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Advancing scaling science in health and social care: a scoping review and appraisal of scaling frameworks

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Abstract

Background Scaling is typically discussed as a way to amplify or expand a health innovation. However, there is limited knowledge about the specific techniques that can enhance access to or improve the quality of innovations, aiming to increase their positive impacts for the public good. We sought to identify, compare, and contrast scaling frameworks to advance the science and practice of scaling.

Methods Using a scoping review we asked: 1) What are the attributes of scaling frameworks for innovations that support health outcomes? and 2) What are the similarities and differences of these attributes? Inclusion criteria were 1) primary studies or review articles, 2) a primary focus on scaling innovations for health and social care, 3) articles that developed a framework, and 4) articles were concerned with a health outcome. Starting from an umbrella review, we identified relevant studies and extracted data about the characteristics of the articles, attributes of framework development, attributes of framework components, transferability, and the framework's underlying ethical lens. Grey literature was included through expert consultation. Data were summarized using frequencies and qualitative description.

Results From 94 potentially eligible articles, we identified 9 unique frameworks and included 4 additional frameworks from the grey literature, resulting in a total of 13 frameworks. Seven frameworks include a definition of scaling, and eight are designed for public health settings. Five of the frameworks were developed for the US/Canada/UK and Australia. Six of the lead authors' primary institutional affiliation are from North America. Framework developers involved diverse stakeholders in a number of ways to develop their framework. Eight frameworks were developed, but not yet tested or applied, while the remaining frameworks were in the process of being applied or had already been applied to cases. All frameworks use a consequentialist-utilitarian ethical lens. Lastly, a comparison between frameworks found in the grey or published literature show important differences.

Conclusion Much may be learned through further support for, and development of, scaling frameworks by primary authors affiliated with the Global South. Important aspects of framework development were identified, especially understanding the nuances of diverse stakeholder involvement in development.

Keywords Scaling, Scalability, Implementation science, Scaling science, Spread, Sustainability, Health, Intervention, Framework, Model

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Introduction

There is a significant global concern about scaling health and social care innovations effectively, efficiently, and equitably to improve outcomes, reduce waste, and decrease disparities. To address this challenge, McLean & Gargani have suggested the need for a rigorous and systematic ‘scaling science’ [1–3] that ultimately would translate into an improved scaling practice and optimize the impacts of scaling. Scaling science involves the practice of scaling innovations to achieve meaningful impacts and systematically studying how this scaling process develops [1]. This description of scaling science embraces a purposeful double meaning. On the one hand, as a means for scaling the impact of research and innovation, and, on the other, as the critical, epistemological and systematic study of how the scaling of knowledge and research unfolds [1–3].

Mainstream views of scaling have been motivated by growth, expansion, diffusion and amplification of a health innovation assuming that only benefits and no harm would be observed [1]. However, simply spreading or replicating the global pool of knowledge about proven health and social care innovations – or replicating the innovation itself – may not be sufficient to increase health and well-being, in other words: impact. In fact, it may also increase the impact of collateral unplanned damages or harms [1, 4]. Accordingly, scaling innovations in challenging contexts requires adaptability and reflexivity capacities [1, 5]. Looking beyond the traditional view of expansion, scaling an innovation may require employing specific techniques to widen the innovation’s reach, heighten its access for equity-deserving groups or enhance its quality [1, 6]. Scholars sometimes speak of vertical and horizontal scaling, where the former leverages structural processes or policies to embed innovations at a large scale, while the latter approach involves expanding the innovation to different settings [7]. The WHO has used the term “spontaneous scaling” to take into account scaling that occurs without, it seems, a deliberate and well-planned effort [8]. To add to these approaches, we emphasize the importance of scaling impact for the public good. In this paper we use a definition of scaling that reflects the importance of impact: “a systematic evidence-informed process whose aim is to increase the positive impacts of an innovation that has proven effective for improving quality in care and the welfare of individuals and populations” [7], pg.3].

The need for ‘scaling science’ as a supplement to ‘implementation science’

The field of implementation science has generated frameworks, methods, and debate which have provided deep value to understanding how research knowledge

can contribute to improved health and social care, and related outcomes [9]. While recognizing the critical importance of research uptake and implementation, a further need lies in understanding and evaluating how the impacts of implementation are distributed over time and place [1–3]. With this in mind, McLean & Gargani suggested: “[scaling science] is concerned with optimising social and environmental impact, and, consequently, scaling requires knowledge creators (researchers and innovators) to think beyond immediate knowledge users [or implementors]” [1], p15]. From this perspective, scaling science may enrich and supplement implementation science. And as such, encourage research beyond implementation challenges toward the development of a scaling science that “encourages consideration of downstream applications, barriers, and opportunities for innovation to contribute to broad social transformation” [1], p15]. However, this poses a complex challenge, with ethical implications, as it brings the need for scaling not only innovations but also ensuring that we are scaling their impact through “a coordinated effort to achieve a collection of impacts at optimal scale that is only undertaken if it is both morally justified and warranted by the dynamic evaluation of evidence” [1], pg.9].

There are signs that the science of scaling and practice are emerging through the development of principles, frameworks, case reports, reporting guidelines and systematic reviews of primary studies in focused areas [1, 7, 10–12]. We refer to a framework as “a systematic model of activities, mechanisms or factors likely to support a health system in scaling an innovation” [13]. Building a rigorous science of scaling is important because less rigorous approaches (e.g., not evidenced-informed, not involving multiple perspectives) could limit the potential of a scaling attempt to achieve its intended impact and avoid unintended harm and result in more waste in research [1, 14]. Or the risk of not scaling an innovation given its social impact could be overlooked. For implementers, researchers and funders, the suboptimal use of scaling theories, frameworks, and other tools could lead to poorly articulated assumptions, negative consequences, research waste, hidden biases, equity issues, and inaccurate conclusions [4, 15]. Not only does the robust development of scaling science serve to accumulate evidence, but the science can support consistency and a critical evolution of scaling practice by learning from our own and others’ experiences [10]. Lastly, with the exponential increased use of AI in all research domains, it is becoming even more important to develop a conceptual understanding of the mechanisms underlining scaling so machine learning alone is not pushing large scale implementation of anything and everything using an ever increasing GIGO (garbage in, garbage out) approach.

