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Scaling Up Public Health Interventions: Engaging Partners Across Multiple Levels

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Abstract

Advancing the science of intervention scale-up is essential to increasing the impact of effective interventions at the regional and national levels. In contrast with work in high-income countries (HICs), where scale-up research has been limited, researchers in low- and middle-income countries (LMICs) have conducted numerous studies on the regional and national scale-up of interventions. In this article, we review the state of the science on intervention scale-up in both HICs and LMICs. We provide an introduction to the elements of scale-up followed by a description of the scale-up process, with an illustrative case study from our own research. We then present findings from a scoping review comparing scale-up studies in LMIC and HIC settings. We conclude with lessons learned and recommendations for improving scale-up research.

INTRODUCTION

Researchers continuously develop new and better interventions to prevent illness and promote health. Translating these interventions into practice is challenging and interventions can take many years to achieve wide-scale implementation (31). In response to this challenge, implementation scientists are developing strategies to accelerate the translation of new interventions into practice (62). In high-income countries (HICs), researchers typically test these strategies in a purposively selected sample of practice settings. Their research yields important information about the strategies required to implement an intervention within a relatively small number of settings. However, this research does not provide the knowledge required to promote and support wide-scale implementation (i.e., scale-up) at the regional or national level. In contrast with the limited research in HICs, researchers in low- and middle-income countries (LMICs) have conducted extensive research on the regional and national scale-up of interventions (9). In this article, we review the state of the science on intervention scale-up and offer recommendations to strengthen scale-up research in both HICs and LMICs.

We define scale-up according to the definition used by the World Health Organization (WHO)'s ExpandNet network 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" (16, p. 2). ExpandNet further distinguishes between two primary types of scale-up: horizontal and vertical. Horizontal scale-up involves the expansion or replication of an innovation across multiple settings and is similar to what may be referred to as spread (21). Vertical scale-up extends beyond replication to also encompass the multilevel "policy, political, legal, regulatory, budgetary or other health systems changes" needed to support an innovation's uptake at the regional, national, or international level (16, p. 21). In this review, we introduce the elements of scale-up and describe the scale-up process, with an illustrative case study from our own research. We then present findings from a scoping review comparing scale-up studies in LMICs and HICs. We conclude with lessons learned and recommendations for improving scale-up research.

THE ELEMENTS OF SCALE-UP

We selected the ExpandNet framework (15) to organize our overview of the elements of scale-up (**Figure 1**) because it is one of the most widely used frameworks in LMICs, and it captures elements found in other scale-up frameworks. As depicted in **Figure 1**, these elements include (*a*) the innovation, (*b*) resource teams (systems), (*c*) user organizations, (*d*) scale-up strategies, and (*e*) the environment. Below, we provide an overview of these five elements and identify characteristics of each element that may determine when scale-up succeeds. (See **Table 1** for a summary.)

The Innovation

The goal of scale-up is to increase the impact of successfully tested innovations, with "innovation" referencing both a new intervention (e.g., new technology, practice, program, or product) and the strategies required to integrate the intervention into practice (16). "Change package" is also used to refer to the combination of an intervention and integration strategies (4). "Integration strategies" encompasses "implementation strategies" (62), "quality improvement methods" (70), "local ideas for best-practice implementation" (4), and the "managerial processes necessary for successful implementation" (16). Although the goal of scale-up is to promote interventions that have been "successfully tested," high-priority problems may require scaling up prior to an intervention being fully tested (36). In a review of 40 scale-up initiatives in HICs, Indig et al. (28) found that in 15% of studies, interventions were taken to scale prior to testing in either efficacy or real-world
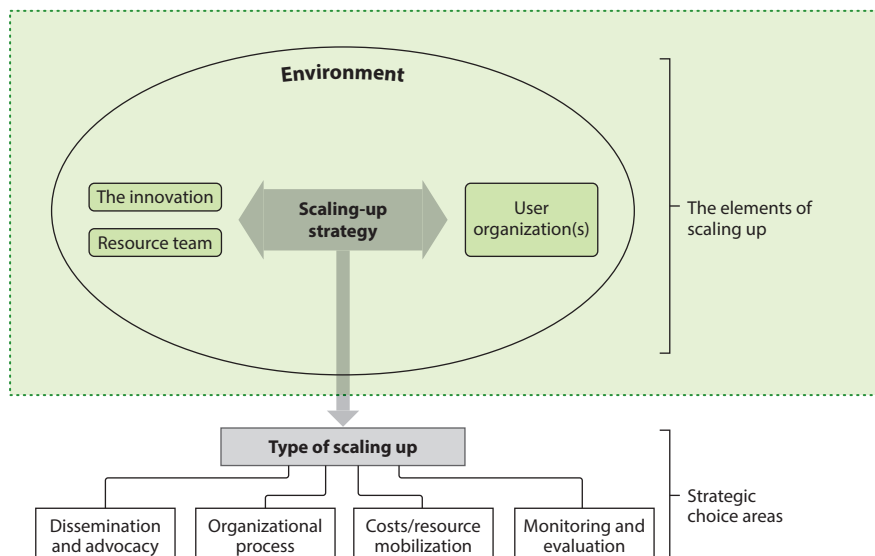
Figure 1

