease (NCD)-related mortality and morbidity are increasing worldwide. In 2016, an estimated 41 million people died from NCDs globally, accounting for about 71% of global deaths. NCDs are also the leading cause of premature death worldwide, and by far, the greatest proportion of these premature deaths (85%) occurs in low and middle-income countries (LMICs).[1 2] The recent Global Burden of Disease report highlights the increasing burden due to disability from NCDs.[3] In 2019, diabetes is now included as a leading cause of global disability-adjusted life years (DALYs), while 6 of the top 10 leading causes of DALYs are now due to NCDs.[3] This is a dramatic increase from 1990 when only 3 of the top 10 causes of DALYs were attributable to NCDs. This trend is likely to continue given that the population is ageing, and NCDs occur more commonly with advancing age.

The United Nation's Sustainable Development Goals (SDGs), drawn up in 2015, highlighted this growing global burden due to NCDs and specifically set a target to reduce by one-third premature deaths from NCDs by 2030.[4 5] In 2011, global leaders met at the first UN High-Level Meeting and acknowledged the global threat due to NCDs.[6 7] In the third UN High-Level Meeting on NCDs in 2018, this need was reiterated, but it was also recognised that several LMICs faced system-level challenges to achieve their NCD goals such as poor system capacity, weak primary healthcare, limited health infrastructure and investments, resource constraints not limited to financial and also health workforce related, and medical supply-related issues.[2 8–10] Despite this heightened recognition, public health experts and policymakers continue to grapple with these constraints and challenges, which necessitate country-specific strategies to accelerate the reach of evidence-based interventions (EBIs) targeting prevention, treatment and management of NCDs, particularly in low-resource settings.[9–11]

Identification of the issues, challenges and enablers in the implementation of EBIs for prevention and treatment of NCDs, particularly in LMICs, is crucial for enhancing scale-up efforts, and supporting countries to achieve their SDG targets for controlling NCDs.[12–14]

RESEARCH GAP

World Health Organization (WHO) defines a health system as—'consists of organisations, people and actions whose primary intent is to promote, restore or maintain health'.[15] These large systems involve subsystems of interactive elements also referred to as 'building blocks', which include service delivery, infrastructure, workforce, information, medical supplies and finance.[15 16] The interactions and relationships between these system elements and actors—the people who represent each of these elements as stakeholders—form a continuously evolving and dynamic system. These health system components alongside contextual factors such as socioeconomic, political and institutional contexts form a complex environment for scale up. This complex web of interactions can impact all stages of planning, implementation, integration, scale up and sustainability of NCD interventions but have not been adequately researched.[13 16–21] While there is some literature available on small-scale trials of successful implementation of interventions for NCD prevention, information about the challenges in the large-scale implementation of such interventions and the interacting with the health system dynamics is scarce, especially across different contexts.[14 22 23]

A system wide understanding of the issues involved in NCD scale-up efforts and the context in which the programmes are being implemented is timely and necessary in order to make a significant improvement in prevention and treatment efforts globally. We define systems thinking as 'a holistic approach to analyse the interrelationship between constituent parts of scale-up interventions and the context in which the interventions are implemented'.[16–18 21 24] Systems thinking will allow us to explore interconnectedness (context and connections), perspectives and boundaries (scope and scale) of interventions.[18] It will increase our knowledge of the components, actors and stakeholders involved, the role of contextual factors, processes, challenges, enablers and pathways, and on how dynamics and relationships between the different elements evolve as a response to the scale up of interventions.[16 17] Such information will assist researchers, programme implementers, policymakers and other stakeholders to plan, design, guide, implement and evaluate the scale up of NCD interventions more efficiently and effectively.[12 17]

Study context: GACD 2019 scale-up call

The Global Alliance for Chronic Diseases (GACD) is an alliance of health research funders, which co-ordinates and supports implementation research activities that address the prevention and treatment of the major NCDs, such as hypertension, diabetes, cardiovascular disease, lung disease, mental health and cancer. The GACD aims to tackle this increasing burden of NCDs by investing in projects that involve collaborations and partnerships across countries and using these projects to build scientific knowledge in the area of implementation science and research.

In 2019, the GACD released its fifth joint call inviting proposals from projects that were 'Scaling-up projects in prevention and control of Hypertension and Diabetes'.

