Achieving impacts at scale in early childhood interventions: innovations in monitoring, evaluation, and learning

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Achieving impacts at scale in early childhood interventions: innovations in monitoring, evaluation, and learning

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Editorial: Achieving impacts at scale in early childhood interventions: innovations in monitoring, evaluation, and learning

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Editorial on the Research Topic
Achieving impacts at scale in early childhood interventions: innovations in monitoring, evaluation, and learning

In this paper, we share the experience of the editors of two linked series that explore learning from interventions in early child development (ECD) (1). The series encouraged discussion on intentional information use and its embedding in developing sustainable systems. Authors were asked to reflect on how information can do more than just record the past by helping re-frame the future. As we intended to explore innovation and shifts in thinking, we reflect on the learning shared and the structures and systems that have supported or hindered the process.

Measurement for Change (M4C) [(2, 3); de Laat et al.], the framework of information use that stimulated these series, provokes intentional reflection on effective delivery and sustainable scaling. While both series were open calls to those working in implementation, the launch of each series was preceded by workshops for invited authors that outlined the framework. The series coordinators who facilitated the workshops were a different group from ours, the editorial team.

Authors from both series have made a palpable contribution to bringing diverse perspectives into the discussion, while also raising the importance of the analysis of process. Overall, we conclude that the principles proposed by M4C have yet to be sufficiently explored by the whole implementation ecosystem, and that the journey to decolonized thinking requires more intentional sharing of information garnered across multiple contexts.

*1. **Effective delivery**: given that the initial intention was to highlight how people get things done, not just what they do, what have the two series contributed to raising the importance of process?*

Our reflections, informed by the critical appraisal of the narratives as well as direct experience of implementing interventions, identify that while vulnerabilities appear from the planning stage of an intervention, responses are often delayed by a lack of awareness of what is missing and the over-concentration in information systems on measuring what has been achieved. The reports in these series were distinctive in that they provided considerable detail about the monitoring, evaluation and learning (MEL) of process, a welcome opportunity given the traditional pressure to focus on results, on measurement *of* change (Watkins et al.; Nair et al.). This exploration aligns with the rapid evolution of the discussion on decolonisation that has been unfolding across the implementation ecosystem since the launch of the first series.

While the language of M4C was not generally applied in these narratives, the interest in the series suggests a hunger for the exploration of the whole implementation system, demonstrating what can happen when a different lens is used. However, the papers illustrate that co-design, and the dismantling of hierarchy in decision making, which we regard as an essential component of sustainable impact, has yet to become centralized in the dialogue and in practice.

*2. **Transition to scale**: what useful themes have emerged regarding how the challenge of sustainable scaling can/has been met?*

Population-level ECD implementation involves embedding change in government structures and enabling population-level engagement, ownership, and cultural change (Volen). This requires attention to a broader narrative, one that captures the complexity of systems and human behavior (Murdock et al.).

However, many narratives included in the series address scaling as an increase in the numbers rather than the embedding of interventions into local systems, or the systematic removal of inequality. Success was generally simplified as transfer to government, with few narratives detailing failure, which is actually more common. Lacking, too, are narratives on developing a long game: on the collective building of the resources required for scale up and of methods to sustain value systems over time.

The invitation to reflect on what scaling means, and what is effective in creating sustainability, was fully taken up by only a few authors (Shaw and da Silva). Narratives identified the value of creating loops of information (Brien et al.), but the description of implementation processes commonly remained linear, with the complexity of the networks and systems implicated in building sustainability and scale remaining largely unexplored (Vohra et al.).

*3. **Changing the narrative**: potential authors raised concerns that it would be difficult to publish narratives on process. To what extent were their concerns validated, and/or overcome?*

The level of response to the call for this series reflects a real need for a public forum, particularly on process. The first series on effective delivery comprised 32 papers, produced by 157 authors (Vohra et al.), and the second, focused on scaling, included 20 papers, and 82 authors. Indeed, implementation science has legitimized engagement with process, providing multiple frameworks and theories, some of which were used by series authors (Sklar and Murokora). More prescriptive frameworks may

be more readily mirrored in the structure of writing, but what is illustrated across these papers was the importance of reflective practice that is central to M4C. The intention to think deeply transformed data from information into learning (Nair et al.).