The ExpandNet/World Health Organization framework for innovation scale-up. Adapted with permission from Reference 19.

trials. While this approach may be appropriate at times, plans should be put in place to test the intervention concurrent with scale-up to prevent the diversion of resources to interventions that may not be effective.

Numerous features of an innovation influence scale-up, including fit to the problem, evidence of effectiveness, implementation costs, cost-effectiveness, adaptation requirements for scale-up, reach to and acceptability among the target population, complexity, and design and packaging (10, 46, 47, 52).

Resource Teams and Systems

We employ the term resource systems in addition to the ExpandNet term resource teams to encompass both the organizations and individuals that promote and support the scale-up of an innovation. Existing literature applies a range of terms to describe the individuals and organizations occupying this role, including intermediaries, purveyors, and support systems (4, 20, 63, 73). Resource systems may be categorized according to their type and geographic scope. The types of organizations that function as resource systems include bilateral and multilateral [e.g., WHO, Joint United Nations Programme on HIV and AIDS (UNAIDS), World Bank], government, academic, private-sector (for-profit) entities, and nongovernmental organizations (NGOs) (15). Finally, the geographic scope of resource systems varies, with systems working at the international, national, regional, and local levels.

Intervention scale-up often involves multiple resource systems working collaboratively to perform different functions. In LMICs, multilateral organizations (e.g., United Nations or the WHO) may prioritize specific interventions, set targets for improved health outcomes, and provide training and other scale-up support to national and/or regional governments or NGOs. National and regional governments may enact policies and authorize their ministries of health and other governmental agencies to plan for scale-up, often in collaboration with national- and regional-level

Table 1   The five elements of scale-up

Element	Definition	Factors that influence scale-up
Innovation	An intervention (e.g., new technology, clinical practice, service, or product) and the strategies required to implement the intervention into a practice setting	■ Fit with problem ■ Evidence of effectiveness ■ Costs to implement ■ Extent of adaptation required for scale-up ■ Potential reach and acceptability to target population ■ Complexity ■ Design and packaging
Resource system	The individuals and organizations that promote and support innovation scale-up	■ Function ■ Type ■ Scope ■ Availability of skilled staff ■ Capacity to collect monitoring and evaluation data ■ Relations with user organizations
User organization	The individuals, organizations, and systems that are intended to adopt and implement an innovation	■ Administrative capacity ■ Workforce capacity ■ Functional capacity ■ Service integration ■ Adequacy and mix of funding
Scale-up strategies	The actions resource systems take to promote and support the adoption, implementation, and sustainment of new innovations	■ Scope ■ Pace ■ Centralized versus decentralized ■ Fixed or adaptable ■ Participatory or donor/expert driven
Environment	Conditions and institutions external to the user organization	■ Mix of public and private funding ■ Government policy ■ Political will ■ Supply chains

NGOs. At any of these levels, academic research teams may collaborate to support and evaluate innovation scale-up (65, 75). The limited literature on scale-up in HICs also describes collaboration across resource systems. For example, national and/or regional governments set policies and provide funding and government, nongovernmental, and academic organizations collaborate in supporting scale-up (6, 18).

Three characteristics of resource systems influence successful scale-up: the availability of skilled staff, the capacity to collect monitoring and evaluation data, and relationships with user organizations (4, 6, 8, 44, 47).