This is the first time that global funding has been made available for scale up of NCD-related interventions, especially in LMICs. This call has resulted in funding of 27 projects globally representing a total funding investment of approximately US$50 million.[25 26] Most projects are being implemented in LMICs spread across South America, Africa and Asia with research partnerships and collaborations in high-income countries (HICs) such as Australia, USA, UK, Canada, Belgium, The Netherlands, Slovenia and Germany. Others are targeted at disadvantaged populations in HICs. This presents a unique opportunity to follow the journey of up to 27 different projects being scaled up in different regions, using various interventions and adopting diverse approaches, but all targeted at preventing or treating hypertension and diabetes.

It should be acknowledged that there is no single agreed on definition for 'scaling up' or 'scale-up', terms that have been widely used in the fields of infectious disease prevention and control, HIV/AIDS and maternal and child health for many years. The WHO and ExpandNet define scale-up as 'deliberate efforts to increase the impact of successfully tested health innovations so as to benefit more people and to foster policy and programme development on a lasting basis'.[27] Depending on the pathway adopted, scale-up projects may be described as being horizontal when the project expands the reach of the programme to cover more people; vertical mostly refers to institutionalisation and integration into policy or health system changes; and diversification refers to adding more interventions to the same population.[23 27–31] Projects could also adopt a combination of these pathways. Scale out is another term that is encountered in implementation science literature and mostly refers to the adaptation efforts and strategies that are involved while implementing EBIs to new populations or a new delivery system, but under conditions that are mostly similar to where the intervention was originally tested.[32]

AIM

The overall aim of this study is to understand the enablers of, and challenges to, scaling up NCD-related interventions in LMICs and vulnerable groups in HICs. We will apply systems thinking to examine up to 27 projects to achieve the following objectives:

1. To identify which NCD interventions and activities are currently part of scale-up research projects.
2. To understand how NCD-related scale-up projects are planned and implemented with a focus on capturing similarities and differences, in the enablers and challenges, that exist both within and between-countries and contexts.
3. To identify the processes and nuances of stakeholder engagement in the planning and development of multicountry and multisectoral collaborative scale-up projects. Specific questions include:
   - How are the stakeholders identified, and roles defined?
   - What are the methods used to establish and sustain engagement?
   - What are the perceptions of stakeholders regarding the planning and roll-out of interventions?
   - What are the governance systems in place to manage and maintain relationships between the stakeholder groups?
   - What is the relationship of the researchers with the other stakeholders?
4. To identify how scale-up projects respond and evolve in response to implementation challenges in the field, such as the COVID-19 pandemic.

CONCEPTUAL FRAMEWORK

We will use the Consolidated Framework for Implementation Research (CFIR) to systematically collect details of the characteristics of the intervention, the implementing organisation, the context, characteristics of the individuals and details of the implementation process.[33] The CFIR framework will also be used to guide the data analysis and present the findings from the different case studies. We will further use the Exploration, Preparation, Implementation, and Sustainment (EPIS) Framework as the overarching framework to guide analysis and present overall findings across all the different projects.[34 35] The EPIS framework is widely used in the implementation science literature and its main components are the four main implementation phases forming the acronym EPIS. It enables systematic collection of factors that bridge the inner and outer context and point to interconnections and interlinkages that characterise the dynamics at play between inner and outer contexts. This framework is well suited to apply to dynamic complex systems, such as scale-up systems, as it considers adaptation as being a necessary part of the implementation process to improve fit between outer and inner contexts and is particularly relevant in multistakeholder projects. In addition, we will consider using other techniques to present specific findings such as the 'most significant change' technique. This technique will be used to determine the process and causal mechanisms of changes made, and in what situations and contexts these changes occur, using short stories or vignettes.[36 37]

METHODS

Since this study is a collaborative effort of several scale-up projects, a logic framework has been developed to help plan and guide all aspects of this study (figure 1).[38 39]

Study design

We will use a multiple case study, longitudinal study design to review up to 27 funded scale-up projects. Longitudinal study design enables us to follow projects over a period of time and to capture data from the projects as snapshots of time. We will use mixed methods to gather data at three time points from every project in real