The objective of our scoping review and framework appraisal was to identify, compare, and contrast scaling frameworks to ultimately advance the science and practice of scaling, with a view to enhancing the impact of produced knowledge on the topic.

Methods

Design

Our interest was in identifying, synthesizing and comparing scaling frameworks for innovations related to health outcomes to identify future directions. To accomplish this, we conducted a scoping review following guidance provided by JBI [16, 17]. We followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses Scoping Review (PRISMA-ScR) [18]. We also examined how the frameworks were developed. This study is registered via Open Science Framework: <https://doi.org/10.17605/OSF.IO/ZK32B>.

An international team of researchers, clinicians, funders, methodological experts, and scaling practitioners co-produced the development and conduct of the scoping review. This large team, bringing different disciplinary, career stage and country perspectives, was sensitive to the potential of conscious or unconscious bias in favour of the funder, represented through three co-authors (one of whom is affiliated with the Global South). We worked consciously to minimize the introduction of bias through iterative team discussions where we weighed any suggestions against their pros and cons.

Research questions

The research questions for this review were: 1) What are the attributes of scaling frameworks for innovations that support health outcomes? and 2) What are the similarities and differences of these attributes?

Eligibility criteria

As we were interested in identifying scaling frameworks, from the academic literature we included articles that: 1) were primary studies or reviews, 2) had a primary focus on scaling innovations for health and social care, 3) developed a framework, and 4) were concerned with a health outcome. A broad range of innovations were eligible. Articles were not limited by language or study design. However, articles that reported the scaling of a particular innovation but omitted to develop a framework were excluded. All grey literature documents were included.

We considered scaling broadly conceptualized as including spreading, scaling up/out/deep, horizontally or vertically. We considered a scaling framework as any model, guideline, mechanisms or approach providing practical or theoretical direction on scaling of a health or social innovation. By innovation we mean interventions

or practices that are new or that have already been successfully implemented in a specific context before being introduced to other settings; innovations are new for program recipients [7, 19]. We defined health care as services provided in institutional or community settings, with any form of access to a health related service and access to health care practitioners [20], while social care was seen as interventions to support vulnerable individuals by meeting needs or enabling them to meet needs from physical, mental or emotional impairment [21].

Search strategy

Team members RC, AG, RKDM, and FL and their colleagues carried out an extensive umbrella review over the period 2005 to 2020 to identify the available evidence on scaling in health and social care [7]; they identified 24 articles relating to “frameworks” about scaling science of innovations in health and social care. We used articles in this “frameworks” category as the starting point for our article screening and to conceptualize how we would update the search strategy. To update the review, we noted that the original umbrella review search strategy was focused on identifying review articles for a broader research question than our scoping review. We decided to focus on specificity over sensitivity and hand-searched the journals associated with our screened and selected included articles from August 2020 – November 2023 to update the original search (Implementation Science, BMJ Open, International Health, Health Research Policy and Systems, Journal of Medical Internet Research, Public Health Research & Practice, Global Health Research and Policy and BMC Public Health). We also scanned the reference lists of included articles and review articles for potentially relevant studies. No formal electronic search was conducted.

This search was supplemented with grey literature scaling frameworks. Grey literature scaling frameworks were identified through expert consultation [21]. All results were downloaded and duplicates removed using Covidence [22].

Data selection

The screening process for each article published in a scholarly journal involved two rounds focused on: 1) titles and abstracts, and 2) full-text review. A calibration exercise of approximately 4–6 randomly selected articles was done before each round by all reviewers (AK, MD, OT, EN) to clarify the eligibility criteria and support convergent screening; repeated iterations and team discussion focused on coming to a common understanding of study concepts. Each article was screened by at least two independent reviewers and conflicts resolved by a third.

When articles were excluded, reviewers selected a reason for their decision based on the eligibility criteria [4].

All grey literature documents identified through expert consultation were included as part of our dataset. Only the main document identified through the consultation was used for data extraction (other documents, websites or resources mentioned in the main document were not analyzed).

Data extraction

Through team discussions and informed by literature [23], an iteratively developed data extraction Covidence template recorded information about five domains from published articles and grey literature documents. Two independent reviewers extracted data and any disagreement was resolved by a third person.

1) Characteristics of included articles:

- a. name of framework
- b. framework's region of application
- c. the country of the first author's primary institutional affiliation
- d. health care setting
- e. innovation/program/product for scaling
- f. definition/description of scaling

In addition to the characteristics of the frameworks, innovation implementers might be interested in how a scaling framework was developed. We used five items to examine the attributes of framework development [10]. The first three items (2a,2b,2c) were originally developed for assessing reporting guidelines and were pilot tested for consistency and feasibility by the developers [10].

2) Attributes of framework development:

- a. did framework development include more than one stakeholder group, either as a developer or through consultation? (yes/no/not applicable/other)
- b. did framework development involve gathering data? (primary data, case studies, secondary data (e.g., literature review), primary and secondary data, opinion/personal experience, other)
- c. did framework development report the use of a consensus process? (yes/no/other)
- d. stage of framework development (developed only, pilot tested, applied to cases, validated, other)
- e. peer reviewed (yes/no/other)

3) Attributes of framework components:

- a. rationale/motivation for framework
- b. type of framework (planning/guiding e.g., a process framework; explaining/understanding what influences scaling outcomes, e.g., determinants framework with facilitators, barriers; evaluating scaling, other)
- c. theory of change
- d. level of framework application (micro (local, clinic, organization), macro (focus on region or country), other)
- e. description of framework components/constructs/stages/principles
- f. sustainability considered? (yes/no/not applicable/other)
- g. evaluative/reflective component? (yes/no/not applicable/other)
- h. engagement/stakeholder involvement addressed within framework (yes/no/not applicable/other)
- i. accessories that accompany framework (e.g., tools, checklists).