User Organizations

User organizations encompass the individuals, organizations, and systems intended to adopt and implement an innovation. These organizations, also referred to as delivery systems, may include hospitals, clinics, health departments, schools, and faith communities, among many others (73). Multiple levels of leaders, managers, and frontline staff may be involved in adopting and implementing an innovation within a single organization or across multiple user organizations (22). Functioning user organizations are foundational to successful scale-up (44, 46, 56). Multiple factors determine how well a user organization functions, including administrative capacity, service integration, and funding. Administrative capacity encompasses both the workforce (i.e., staff with

the necessary expertise) and functional capacity (e.g., ability to collect performance data and manage funds and other resources) (6). Implementing an innovation often involves the integration of services across multiple organizations (6). Poorly integrated service delivery across organizations and the resulting weak links inevitably present barriers to scale-up (56). Finally, the amount and stability of funding also influence how well a user organization functions (3, 56).

Scale-Up Strategies

Scale-up strategies are the actions that resource systems take to promote and support innovation scale-up. Below, we describe seven categories of strategies.

Dissemination. Dissemination is defined as the "targeted distribution of information and intervention materials" to specific audiences intended to adopt and/or implement an innovation (54). Dissemination strategies include (*a*) developing messages to persuade decision makers to adopt an innovation, (*b*) packaging innovation materials into ready-to-use formats, and (*c*) distributing innovation messages and materials through personal (e.g., advocacy) and impersonal (e.g., websites and tool kits) channels (16, 20, 32, 63).

Engagement. Engagement strategies include any actions that involve key stakeholders in planning, executing, and sustaining scale-up. These stakeholders may include individuals in both resource systems and user organizations, as well as members of the local communities where an innovation will be implemented. Resource systems may engage stakeholders as members of research and planning teams and advisory boards and as champions within user organizations. Resource systems also elicit stakeholder input through surveys and interviews. Engaging stakeholders is critical to tailoring innovations to fit local needs and nurturing partnerships at the local, regional, and/or national level (7, 17, 47, 51, 52, 56).

Training and technical assistance. Training aims to build workforce capacity to deliver and implement the innovation (6, 16). In addition to training, resource systems may provide technical assistance—also referred to as practice facilitation, consultation, and coaching—to support user organizations to overcome site-specific barriers to scale-up (20, 58, 63).

Policy making. Policy making strategies include reaching out to and collaborating with policy makers, with the goal of changing public policy to prioritize, mandate, regulate, or fund innovation scale-up (7, 9, 10, 16). Government-level policy makers fund innovations through both direct and indirect mechanisms. A government may fund an innovation directly through global or line-item budgets or indirectly through allocations to government or private grant-making agencies (13).

Resource mobilization. Resources mobilization strategies include any actions to enhance the financial and material supply of resources required for scale-up (47). Strategies to mobilize financial resources include (*a*) policy making to influence government funding (see the section titled Policy Making), (*b*) linking to existing government financing strategies (e.g., annual budget allocation) and donor-supported funding mechanisms, (*c*) applying for grant funding, and (*d*) commercializing the innovation (63). In a review of scale-up in HICs, Indig et al. (28) found that commercialization was most relevant to the United States. Findings from a survey study of 54 representatives from US organizations illustrate how commercialization was used to support the spread of child mental health innovations. The study found that a majority of (80%) organizations were charging a fee for their training, and many generated additional revenue by charging fees for supervision and

the purchase of treatment manuals (63). Resource mobilization may involve supplying material resources (e.g., drugs, test kits, and other supplies), in addition to financial resources, directly to user organizations and/or working to strengthen existing supply chains (7, 8, 16, 56).

Monitoring and evaluation. Monitoring and evaluation strategies involve collecting, interpreting, and acting on data related to scale-up processes and outcomes (16, 47). Resource systems may iteratively monitor and improve a scale-up initiative or retrospectively conduct a summative evaluation of an initiative's impact. Resource systems may also provide user organizations with the tools with which to monitor and evaluate their own processes and outcomes (20, 52, 63). Furthermore, monitoring and evaluation provide a means for resource systems to hold user systems accountable for their services (44).

Institutionalization. We use the term institutionalization to refer to efforts taken to transfer responsibility for scale-up to an established host agency or organization (28, 52). Researchers, NGOs, and other resource systems often support only the initial scale-up of an innovation. To maintain an innovation over time, resource systems must plan for the eventual transfer of scale-up to a host agency or organization. In LMICs, plans may involve transferring responsibility to the Ministry of Health or an NGO with an established within-country presence (52). In both LMICs and HICs, transfer typically involves building host system capacity to plan, budget, and manage scale-up.