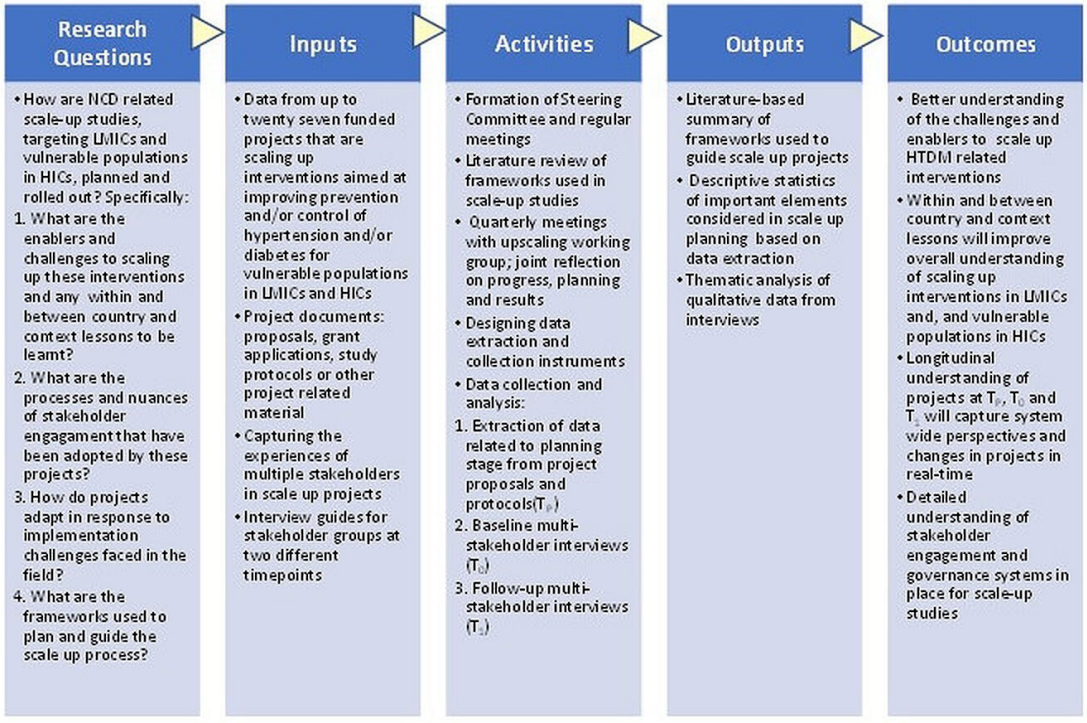

Figure 1 Logic model for the project. HICs, high-income countries; HTDM, hypertension and diabetes mellitus; LMICs, low-income and middle-income countries; NCD, non-communicable disease. Timepoints comprise the following: planning (T_p), initiation (T_0), 1-year post-implementation (T_1).

time, ie, as they are planned and being implemented in the field (figure 2). The first time point will provide a descriptive understanding of the studies, which will be followed by two time points focused on gathering system wide perspectives on the implementation process.[21] Data collected from every project at one time point will be used to guide the data collection for subsequent time points. The mixed method data collection offers the strength of understanding issues from varied theoretical approaches and thereby developing rich insights into complex systems.[19 40 41] The longitudinal study design will be suitable to capture and understand the enablers and challenges that stakeholders face as their projects are planned and rolled out.[16 17 21 28] It will also provide an opportunity to determine how scale-up projects adapt and evolve in response to challenges faced across different stages of the scale-up process.

STUDY SETTING

The GACD secretariat and the Upscaling Working Group

The Upscaling Working Group was established in 2018, under the GACD research network and includes academics and researchers, with projects funded through various GACD calls since 2012, who are interested in developing and contributing to the science of scale-up. Teams from the 27 projects funded as part of the GACD Scale-up Call have also been invited to be a part of this working group (online supplemental appendix 1). We will use the quarterly scale-up group meetings to engage with members, invite them to collaborate in this study, provide opportunities to shape the collaboration, keep the group informed about the progress of this study and jointly reflect on the findings.

Study participants

This protocol comprises up to 27 scale-up projects that have been funded and are currently being implemented. The lead researchers from the funded projects are the main stakeholders for this study and we have codesigned this protocol collaboratively with their involvement. They will be our point of contact for project-related data at all stages. We aim to capture project data from a multistakeholder perspective at project initiation (T_0) and at 1-year post-implementation (T_1). We will include a sample of the following stakeholders from across these projects:

1. Principal/lead investigator (PI), Co-PI or nominated representative(s) from the project teams.
2. Other project investigators, project team members and research partners.
3. Government representatives and policymakers.
4. Country leads, members of civil society and industry partners.
5. Staff members or frontline workers or community health workers.
6. Members of the community where scale-up is planned or end-users of interventions (T_1 only).