4) Transferability:

- a. Transferability of the framework (according to authors).

We were also interested in understanding the ethical positioning of the framework in order to understand the alignment of actions and decisions with ethical principles and values in the frameworks. By undertaking this analysis, we aimed to strengthen our understanding of the underlying principles that guide the framework's design and implementation. In other words, this ensures that we were not only aware of a framework's intended outcomes but also its broader ethical implications. This understanding allows us to make informed decisions and judgments regarding the framework's appropriateness and potential impact. Informed by Hunyadi [24], we interpreted whether the framework is goal-oriented, and if so, whether its aim is to increase innovation effectiveness or to consider values. The framework could also be seen as a 'must-do' based on duty, or it could incorporate both ethical lenses (see Additional file 3: Fig. 1).

5) Ethical lenses (as interpreted by reviewers; yes/no/; Additional file 3: Fig. 1).

- a. Consequentialist-utilitarian (the scaling framework is goal-oriented to increase innovation effectiveness)
- b. Scaling framework values (the scaling framework is goal-oriented to consider stakeholders' values., e.g. health system values, people's values)

- c. Duty-right (the scaling framework is based on principles that guide scaling science; either a duty to create a framework to enhance the impact of the health innovations or a right for users)
- d. Mixed ethical lenses (the scaling framework is based on multiple ethical lenses)

Data analysis and reporting

Data were summarized using quantitative frequencies and qualitative descriptions. Findings were reported across the published and grey literature in aggregate except when notable exceptions between the two categories were observed.

Results

Search results

The initial dataset of published literature yielded 99 records (Fig. 1). After removing 5 duplicates, 94 titles and abstracts were screened. Of these, 33 full-text articles were reviewed, and a total of 10 articles were included. Our grey literature search yielded 4 additional documents, resulting in a total of 14 articles from which 13 unique frameworks were included in the final review. The same framework was used in two articles [25, 26].

Characteristics of included articles (See Table 1)

A little over one third of the 13 frameworks were developed for or applied in the United States, Canada, UK and Australia ($n=5$, 38%) [5, 27, 28, 30, 31]. One was developed for Africa (7%) [13] one for low and middle income countries (7%) [25, 26], while the region of application was explicitly unspecified for six of them [1, 19, 29, 31–34] although they may be global in intent. Almost half of the lead authors' primary institutional affiliation is from North America ($n=6$, 46%). Three are from Canada (23%) [1, 27, 30], and three are from the USA (23%) [13, 25, 29]. There is one each from the UK [5], Mexico [26] and Vietnam [31], and two from Australia (15%) [28, 34]. Three frameworks are credited to organizations (23%) [19, 32, 33], not individuals. The grey literature scaling frameworks were developed by non-governmental organizations/funders, primarily for use in the Global South, in contrast with scaling frameworks found in the published literature.

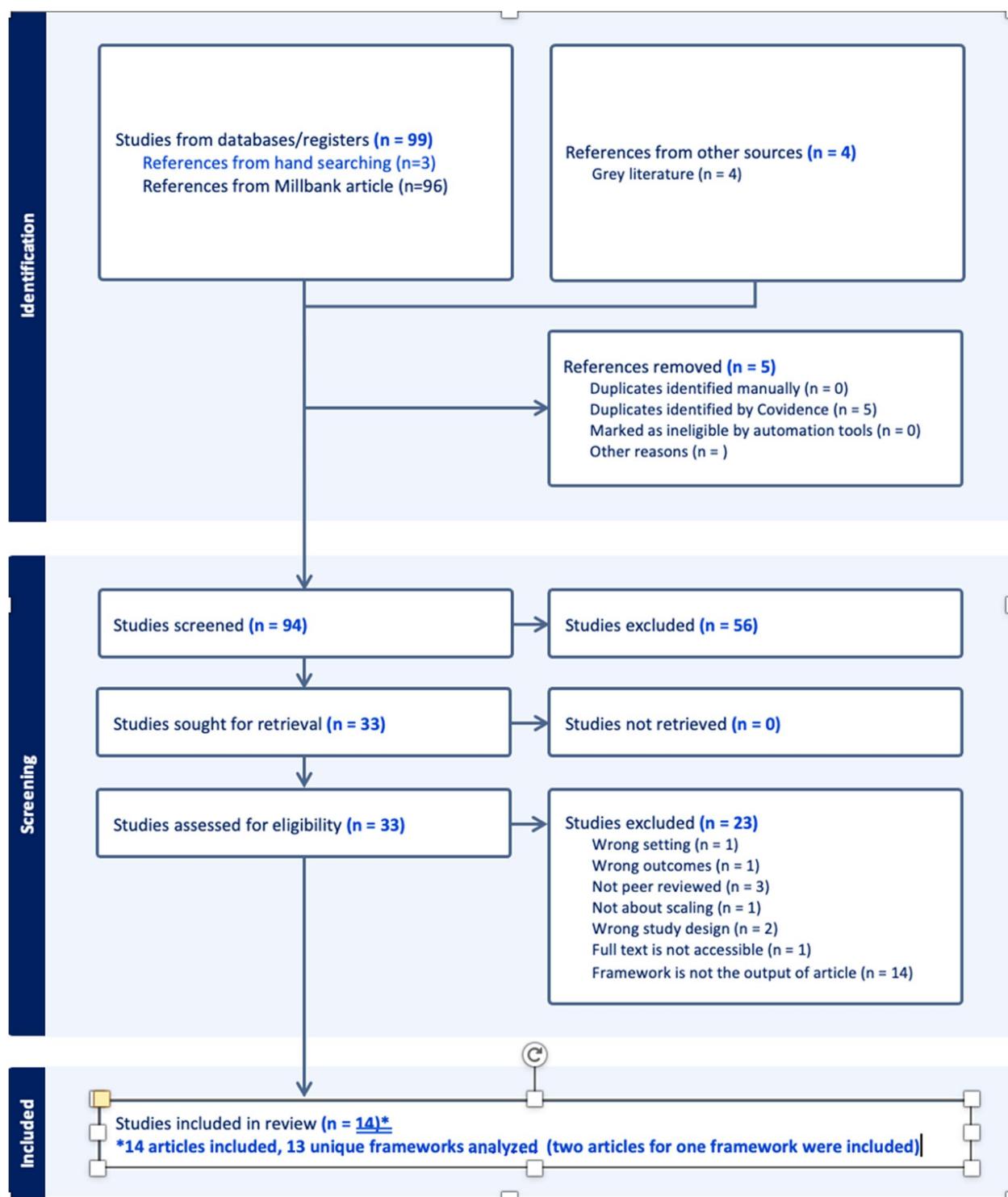
The 13 frameworks were developed for innovations in various settings, some which overlapped categories: hospital ($n=2$, 15%) [5, 30], public health ($n=8$, 62%) [13, 25, 26, 28–31, 33, 34], community ($n=1$, 7%) [5] and seniors care ($n=1$, 7%) [27]. The other three (23%) frameworks for developed for various settings [1, 19, 32]. Innovations range from preventative focused (e.g. family health innovations) to technology-assisted programs, among others.