ExpandNet identifies several factors that influence the impact of scale-up strategies. These include the scope and pace of scale-up, whether strategies are centralized or decentralized, whether the innovation is fixed or adaptable, and whether a participatory or donor/expert-driven approach guides the strategies (16).

Environment

In the ExpandNet Framework, "environment" refers to "the conditions and institutions which are external to the user organization but affect the prospects of scale-up" (16, p. 6). Multiple implementation determinant frameworks describe factors at the level of what Nilsen and Bernhardsson refer to as the "wider environment" (55). Two of the most widely used frameworks are the Consolidated Framework for Implementation Research (CFIR) (11) and the Exploration, Preparation, Implementation, Sustainment (EPIS) framework (49), which describe factors at the level of the "outer setting" and "outer context," respectively. These factors include features of the political, economic, social, and physical environment (3) at the national, regional, and local levels (3, 22, 46). Some features of the environment that may influence scale-up include the mix of public and private funding for health care and social welfare programs (2, 5), the degree to which governance of health care systems is centralized (10), existing government policy related to the innovation (6), political will to address the problem, and the robustness of supply chains for required materials (8).

Successful scale-up typically involves a multistep process to progressively identify, understand, and align each of these five elements of scale-up (**Table 1**).

THE MULTISTEP SCALE-UP PROCESS

In a review of scale-up frameworks, Milat et al. (47) identified five frameworks that depict scale-up as a multistep process. The number of steps varied, ranging from three broad stages (develop a scale-up plan, establish the preconditions for scale-up, and implement the scale-up process) to

eleven steps (e.g., define roles, relationships, and responsibility of all partners; mobilize resources; provide training and technical assistance). Scaling up in phases allows resource systems to design innovations and scale-up strategies iteratively and thereby address the distinct features of user organizations, the populations they serve, and the wider environments in which they function. Below, we illustrate the phases of the scale-up process as they are described by Barker et al. (4). Building on a review of the literature and their own experience, Barker et al. describe scale-up as a four-phase process: initiate set up, develop the scalable unit, test scale-up, and go to full scale (4). In the following case study, we describe how we moved through each phase as we planned for the scale-up of a systems navigator and psychosocial counseling (SNaP) intervention for people who inject drugs (PWID) living with HIV. In a randomized controlled trial from 2015 to 2018, SNaP was shown to be markedly effective in increasing uptake of antiretroviral treatment (ART) and medication for opioid use disorder, increasing viral suppression, and reducing mortality in Vietnam, Ukraine, and Indonesia (48). To illustrate the four phases of scale-up, we describe the process of planning for SNaP scale-up in Vietnam.

Phase 1: Initiate Setup

The purpose of Phase 1 is to gain entrée into the resource systems and user organizations that would be involved in scale-up. To gain entrée, we introduced SNaP in a meeting with leaders of the Vietnam Authority of HIV/AIDS Control (VAAC), a division of the Ministry of Health. We also established an advisory board that included PWID; people living with HIV; and representatives from HIV testing sites, outpatient centers, and provincial (e.g., provincial Center for Disease Control) and federal-level (e.g., VAAC) organizations (53). With input from the advisory board, the team decided to scale up SNaP in HIV testing sites.

Phase 2: Develop the Scalable Unit

The purpose of Phase 2 is to develop the intervention and implementation strategies that will comprise the scale-up change package. The intervention protocols developed in the SNaP efficacy trial served as the starting point for this work (48). We applied intervention mapping techniques (61) to translate these protocols into a change package. To identify determinants of implementation at the level of the user organization, we visited HIV testing sites and collected data on site infrastructure, personnel, and existing routines for ART and methadone referral (53). With input from our advisory board, we revised SNaP protocols to simplify delivery, reduce duplication with what sites were already doing, and align with recent changes in Vietnam's health care system and HIV care policies. We then identified a menu of implementation strategies that testing sites could use to target barriers to and facilitators of SNaP implementation. The menu included auditing and providing feedback, conducting cyclical small tests of change, obtaining and using participants' and family feedback, and organizing implementation team meetings, among others (53).