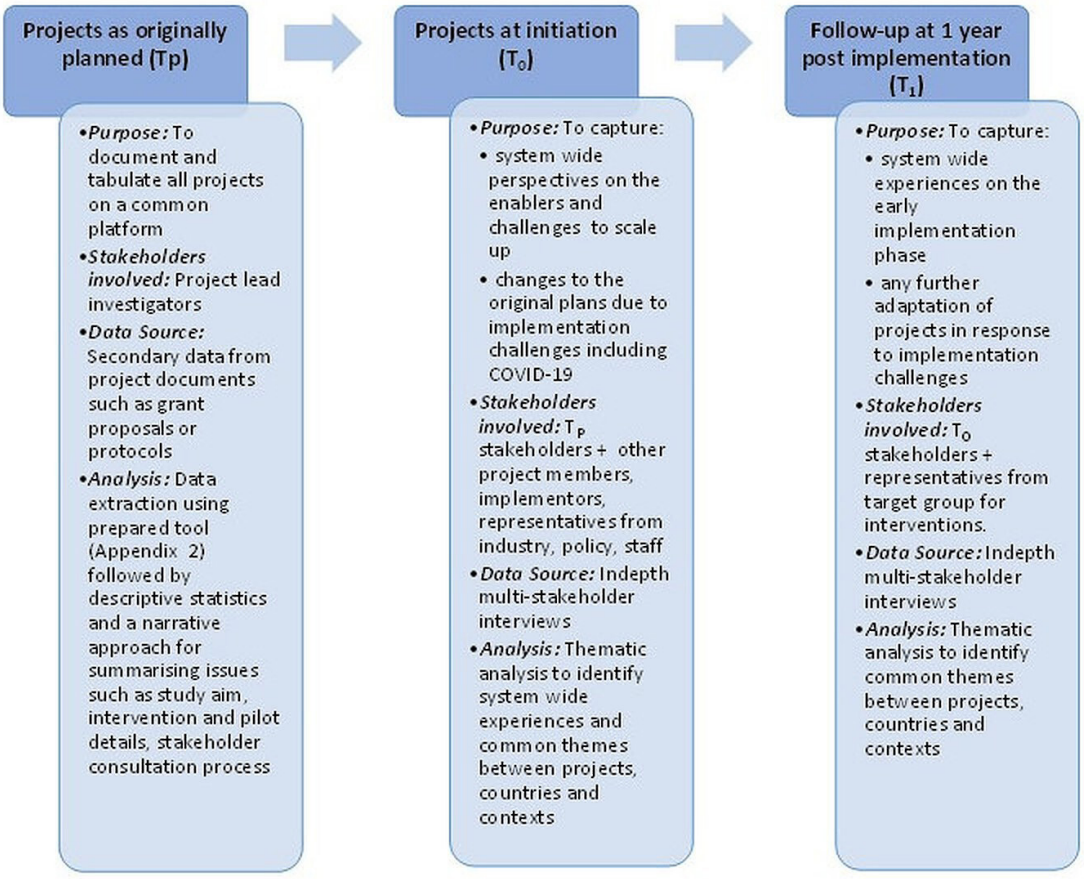

Figure 2 Design of the study.

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research. The individual projects are likely to have community and patient involvement, depending on the specifics of each project, and that will form a part of the individual project protocol and is beyond the scope of this current protocol.

Data collection

Data will be captured from each project at three different time points using a data extraction tool and interview guides (figure 2). The data extraction tool will map different projects and help understand which studies involve health policy, education (prevention) and health systems (prevention and management). We undertook a literature review of scale up studies, with a focus on analysis of frameworks, to develop a roadmap for conducting scale-up studies and thereby guide development of the study tools.[27 31 42–53]

Planning stage (T_p)

Initially, project teams will be invited to share project documents with information regarding how their scale-up project in hypertension and diabetes was originally planned. These documents could include the study protocol, funding application or any other relevant documentation that the teams are willing to share. Using our data extraction tool (online supplemental appendix 2), we will extract the same data from each project.

Interview at project initiation (T_0)

In order to apply a systems thinking lens, semistructured in-depth qualitative interviews will be conducted with a sample of up to five stakeholders from every project. Project-related data gathered at T_p will help guide the discussions at T_0, with multistakeholder interviews used to capture individual perspectives on the challenges and enablers to the scale-up process. We will also be able to capture insights into the nuances of stakeholder engagement and role of relationships that exist within each project. The interviews at this time point will also help capture changes in the project plan that have resulted from the COVID-19 pandemic. Four separate interview guides, targeted specifically at principal investigators, team members, partners, and frontline staff, have been developed for this purpose (online supplemental appendices 3–6). The qualitative data will be audiotaped, transcribed verbatim and, if necessary, translated into English.