More than half of the frameworks ($n=7$, 54%) [1, 27–29, 32–34] provide a definition for scaling or adopt an existing definition from other authors. For example, Indig et al. state that scaling up refers to "deliberate efforts to increase the impact of successfully tested health interventions so as to benefit more people and to foster policy and program development on a lasting basis." No definition is provided, however, in the remaining frameworks. Keywords such as "diffusion," "increasing," "sustainability," and "spread" are used to describe scaling. Authors who deliberately do not define scaling describe the concept in terms of sustainability.

Attributes of framework development (See Table 2)

Each of the authors used various processes to develop their frameworks, including differences in the composition of the teams involved, the types of data collected, and the consensus methods used in developing the framework. We examined stakeholder involvement in framework development. Of the 13 frameworks, 43% noted ($n=6$) that individuals with scaling expertise and experience who were external to the team were involved in developing the framework through consultations and providing input [1, 5, 13, 22, 25, 33]. Inclusion of stakeholders as team members developing scaling frameworks occurred with grey literature frameworks ($n=4$) [1, 19, 32, 33] with two exceptions from the published literature [5, 30] for which research colleagues were asked to comment on a draft framework [5] or decision-makers worked iteratively and collaboratively with the research team to develop the framework [30].

Another attribute of development was whether data were collected to develop the framework. All authors reported collecting data, and in some cases multiple types of data, to inform framework development. This included primary data ($n=4$, 23%) [1, 25, 27, 28], secondary data ($n=10$, 77%) [5, 13, 19, 25, 26, 28–31], case studies ($n=4$, 31%) [1, 5, 26, 33], or opinion/personal experience ($n=3$, 23%) [1, 19, 33]. Multiple authors combined data collection methods, which is reflected in the sum being larger than 13 in Table 2. Primary data collection referred to formally collecting information from experts involved in scaling [1, 25, 28] as research participants or those involved as part of an innovation scaling effort, e.g., directors, staff, champions [1, 27], as research participants. The most common type of data used, secondary data, came in the form of literature reviews, systematic reviews, and scoping reviews of existing frameworks or literature on scaling of interventions. Three frameworks developed using opinion/personal experience were also supported by secondary data, and came from the grey literature dataset [1, 19, 33].

**Fig. 1** PRIMSA chart from literature search

A feature of framework development is the reporting of a consensus process. Of the 13 frameworks, 36% report ($n=5$) using a consensus method [1, 25–28, 30,

33], although no process is described in detail. There were different ways in which the authors of the frameworks sought consensus during the development of the

Table 1 Characteristics of included articles

Author and Year	Name of framework	Region of Application	Country of Institutional Affiliation of First Author	Healthcare Setting	Innovation/program/ product for scaling	Definition of scaling
Ploeg, [27]	Spreading Best Practices in Home Care	US, Canada, UK	Canada	Homecare for older adults	Best care practices in home care	Separate spread and scale up. Scale up is more commonly used in international contexts, spread used to refer to improvements in high-income countries. Their definition of spread: "the process through which new working methods developed in one setting are adopted, perhaps with appropriate modifications, in other organizational contexts"
Milat, [28]	A Guide to Scaling Up Population Health Interventions	US, Canada, UK	Australia	Primary care, health policy	Public health innovations	Scaling up is deliberate efforts to increase the impact of successfully tested health interventions so as to benefit more people and to foster policy and program development on a lasting basis."
Bryce, [29]	Model for the scale-up of MDG3 4&5	Other: no region explicitly mentioned	US	Ministries of health, donors	Maternal and child health programs, nutrition	Universal coverage where intervention has been proven to be effective
Bradley, [25]	AIDED (Assess, Innovate, Develop, Engage, Devolve) model	Other: low/middle-income countries	US	Public health	Public health innovations (family health programs)	No specific definition outlined
Barker, [13]	Framework for Going Full Scale	Africa	US	Health innovations in Africa	Healthcare Innovations	No specific definition outlined
Côté-Boileau, [30]	Framework for actionable guidance for 3S across five key focus areas	US, Canada, UK	Canada	Hospitals, health systems	Healthcare innovations	No specific definition outlined
Greenhalgh, [5]	Nonadoption, abandonment, scale-up, spread, and sustainability (NASSS) framework	US, Canada, UK	UK	Hospitals, social care, health care, community health	Technology supported health and social care programs	No specific definition outlined