Phase 3: Test Scale-Up

We developed scale-up strategies based on findings from the Phase 2 site visits and input from our stakeholder advisory board. We are now testing two approaches to SNaP scale-up in 42 HIV testing sites in 10 provinces with the highest PWID HIV prevalence (from 2019 to 2024) (53). Using a hybrid type III effectiveness-implementation design, we are comparing a standard approach to scale-up with a tailored approach. In both the standard and tailored approaches, the resource team is engaging regional- and local-level stakeholders, providing training and technical assistance, and monitoring and evaluating performance. In addition to these scale-up strategies,

sites in the tailored scale-up arm of the trial have been given the menu of implementation strategies and provided with additional training and technical assistance on how to select and use these strategies to address site-specific challenges to SNaP implementation. We are now comparing the standard approach to scale-up with the tailored approach, with fidelity to SNaP as the primary implementation outcome.

Phase 4: Go to Full Scale

Following completion of the test of scale-up strategies, our next step will be to work with the Vietnamese Ministry of Health to mobilize resources and institutionalize SNaP within the Vietnamese health systems, using either a standard or tailored approach to scale-up.

Most reports and systematic reviews of scale-up processes are of studies conducted in LMICs (7, 9, 51, 52, 75). Fewer research studies and reviews exist on scale-up in HICs. To provide a more comprehensive understanding of scale-up research, we conducted a scoping review to explore differences in how studies in LMICs and HICs operationalize scale-up elements and processes.

SCOPING REVIEW: HOW DOES SCALE-UP DIFFER IN LMICs COMPARED WITH HICs?

Methods

We conducted a scoping review of a purposeful sample of scale-up studies in LMICs and HICs (72). To sample scale-up studies in LMICs, we leveraged an existing systematic review by Bulthuis et al. (7) of 27 LMIC-based scale-up studies. In the absence of a similar review in HICs, we replicated the search strategy of Bulthuis et al., including search terms and date range for included publications. To ensure an adequate sample, we removed criteria used by Bulthuis et al. that required studies to include a qualitative component. We searched PubMed for HIC-based articles published between 2010 and 2019 in English using the following search string: (scale-up[tiab] OR scale up[tiab] OR scalability[tiab] OR scalable[tiab] OR scaling up[tiab] OR scaled up[tiab] OR scaled-up[tiab]) AND (public health[tw] OR health promotion[tw] OR health promotion[Mesh] OR primary prevention[tw]). To search for HICs, we used the World Bank listings of 80 HICs and searched by name for the 61 countries with a population of more than 100,000 (76). Two researchers independently screened titles and abstracts and included publications that described scale-up or implementation of a health intervention across at least eight settings. Studies were excluded if they described mHealth interventions delivered directly to consumers, without engaging a user organization. **Figure 2** provides the PRISMA diagram for the search, which yielded 39 studies (15 LMICs and 24 HICs).

Two reviewers (J.L. and A.B.) read each study and extracted the following data: purpose, country(ies), intervention being scaled, resource system, user organization, and scale-up strategies. Disagreements were resolved through discussion and consensus.

Findings

Supplemental Tables 1 and 2 summarize studies included in this review. **Table 2** provides a summary of review findings on how scale-up differs between the LMIC and HIC studies included in the review. The 15 LMIC studies were conducted in sub-Saharan Africa ($n = 12$), Asia ($n = 2$), the Middle East ($n = 1$), and South America ($n = 1$). The most common health problems addressed were sexual and reproductive health ($n = 7$) and HIV ($n = 4$). The 25 HIC studies were conducted in Australia ($n = 10$), the United States ($n = 9$), the United Kingdom ($n = 3$), and Canada ($n = 2$)
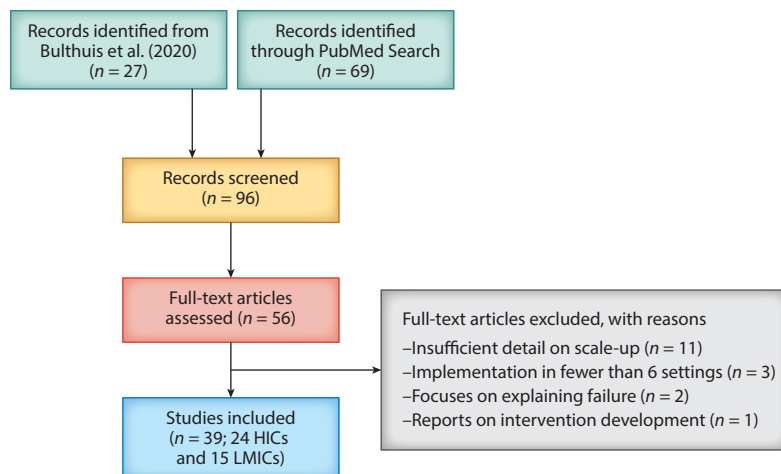
Figure 2