One-year post-initiation (T_1)

Follow-up in-depth semistructured qualitative interviews will be conducted with multiple project stakeholders for project data at 1-year postinitiation of implementation. Data collected at T_p and T_0 will help guide the discussions at T_1. Four separate follow-up interview guides have been

developed for this purpose (online supplemental appendices 7–10). These interviews will be used to elucidate how the projects might have been modified based on real-life implementation challenges faced during the first 12 months of implementation. In addition to the investigators, team members, partners and frontline staff interviewed at T_0, at T_1, we also aim to interview members of the community who are recipients of the intervention as it is envisaged that all projects will have initiated engagement and consultation with this stakeholder group by this time point. A fifth interview guide has been developed for this purpose. (online supplemental appendix 11).

We anticipate final data collection for this study will occur in July 2022.

Recruitment

A fair, transparent and collaborative approach will be used to contact the lead investigators for project data. At all stages, we will assure them of data security and confidentiality. To encourage participation, we will reiterate at every stage that the aim of this study is to develop a better shared understanding of scale-up of NCDs.

The project lead investigators will be our point of contact for identifying and introducing the participants to be interviewed for the study. All interviews will be conducted after following ethical processes to obtain informed consent from all participants. The potential participants will be emailed an information sheet, with all details of the study, and a consent form, to be signed and returned, seeking permission for participation and audio recording. Verbal consent will be obtained at the start of each interview. All interviews will be conducted by the first author (AR-C) who is a skilled qualitative researcher with several years of experience across different countries and cultural settings. Interviews will be conducted via phone or Zoom, according to the convenience of the participants. All interviews will be audio recorded and professionally transcribed for analysis purposes. We will work in close conjunction with the teams to understand and respect local sociocultural norms while conducting interviews. Given the broad range of countries that are involved in this study, language may be a challenge while conducting some interviews. In order to minimise bias and maintain quality of data, we will ensure that no translation support will be taken from within the project teams. We will, instead, identify suitable support for other members within the broader GACD umbrella or, if necessary, employ professional translators.

Data analysis

System thinking approaches will be applied for data collection and analysis.[16] We will undertake descriptive statistical analysis of data from T_P and undertake inductive thematic coding analysis of the qualitative interviews conducted at T_0 and T_1 (NVivo software, QSR International, Melbourne, Australia). Thematic analysis of qualitative data will be used to identify any similarities or patterns in the data set from a wide range of perspectives.[54]

Initial data extraction for analysis of T_P will be jointly undertaken by the project team (AR-C, RJ, AGT) and discussed in detail. This will provide validity of the process and results. The extracted data will be reviewed by project teams to ensure data accuracy. We will use descriptive statistics and a narrative approach to summarise the study aim, design, details of pilot studies and intervention selection, governance, type of study and other elements of the scaling-up process, such as range of stakeholders involved and details related to engagement strategy (online supplemental appendix 2), to identify patterns and themes (objective 1).

Transcripts will be open coded using thematic analysis. NVivo software (NVivo software V.12, QSR International, Melbourne, Australia) will be used to assist the investigative team with organising and analysing the qualitative data.

The draft coding scheme will be reviewed by the study team and reconciled by consensus. AR-C will organise participants' responses by the corresponding codes with support and guidance from AGT and RJ who will also review 20% of the interviews and audit the findings. This process will provide additional rigour, accuracy and face validity of results.

Following coding of each study separately, inductive thematic analysis of data obtained at T_0 and T_1 will help identify any patterns of enablers and challenges within and between countries and contexts (objective 2). This approach will help us to explore different stakeholder perspectives, to identify shared challenges and differences, if any, that exist across projects, and to identify any patterns experienced by stakeholders during the scaling-up process. Inductive thematic analysis will also help explore the process of stakeholder engagement, how these are built and strengthened with time and determine differences in the priorities between researchers, partners and other stakeholders (objective 3). The analysis will explore the nature of these relationships and how the scale-up project team govern and manage the stakeholders for flow of information and timely decision-making.

Thematic analysis of the longitudinal collection of data over all time points will be undertaken to assess how projects evolved or adapted in response to challenges arising over time (objective 4). This includes an analysis of how scale-up plans were impacted by the COVID-19 pandemic, and how governments modified their approach to the scale-up when faced with this global pandemic.