Table 1 (continued)

Author and Year	Name of framework	Region of Application	Country of Institutional Affiliation of First Author	Healthcare Setting	Innovation/program/ product for scaling	Definition of Scaling
Indig, 2017	Scaling up Pathways	Other: International search done	Australia	Public health	Chronic disease prevention interventions	"deliberate efforts to increase the impact of successfully tested health interventions so as to benefit more people and to foster policy and program development on a lasting basis"
Nguyen, [31]	Scale-up Readiness Assessment Framework	US, Canada, UK	Vietnam	Public health	Public health innovations	No specific definition outlined
Pérez-Escamilla [26]	AIDED (Assess, Innovate, Develop, Engage, Devolve) model	Other: 28 countries around world (Low/middle income)	Mexico	Public health	Breastfeeding programs	No definition outlined
McLean, [1]	Scaling Impact for the Public Good	Other: based on work from Global South	Canada	Variety of settings	Scaling is the positive impact the innovation creates for people and the environment. Any configuration of scaling up, out, deep, or otherwise is acceptable if it improves impacts in meaningful ways	
World Health Organization, [19]	N/A	Other: intended for Global South	N/A – WHO and Expand-Net	Variety of health settings	Policy, proof-of-concept studies, and operations research in reproductive health	None
Management Systems International, [32]	The Scale Up Management Framework (SUM)	Other: not clearly stated but implicitly from Global South	Does not specify	Variety of settings	Not specific, focus on scaling up best care practices. A range of examples of where the framework has been applied, such as family planning and climate change	Adopted working definition from Hartmann and Linn: "Scaling up is the process of expanding, adapting and sustaining successful policies, programs or projects in geographic space and over time to reach a greater number of people."

Table 1 (continued)

Author and Year	Name of framework	Region of Application	Country of Institutional Affiliation of First Author	Healthcare Setting	Innovation/program/ product for scaling	Definition of Scaling
Implementing Best Practices, [33]	A guide for fostering change to scale up effective health care	Other: based on Global South	N/A – Group authorship (consortium of agencies)	Reproductive health care	Reproductive health	Expanding the introduction, adaptation, and utilization of proven effective technical and managerial practices in healthcare, especially in reproductive health; to enhance access and improve the quality of services on a larger scale

Table 2 Attributes of framework development

Author and Year	Development contained stakeholder involvement	Data gathering	Consensus method reported	Stage of development	Peer reviewed
Ploeg, [27]	Yes	Primary Data (they collected data)	No	Developed only	Yes
Milat, [28]	Yes	Primary Data (they collected data); Secondary Data (lit review)	Yes	Developed only	Yes
Bryce, [29]	No	Secondary Data (lit review)	No	Developed only	Yes
Bradley, [25]	Yes	Primary Data (they collected data); Secondary Data (lit review)	Yes	Developed only	Yes
Barker, [13]	No	Secondary Data (lit review)	No	Developed only	Yes
Côté-Boileau, [30]	No	Secondary Data (lit review)	Yes	Developed only	Yes
Greenhalgh, [5]	Yes	Secondary Data (lit review); Case Studies	No	Applied to Cases	Yes
Indig, 2017	No	Secondary Data (lit review)	No	Developed only	Yes
Nguyen, [31]	No	Secondary Data (lit review)	No	Developed only	Yes
Pérez-Escamilla [26]	No	Case Studies; Secondary Data (lit review)	Yes	Developed only	Yes
McLean, [1]	Yes	Primary Data, Case Studies; Opinion/Personal Experience	Yes	Developed from cases and being applied	Yes
World Health Organization, [19]	Yes	Secondary Data (lit review); Opinion/Personal Experience	No	Being applied	No
Management Systems International, [32]	Yes	Other: field testing and feedback on earlier editions	No	Applied to Cases	No
Implementing Best Practices, [33]	Yes	Case studies; Opinion/Personal Experience	Yes	Applied to cases	NO

framework; either as part of the research methods [28], part of the internal team process [1, 25, 26] or with external stakeholders [30, 33]. For example, authors used the formal technique of a Delphi process involving policy makers, practitioners and researchers to achieve consensus on a four step guide to assist with scaling [28].

The included frameworks are presented in various stages of development. Of the 13 frameworks, most were developed, but not yet tested or applied ($n=8$, 62%), [13, 25–31, 33]; the rest were either in the process of being applied or already applied to cases ($n=5$, 38%), [1, 5, 19, 32, 33].

Attributes of framework components (See Additional File 1)

Rationales provided for developing the frameworks include introducing actionable tools or guidelines ($n=5$, 38%) [10, 24, 25, 30, 31], scale-up for context specific interventions ($n=3$, 21%) [25, 27, 29], and existing frameworks not being evidence based or theory informed ($n=2$, 14%) [26, 31]. Along with these, 4 articles state unique rationales, including a goal for long-term spread and scale up [5], a focus on scaling impact [1], the need to take into account large scale

implementation [19], and the importance of effective implementation in scaling [33].

Most of the 13 frameworks focus on planning for scaling ($n=9$, 69%) [1, 5, 13, 19, 26–28, 31–33], while a few are about explaining what influences scaling outcomes ($n=2$, 15%) [29, 34], and 16% are unspecified ($n=2$) [25, 30]. The frameworks are meant to be applied to various geographic settings, most are aimed at macro levels ($n=12$, 92%,) [1, 5, 13, 19, 25, 26, 28–34] with the remaining framework designed for application is aimed solely at the micro level (8%, $n=1$) [27].