PRISMA diagram for scoping review of scale-up studies in low- and middle-income countries (LMICs) and high-income countries (HICs).

and across multiple European countries ($n = 1$). The most common health problems addressed were physical activity and dietary change to prevent ($n = 15$) and manage ($n = 2$) obesity, diabetes, and other chronic diseases. Other problems addressed included low back pain, bullying, HIV prevention, oral health, mobility, preventive services delivery, and exposure to secondhand smoke ($n = 1$ for each).

In LMICs, two or more resource systems were involved in scale-up in 14 of the 15 studies, with the Ministry of Health or other government agencies involved in all 15 studies. Other resource

Table 2 Summary of review findings on how scale-up differs between LMICs and HICs

Component	LMICs	HICs
Innovation	Most common targets were sexual and reproductive health and HIV	Most common targets were physical activity and/or dietary intake
Resource system	Two or more involved in scale-up and always included the Ministry of Health or other government agency	Researchers served as resource team for all and the only resource system for close to half of studies
User organizations	Predominantly health care facilities	Most common were schools followed by health care facilities and a range of other organizations
Scale-up strategies	Majority used all seven types of scale-up strategies	One strategy was used less than half the time (institutionalization), and two were used less than 25% of the time (policy making and resource mobilization)
Frameworks	More than half guided by ExpandNet Framework	Less than 25% were guided by a framework
Scale-up process	Most involved a multiphase progression from pilot study to regional or national scale-up	Only 25% involved a multiphase progression from pilot study to regional or national scale-up. Most were testing the feasibility or effectiveness of a scalable intervention
Funding	Majority funded by external donors	Majority funded by national or regional governments

Abbreviations: HICs, high-income countries; LMICs, low- and middle-income countries.

systems included other government entities, such as the Ministry of Education (69); NGOs, both local (23, 59) and international (30, 57); academics (66); multilaterals (19); and the private sector (5). The user organizations where innovations were scaled up were predominantly health care facilities ($n = 10$), including primary care, antenatal care, family planning, and ART. In five studies, innovations were scaled up in communities or community-based organizations (e.g., schools). In all LMIC-based studies, resource systems used 4 of the 7 categories of scale-up strategies (training and technical assistance, policy making, monitoring and evaluation, and institutionalization), and they almost always ($n = 13$ or 14) used the other three strategies (resource mobilization, dissemination, and engagement). Eight studies were guided by the ExpandNet Framework, and most described a phased, multiple-year progression from pilot study to regional or nationwide scale-up, with plans for a resource system to assume at least partial, long-term responsibility for scaling up (e.g., 1, 2, 5, 23, 27, 69). Only two studies were funded by the national government (2, 59), all other studies being funded partially ($n = 1$) or fully ($n = 11$) by external donors such as the US Agency for International Development (USAID) (23), the Bill and Melinda Gates Foundation (30), or the European Commission (69).

In HICs, researchers (primarily academics) served as a resource system in all 24 studies and were the only resource system in 11 studies. In 13 studies, researchers partnered with one or more established resource systems, including regional departments of education ($n = 3$), other government agencies ($n = 2$), national or regional service organizations ($n = 4$), a national phone-based referral service ($n = 1$); Cooperative Extension ($n = 1$); and a practice-based research network ($n = 1$). In three studies, researchers also partnered with resource teams that provided training and technical assistance on a specific intervention. In HICs, scale-up occurred in schools ($n = 8$), community clinics and other health care facilities ($n = 5$), and a range of other user organizations (e.g., Weight Watchers locations, YMCAs, residential units for people with disabilities, and public parks). The majority of studies included the following four scale-up strategies: monitoring and evaluation ($n = 23$), training and technical assistance ($n = 20$), dissemination ($n = 19$), and engagement ($n = 12$). Studies were less likely to include institutionalization ($n = 11$), policy making ($n = 5$), and resource mobilization ($n = 5$) strategies. For most studies in HICs, the purpose was to test the feasibility or effectiveness of a scalable intervention and/or to test an intervention's scalability across multiple settings. Only five studies referenced a framework that guided either implementation or scale-up (14, 24, 40, 67, 68), and only six of the studies described a phased, multiyear process that moved from pilot studies to regional or national scale-up (25, 29, 33, 41, 43, 60). Studies were funded predominately by national ($n = 19$) or regional governments ($n = 5$), with one study funded by the European Commission (a multilateral) (41) and one by Weight Watchers (a for-profit entity) (26).