DISCUSSION

Programme implementers and policymakers face many challenges in designing and delivering innovative ideas, methods and programmes that offer effective approaches to prevention and management of NCDs particularly in LMICs. Governments and public health systems are already under-resourced, so the increasing burden from NCDs adds to the challenge of delivering programmes in the face of other conflicting health priorities.[55] For

instance, there are reports that the COVID-19 global pandemic has interrupted public health services and NCD efforts in nearly 75% of countries surveyed.[56] Other challenges faced by health systems when implementing NCD-related health programmes include lack of a national NCD policy, inadequate funding allocation, weak health systems and preparedness, poor capacity of health workers and frontline staff and poor technical infrastructure.[57 58]

Scale-up of health system interventions is typically large collaborative efforts and include several stakeholders across different sectors of policymaking, public health, research, implementation agencies, governments, civil society and others.[16 21] These different stakeholders form a complex system with several interactive elements, processes and actors who may at times have conflicting or differing priorities but have to align their common interests during implementation.[15–17 21 28] Presently, there is little information and understanding of these individual components and their interactions, particularly in relation to the scale-up of complex interventions for NCDs.

Systems thinking is an approach that can help explore and identify the individual elements within complex health systems.[16 17] By applying systems thinking to these GACD-funded projects, we will be able to identify how interactions and relationships can potentially influence the scaling-up process. This will help better design these complex interventions in the future, including practical strategies to encourage buy-in and continued engagement, to better promote sustainability.

A major advantage of our analysis is the potential to study a diversity of contexts and a diversity of NCD interventions that can individually influence scale-up efforts, such as the public health context, NCD context, political context, health and other policy context and sociocultural factors.[44 49] This may help to identify commonalities that exist across regions, countries or contexts. It may also identify some unique and powerful country-specific and context-specific factors that influence the scale-up process. Furthermore, it may help identify the role of governance and the political economy around NCD prevention and control. Together, this may further add to better planning and implementation of scaling strategies in under-resourced settings in the future.[59 60]

The design of our study, initiated prior to commencement of the projects, is uniquely placed to identify how teams recognise, respond, adapt and modify or potentially halt and/or discard their plans to scale-up as they encounter challenges in the field. The COVID-19 pandemic is an example of a common challenge faced in the early implementation phase of these scale-up projects, so it provides a means to identify this adaptation and evolution process.

There are a number of limitations to the study. First, many of the contributing authors of this paper are also investigators of the projects and hence a part of this working group. In order to minimise conflict of interest and bias, all data collection and analysis will be conducted by an independent team of researchers, within the working group, who are not involved in any of the scale-up projects. The inclusion of investigators as members of this working group also presents a strength, in that researchers may have the opportunity to learn from each other, to improve the scalability of their intervention and to increase internal validity of findings through joint reflection. In addition, we are reliant on project teams to introduce us to their stakeholders/partners, and this is likely to result in some selection bias. To minimise this bias, we obtain a list of stakeholders for each project, and the study team then makes a final decision on who to invite. Third, we initially aimed to capture changes during the planning phase and early implementation phase. But, because the first round of interviews is occurring during COVID-19, we are now unlikely to be able to capture other real-world implementation challenges, which would have contributed to our understanding of scale-up science. The major threat of COVID-19, to country's health systems, also presents an opportunity to study, in the real world, how NCD interventions are affected by health system challenges. Finally, we aspire to interview the same set of stakeholders at both T_0 and T_1, but this may not always be possible due to people's commitments, availability and staff turnover. However, fresh insights obtained through these newer participants may add to the overall quality of feedback received.

CONCLUSION

This collaborative effort will provide an opportunity to systematically evaluate how processes such as stakeholder engagement and governance evolve over time in response to challenges and facilitators in the field, and thereby contribute to scale-up efforts for NCDs in low-resource settings in the future. As a practical output, this research effort should enable us to identify a suitable framework, or a combination of different frameworks, for use by researchers, programme implementers and policymakers worldwide.

ETHICS AND DISSEMINATION

Each project funded under the scale-up call will have its own individual ethics approval, and independent of this currently described protocol. This protocol has been independently approved by the Monash University Human Research Ethics Committee (HREC number 23482).

This study is a collaborative study within the working group and has no bearing whatsoever on individual project's research, ethics or dissemination plans. This project has been codesigned with open and transparent processes of consultation with all members of the upscaling working group. Written consent for sharing of project-related data will be obtained from lead investigators, and written and verbal consent will be obtained prior to interviews. Dissemination of the results, from this study, to research, clinical and health communities will be at the annual

GACD scientific meetings, other scientific conferences and via international peer-reviewed journals.

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