In terms of theoretical basis, the majority of frameworks draw on a variety of theoretical models to conceptualize how scaling will happen. Among the published works, explicitly named models include quality improvement (8%, $n=1$) [13], complex adaptive systems (15%, $n=2$) [25], [26], diffusion of innovations (15%, $n=2$) [27, 30], sociological theories (8%, $n=1$) [5] or multiple theories (organizational readiness for change theory, complex adaptive systems and diffusion of innovations theory; 8%, $n=1$) [31]. Within the grey literature frameworks, two (50%, $n=4$) [32, 33] explicitly name management theories as drivers of change.

A range of components or constructs are included in 13 of the frameworks. Authors use diverse language to describe these components including stages [25, 26], domains [5], and phases [27], among others ($n=10$, 77%) [1, 13, 19, 28–34]. Each framework has its own set of components that are mostly linear or cyclical in their conceptualization, with a small number including interconnected elements. A commonality among most of the frameworks is a “beginning”, “middle”, and “end” to their plans. Often the beginning involve planning, committing to scale, or evaluating the existing initiative. The middle is more variable across frameworks and includes activities such as resource mobilization, develop support, and advocacy. The end typically includes sustainability, implementation, or user involvement. Alternatively, frameworks that do not follow this pathway use principles or domains to guide scaling as an iterative process, or in a more general sense [1, 5, 19, 30, 33].

The majority of frameworks ($n=11$, 85%) [1, 5, 13, 19, 27–33] include a sustainability component to the framework (i.e., sustainability for the program or innovation [35]). For example, one framework includes sustainability as a core part of their framework to achieve scaling success, using education, communication and feedback among other strategies to achieve this [27]. Including an evaluation or reflection component in the framework is common ($n=10$, 77%) [1, 5, 13, 19, 26–30, 32, 34]. In one framework, for example, evaluation and monitoring is positioned as an ongoing process throughout scaling: pre-scaling to determine the acceptability of the scaling, then monitoring and evaluation during

scale-up to measure effectiveness, and finally the last steps of the framework included post-evaluation [24]. In another example, evaluation is embedded as more than a stepwise and stage-gating function, but as a principle encouraging dynamic evaluative reflection [1]. Finally, more than half of the frameworks include a recommendation to involve stakeholders in the scaling process ($n=9$, 69%) [1, 5, 19, 25–28, 30–32]; these recommendations are distributed across the published frameworks ($n=6$, 67% [5, 25–28, 30, 31]) and grey literature frameworks ($n=3$, 75% [1, 19, 32]).

Less than half of the frameworks are accompanied by additional accessories ($n=6$, 46%) [1, 19, 25, 29, 32, 33] to enhance its usability, such as worksheets. Of note is that all the grey literature frameworks include accessories to enhance the usability of their framework. An example of an accessory that accompanies a framework is a checklist to assess the potential scalability of a project before using the framework [19].

Transferability of the framework (See Table 3)

Generally, the frameworks were developed for or applied to a variety of specific or broad initiatives. For some, the frameworks are meant for limited application within the specific context of their development [25, 26], in which case the authors either do not mention generalizability and transferability or they acknowledge the specificity of their framework. For example, authors describe one framework as being specific to chronic disease risk factor innovations and therefore not readily transferrable beyond this context [34]. Other frameworks are designed

Table 3 Transferability of the framework

Author and Year	Transferability according to author
Ploeg, [27]	Framework needs to be tested in other home care settings
Milat, [28]	The framework is transferrable to other human service endeavors
Bryce, [29]	There is a need to test the framework and build consensus on additional elements for the framework
Bradley, [25]	Authors suggest there may be limited transferability to other contexts outside of family health programs and low/middle income countries
Barker, [13]	Yes, in various settings and types of interventions for large-scale improvement efforts
Côté-Boileau, [30]	The authors stated that the study was unique because it was developed collaboratively by researchers and decision-makers
Greenhalgh, [5]	Authors state framework showed promise when applied to other programs and could be applied across a variety of technologies for health and social care
Indig, 2017	May not be able to be applied to other scale up areas as the innovations were focused on chronic disease risk factor interventions
Nguyen, [31]	The authors state that the framework's content validity and utility require further assessment
Pérez-Escamilla [26]	Framework application is limited to SSA, Asia and Latin America (LMIC)
McLean, [1]	The principles can be transferred to other settings
World Health Organization, [19]	Authors claim that the recommendations can be applied to other fields
Management Systems International, [32]	Authors describe a large variety of settings where the framework has been applied
Implementing Best Practices, [33]	The principles can be transferred to other settings

for a broad range of innovations and initiatives [1, 5, 19, 27–33]. These often had components that adjust for context and therefore can be transferred to those outside of the context within which they were developed. For example, the AIDED framework has a component called user receptivity that adjusts for the context of different settings [25, 26].

Ethical lenses(See Additional file 2)

All 13 frameworks in both types of literature use the teleological (goal-oriented), consequentialist-utilitarian ethical lens (Additional file 3). Within the published frameworks, 40% ($n=4$) [13, 25, 26, 28], these also incorporate a second teleological ethical perspective focusing on values, considering stakeholders' viewpoint. Conversely, only one of these frameworks embrace a combination of goal-oriented and deontological ethical lenses [29]. Of the grey literature frameworks, 75% ($n=3$) [1, 19, 33] employ both teleological and deontological ethical lenses, with one framework integrating all aspects of goal-oriented (utilitarian and values) and deontological ethical lenses [1].