We did not intend for this scoping review to provide a comprehensive overview but rather to illustrate the difference between scale-up in LMICs and scale-up in HICs. Of note, compared with HICs, LMICs were much more likely to report on the scale-up of interventions at the regional and national levels using a multistep process that engaged resource systems in planning for institutionalization. Furthermore, while most studies in HICs focused only on horizontal scale-up, studies in LMICs also described the strategies used to promote vertical scale-up, including both policy making and resource mobilization.

RECOMMENDATIONS FOR STRENGTHENING SCALE-UP RESEARCH

Advancing the science of scale-up is essential to increasing the impact of effective interventions at the regional and national levels. Below we draw from the strengths of LMIC-based scale-up studies and our own experience to offer recommendations for advancing scale-up research.

Engage Established Resource Systems to Plan for Institutionalization from the Onset of the Scale-Up Process

To improve population health, researchers need to move beyond determining whether an innovation is scalable to also test the effectiveness of the strategies needed to scale up innovations at the regional and national levels. As an essential first step, researchers need to engage established resource systems early in the scale-up process. Studies from LMICs provide multiple examples of how more transient resource systems (e.g., international NGOs) have engaged established resource systems (e.g., ministries of health) to institutionalize innovations (e.g., point-of-care rapid syphilis tests; 1). Following this example, researchers in HICs might partner with a wide variety of national and regional resource systems. In our research, we have had success with two approaches to engaging resource systems. In the first approach, we engaged resource systems in research that we initiated (researcher-initiated scale-up). In the second approach, we responded to an established resource system's request for assistance (researcher-responsive scale-up). Below we illustrate the two approaches.

Researcher-initiated scale-up. In 2015, Mark Toles and colleagues began testing the preliminary efficacy of their Connect-Home intervention in skilled nursing facilities (SNFs) (71). Connect-Home provides SNF staff with training, a template in the electronic health record, and other resources to prepare patients and caregivers for the transition to home. From the start of his efficacy research, Toles engaged with a national NGO (Lutheran Family Services). Toles is now pursuing two lines of research. In an engaged partnership with Lutheran Family Services, Toles and his team have pilot tested Connect-Home scale-up in eight US states (38). Concurrent with these studies, Toles is testing Connect-Home efficacy in a randomized controlled trial. Toles is now planning to bring the two lines of research together in a trial testing Connect-Home scale-up.

Researcher-responsive scale-up. In 2008, a US-based NGO [Nurse-Family Partnership (NFP)] invited Linda Beeber to advise them on how to integrate mental health interventions into their nurse home-visiting program for first-time mothers. Beeber engaged with the NFP in a 12-year, multiphase process to design a mental health innovation (MHI) and take it to scale in 250 local agencies across 40 US states. Beeber and colleagues engaged key stakeholders (NFP national office staff and regional consultants) in an iterative process of testing and refinement to design the MHI to fit the NFP context and integrate with NFP infrastructure and processes (34). In 2018, Beeber received funding to test MHI scale-up nationwide.

Engage Multiple Levels of Resource Systems and User Organizations

Resource systems need to balance the costs and benefits of centralized versus decentralized approaches to scale-up. In a centralized or top-down approach, resource systems engage with a user organization's national or regional levels, and the user organization then rolls out the innovation to the local level. While a centralized approach is efficient, it may fail to align the innovation with local priorities and contexts, resulting in suboptimal scale-up. In a decentralized approach, resource systems engage directly with local-level user organizations and communities. A decentralized approach has the advantage of supporting local adaptation but is often time and staffing intensive (47, 77). To promote local engagement, national resource systems may partner with local resource systems that have existing relationships and expertise working with local user organizations (56, 75). Decentralized approaches are important particularly when health disparities are high so that user organizations have the support to adapt innovations to address the specific factors that are

contributing to local disparities. Our scoping review identified multiple examples of partnerships with multilevel resource systems with national, regional, and local infrastructures (e.g., departments of health, education, and parks and recreation; ministries of health; national-level service organizations).

Specify and Test Two Levels of Strategies

Reports from both LMICs and HICs often provide only limited information on the strategies used to scale up innovations (9). This lack of detail limits the potential to successfully replicate scale-up initiatives or conduct the cross-study syntheses essential to advancing the science. To address this limitation, we recommend that scale-up studies adhere to guidelines for reporting implementation studies and clearly identify the strategy's actors, actions, action targets, dose, timing, and outcome measures (64). We further recommend that scale-up studies apply Leeman and colleagues' system for classifying strategies according to whether they were enacted at the level of the support system (i.e., resource system) or delivery system (i.e., user organization; 35, 37). Nettlefold et al. (50) illustrate how this system can be applied to describe the two levels of strategies used to scale up Action Schools! BC. By specifying the strategies used by resource systems and user organizations, researchers can explicate and optimize how strategies interact across the two levels (74). This type of multilevel research would be further enhanced through greater use of theory to identify the mechanisms through which strategies impact outcomes (21).

Identify Factors that Determine Successful Scale-Up

Most methods for selecting implementation strategies involve identifying implementation determinants and then selecting strategies to target those determinants (61). Researchers have conducted multiple reviews to identify the determinants of scale-up in LMICs (4, 7, 47) but have yet to develop widely used frameworks or terminology. In HICs, researchers have developed determinants frameworks for implementation but not specifically for scale-up (49). Additional research is needed to develop determinant frameworks for scale-up in HICs and LMICs. In a recent study, Means et al. (45) made progress toward this goal in a review of the use of the CFIR in LMICs. Although scale-up was not the focus of their study, they identified the need for new determinants that align with those known to affect the successful scale-up of interventions in both LMICs and HICs (see **Table 1**). For example, they recommended adding a domain called "characteristics of systems" to address the multiple systems levels (regional or national) involved in implementing interventions in LMICs. Additional research is needed to specify further the multilevel determinants of successful scale-up and their similarities and differences across LMIC and HIC settings.

Study Both Vertical and Horizontal Scale-Up

In HICs, scale-up studies have focused on the horizontal scale-up or spread of innovations across multiple settings and have given only limited attention to vertical scale-up. As a result, only a minority of the HIC studies in our review reported the use of policy making or resource mobilization strategies compared with almost all the LMIC studies. HIC studies led by government organizations [e.g., the US Centers for Disease Control and Prevention (CDC) or a regional department of parks and recreation] were the exception (25). In HICs, the researchers who lead most published scale-up studies are not incentivized or funded to influence policy making or mobilize resources. We recommend that researchers consider three options for addressing this barrier. The first option is the most common and involves assessing existing policy, funding sources, and supply chains and then aligning scale-up initiatives to leverage what already exists. Manios et al. (42) illustrated

this approach by engaging local research teams who collaborated with local municipal authorities to gather information about existing legislation and policies, available human resources, and infrastructure early in the scale-up planning process. The second option involves studying naturally occurring scale-up initiatives. For example, Leeman et al. (39) evaluated the use of four school-health tools that the US CDC had scaled to the national level, with attention given to the role of policy and resources as barriers to and facilitators of scale-up. Finally, researchers have the option of modeling the potential impact of policy changes on innovation scale-up. For example, Davis et al. (12) modeled the impact of different policies on the uptake of colorectal cancer screening interventions.

CONCLUSIONS

In this article, we provide a broad overview of the elements of innovation scale-up and how those elements differ across LMIC and HIC contexts. Advancing the science of innovation scale-up is essential to taking effective interventions to scale at the regional and national levels. The focus on scale-up in LMICs offers multiple lessons for HICs, including the importance of using a multiphase process to plan for scale-up, strategically engaging multilevel stakeholders, and applying the vertical scale-up strategies needed to effect the "policy, political, legal, regulatory, budgetary or other health systems change" (16, p. 21) needed to support wide-scale implementation.

DISCLOSURE STATEMENT

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