Discussion

This review set out to identify, compare, and contrast scaling frameworks to ultimately advance scaling science for enhancing the impact of produced knowledge on the topic. Of thirteen identified frameworks, nine were published in scholarly journals and four were from the grey literature. Findings confirm that while scaling is occurring mostly in the Global South, most framework primary authors are affiliated with the Global North [7]. Framework developers involved diverse stakeholders in a number of ways to develop their framework. Most frameworks identified were for a planning purpose. In addition, frameworks demonstrated diversity in terms of generic compared to specific applicability. Lastly, a comparison of frameworks found in the grey and published literature show differences that are important, including the ethical lens incorporated into the frameworks. These results lead us to make the following observations.

Firstly, the primary authors of these frameworks seldom have institutional affiliations with the Global South, despite the extensive scaling experience and learning that occurs there[36]. This is congruent with a previous related review that found most first authors were from high-income countries [7]. The grey literature scaling frameworks reflect considerable experience from the South and thus are essential for capturing learnings about scaling. Future work in scaling science can support shared learning by surfacing and acknowledging Global South evidence and expertise; promoting equitable

partnerships and team composition; and calling for equitable resource allocation [37]. Future researchers might also challenge the dominance of high-income country perspectives by creating a decolonial scaling framework.

Secondly, this scoping review advances scaling science by highlighting the development processes of these frameworks. Users of scaling frameworks would benefit from understanding how a framework was constructed in order to select and use one that can confidently contribute to scaling success for their context. We considered five dimensions, three of which – involvement of stakeholders, data used, a consensus process – were based on previous work focused on development of a reporting guideline [10, 38]. We welcome further discussion about how these dimensions might be revised or supplemented to assess framework development. Further, although most framework authors initially reference theories like Rogers' Diffusion of Innovation model, the language in these articles often implies an instrumental approach—emphasizing adherence to framework steps for successful scaling—without further explicit mention of the foundational theories. The field would benefit from active dialogue on this point, debate about what best practices in framework development should be and how they contribute to scaling success if we are to meaningfully advance scaling science. The area of theory analysis criteria, accepted as being important when appraising theories, might serve as a model for this development [23].

We positioned involvement of stakeholders as an informative feature of framework development. Involving interested parties as part of the development process is seen as a way to make services and research more useful, usable and thereby used [10]. Input from multiple perspectives is also seen as an ethical obligation [39]. We observed that in a few cases the framework developers involved others (funders, policymakers, researchers) as either part of the research team, or to comment on the draft framework's applicability by considering previous or on-going innovation scaling projects with which they were involved. Framework development mostly involved peers/colleagues in the scaling ecosystem, which, while a good first step, ought to be expanded to include other viewpoints. Ploeg et al. [27] call for program recipients to be part of framework development, for example.

The other two development dimensions focused on using data to develop the framework and a consensus process to refine the framework. All framework development processes included gathering data (often multiple types of data), lending confidence in the robustness of the framework. What remains unclear is how information from experts solicited from consultation (as described in the paragraph above) compares with information from experts who are part of the research process as research

participants in terms of usefulness, bias, etc. Future research can explore how consultative advice compares with research input in terms of a) the resulting quality of the framework, and b) the application of the framework for scaling innovations.

Less than half of the authors used a consensus process, but what must be emphasized is that this finding reflects what was reported. Discussions with our team revealed that an informal consensus approach might be used, but not reported, as part of the development process by non-governmental organizations to establish the framework's legitimacy with different framework users before releasing it in the public sphere. In terms of development stage, only a few frameworks have been subsequently applied to cases (5/13, 38%). This calls into question the need for future research about the best ways to develop and validate scaling frameworks.

Thirdly, most frameworks are described by framework authors as relevant for planning purposes, which is important given how difficult scaling can be with complex innovations in sometimes challenging contexts. An examination of the components or constructs show that many frameworks address concerns related to these complexities, such as directions on how to adapt (e.g., by considering the contextual fit or local values) or monitor (e.g., by emphasizing the importance of including an information system) innovation progress and health outcomes. And most frameworks include an evaluation component, again demonstrating that the stated purpose of "planning" encompasses additional value for those in the field.

Fourthly, we examined whether the frameworks recommend engagement with others within a stage or as a stage of the framework. Engagement with stakeholders can be a mechanism to determine the suitability of the framework for the setting and through which assumptions can be uncovered and confirmation bias avoided. We found that 6/9 published frameworks and ¾ grey literature frameworks promote stakeholder engagement (e.g., program recipients, organizations taking on the innovation, funders) as part of a successful scaling process, especially for innovation sustainability. One framework recommends that the decision to scale should be made with those impacted because it is a determinant of scaling success [1]. Generally, the frameworks recommend different points at which engagement ought to occur in the scaling process, and a few frameworks call for iterative engagement.

Fifth, and lastly, we observed numerous and important differences between published and grey literature frameworks. For example, in terms of specific application or generic applicability, the grey literature frameworks in particular were drawn from a broad array of cases and are

more readily transferable to other settings. On the other hand, authors of some published frameworks are careful to note that further testing or study is required before they can be transferred outside of the setting in which they were studied. These scaling frameworks differ on whether innovation implementers and other interested parties ought to select a specific or generic framework to guide their scaling efforts.

Our initial objective was not to examine differences between published and grey literature frameworks, however differences did emerge as we analyzed the frameworks. At the start of the review we deliberately included the grey literature frameworks because we understood they were being used in the field even if not published as scholarly outputs. We contemplated the idea that both types of frameworks were perhaps borne from different motivations. Our interpretation is that academic frameworks, built from reviews of primary studies and case studies, might be reflective of what has already happened in the world of scaling and health and social care innovations. The grey literature frameworks, from non-governmental organizations and funders, might be more forward looking or more practice oriented in an attempt to support researchers and others involved in scaling practice and scaling science. Supporting this explanation is the finding that grey literature frameworks were accompanied by more checklists, guides, and other tools, which points to a practice orientation. To illustrate, both the frameworks from the Implementing Best Practices consortium and the International Development Research Centre include "principles" for scaling. Principles communicate norms or beliefs to outline what is desired from scaling and can in turn inform objectives and policy [1, 33].

Moreover, from an ethical perspective, the teleological consequentialist-utilitarian lens—i.e., is goal-oriented to increase innovation effectiveness—dominates discussions on scaling frameworks in both types of literature. Among the 9 published frameworks, all adopted a goal-oriented lens. Additionally, 4 of these frameworks incorporated a goal-oriented lens of values, considering stakeholders' perspectives. Only 1 among 10 published frameworks embrace a blend of goal-oriented and deontological approaches (i.e., the scaling framework is based on principles that guide scaling science as duty or right). Three-quarters of the grey literature frameworks ($n=3$) employ both goal-oriented and deontological approaches, with one framework integrating all aspects of goal-oriented (utilitarian and values) and deontological ethics. This suggests that grey literature frameworks exhibit greater flexibility in integrating multiple ethical perspectives. It may also indicate that grey literature frameworks, being based on ongoing practices, have the

potential to be more responsive to the specific needs of the field. In the process of scaling, it is important to not only prioritize effectiveness but also consider the values of stakeholders through a goal-oriented lens [40]. However, to comprehensively address the complexities inherent in scaling initiatives, it is equally vital to integrate various ethical perspectives. By incorporating both teleological and deontological ethical frameworks, a broader spectrum of concerns can be addressed, and inequalities can be mitigated. For instance, incorporating principles of equity from a deontological perspective can serve as a potent strategy to ensure fairness [39] within scaling frameworks. This approach not only emphasizes achieving desired outcomes but also prioritizes a balanced distribution of benefits and opportunities. Acknowledging moral duties and principles guiding the scaling process, both goal-oriented and deontological perspectives contribute to a more holistic and ethical scaling approach.

There are likely more differences between published and grey literature scaling frameworks that future research can uncover. These differences may simply reflect the dynamic of a growing science, as it moves through stages of evidence accumulation related to quality and consistency, in tandem with the practice[41]. More importantly, it is important to determine how implementers, researchers, funders and policymakers can use the best from both sets of frameworks to fully support scaling as the evidence-base grows.

Limitations and strengths

We turned to a recent, rigorous systematic umbrella review as a starting point for our scoping review [7]. While advantageous, this approach might have missed published frameworks and, grey literature frameworks might not have been identified through expert consultation. Frameworks might have also been overlooked when we updated the search from the starting point article – our decision to hand search particular journals was a choice favouring specificity over sensitivity, and we assumed that experts on the team would be aware of frameworks missed through this strategy. Our findings related to the grey literature frameworks are based on the primary document identified, but others might come to another interpretation if related websites, webinars, training materials, and other accompanying material were also analyzed.

Another limitation is that, to the best of our knowledge, criteria for framework development do not exist, and thus we selected and adopted reasonable criteria from another area. While the findings may need to be

interpreted carefully, the exercise also serves to highlight the importance of developing rigorous frameworks and tools for scaling. Nevertheless, the set of criteria need further testing and refinement to determine if they contribute to positive scaling outcomes.

A major strength of this work is the diverse expertise that the team brought to the project. The team provided perspectives from many disciplines (methodologists, sociologists, health services scientists, public health, interventionists, evaluators), career stages (trainees, early/mid/senior), roles (funders, university and community-based researchers) and the Global North and South, supporting a fulsome discussion of the findings from multiple views and experiences. The learnings from this scoping review are drawn from the health and social innovation literature. A future research agenda could involve carrying out similar reviews in other areas, such as agriculture or climate science, and then synthesizing useful contributions across different fields.

Conclusion

The rationale for conducting this scoping review was to gain a deeper understanding of the emerging field of scaling science. The relevance and significance of advancing the field of scaling science has been highlighted by high-level global consortiums (e.g., www.scalingXchange.org) [42]. The majority of scaling frameworks, mostly developed by primary authors with primary affiliation in the Global North, include a sustainability component and were developed using primary data and literature reviews; about half of the frameworks involved a range of stakeholders in the development process. This review of scaling frameworks for health and social care innovations demonstrates areas that require further attention by implementers, researchers, decision-makers and funders. There were many commonalities among the frameworks but there are some differences, e.g., involving stakeholders or the underlying ethical lenses, that may be important because they might contribute to effective scaling, followed by contextually-sensitive and useful programs or services, minimal waste and sustainable health and social impacts. Researchers are encouraged to consider whether additional scaling frameworks are necessary or if the focus should be on testing and refining the existing frameworks reviewed in this study. Testing and revision would then contribute to suggestions about what to look for when picking a framework for use. Ultimately, to advance the science of scaling, future research is needed on the effects of operationalizing or using the frameworks.

Supplementary Information

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Additional file 1: Attributes of Framework Components, describing framework components of each article analyzed.

Additional file 2: Ethical Lenses, describing ethical components of each article analyzed.

Additional file 3: Figure 1. Ethical lenses in SSF diagram.

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Authors' contributions

AK, IG and RKDM were responsible for conception and design of the project; AK, MD, EN and OT executed the research in close collaboration with the team; AK and MD wrote the original draft, of which DM and RC carried out the ethical analysis; CC, RC, DM, AE, MGI, LG, AG, DM, FL, HV and RKDM were responsible for interpretation and critically reviewing versions of the manuscript; All authors read and approved the final manuscript.

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Data availability

Data is provided within the manuscript or supplementary information files.

Declarations

Ethics approval and consent to participate

Ethics approval and consent to participate are not required for this research as it is a scoping review and uses secondary data. Human Ethics and Consent to Participate declarations: not applicable.

Consent for publication

Not applicable.

Competing interests

Three of the authors (AE, MGI, RKDM) work for the International Development Research Centre whose scaling science framework was found in the parent umbrella review, and therefore included in this analysis.

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