M4C also champions continuous evolution of thinking (Gaidhane et al.), and this is mirrored in the shifts seen between the two series (Apte and Pahan). The inclusion of new voices was a major achievement. For many authors, writing for peer reviewed journals was a new experience. In the second series new voices brought in perspectives from outside the early childhood field, opening up a broader spectrum of ideas and contexts (Krause et al.). This aligns with M4C's goal of ecosystem change (Landon et al.), where all programme participants, notably including funders, engage with a broader range of stakeholders, and apply a human rights based approach to programme design.

While there is a ground swell moving away from centering decision making on randomized control trials alone, many papers still focused on effect size, reporting on achievements without also exploring how change and progress occurred. This is to be expected while authors struggle with the traditional format commonly outlined by publishers. Departures from the standard sequence—Introduction, Methods, Results, and Discussion—also acted as a constraint on generating a pool of reviewers willing to critique narratives centered on process and not on outcome.

Reviewers who were adequately primed on the intention of the series actively engaged with narratives that included speculative commentary. Within this approach reviewers sought revisions that increased the transparency of the reflective process. Demanded from authors was a level of rigor in identifying the speculative, and detailing of the information that triggered the speculation.

*4. **Changing the paradigm**: the intention of M4C has been to ensure that design, evaluation and planning are diverse, equitable, and inclusive. What have been the successes observed, and what remain the key challenges in decolonizing implementation science?*

The two series reflect a measure of success in the decolonization of thought (Watkins et al.; Rasheed), with authors looking from a more holistic perspective and questioning linear frameworks in the decision making process (Dusabe et al.). However, boundaries need to be pushed further. We need explanations of the scaling process that are informed by clearly structured intentional MEL frameworks, and that expand understanding of variability and complex systems (Anago et al.).

Diversity of voices is important to challenge and change, and we were able to draw in multiple voices. Together the papers open a window to how different cultures and communities use evidence, recognize specific gaps, and generate a collaborative planning and consultation process [Shaw and da Silva; (4)]. Nonetheless we still witnessed a dependency on the values and principles of high-income northern partners both in the choice of content shared and in how narratives were structured. Implementation science and the donor community remain overly tied to values that originate in the global north, while decolonisation depends upon being deeply informed by context and variability.

The support shown by Frontiers, inviting us back for a second series, has been a pivotal part of the process of changing the discussion. To continue the dialogue more constructively, publishing culture must also change, encouraging narratives

that expand beyond impact to explore features of replication, sustainability, and scale. Journals must actively seek narratives that speak to wider audiences, in different languages.

For many countries, resources targeted at ECD still lag behind those focused on survival. To bridge this gap a parenting product is often imposed, rather than evolving out of homegrown methods and solutions already embedded in local goals. Funding structures too must therefore change to support a broader capacity to grow alternatives and embed delivery.

5. *M4C suggests **five key principles are** implicated in effective practice and sustainable scaling: **Dynamic, Inclusive, Informative, Interactive, People Centered.** What examples have you seen included in the narratives shared?*

While most contributions did not name the five M4C principles explicitly, their intention was implicit in many of the narratives. A fixed narrative structure based on M4C was not prescribed by the series co-ordinators, so it is hard to draw firm conclusions on the absence of the language of M4C, or the value of the five principles for different authors.

In almost all the narratives information was used in a generative way. A Dynamic, iterative, and Interactive approach to implementation design that moves away from fixed protocols featured in many narratives. Implementation teams did not necessarily wait for a final report of results to make modifications and improve practice, although descriptions of fully Informative and regular data sharing across a broad network of stakeholders were uncommon (Coore-Hall et al.).

Understanding and responding to variability in needs, being People Centered, also featured, although generally this principle was narrowly applied, and multiple levels of meaning were not explored systematically. As we have already shared, actively building long term collaborations, part of being Inclusive, was even less commonly described.

6. *Reflections on what we learnt about information use*

The means and methods to embed an information system in a programme, through inclusive tools, methods, or collective decision making, were variously explored in the narratives. Implementation teams generally used a variety of data, and looked beyond the numbers (López et al.). Still, the quantitative tradition dominated, with only a few contributions describing application of more innovative methods to capture contextual meaning and or deepen understanding through triangulation across means and Slemming et al. (5). Another obvious gap was the lack of explorations of consequences, particularly the unanticipated. As the narratives from the COVID-19 pandemic illustrate, response to the unanticipated can provide a powerful source of learning on resilience and adaptability.

There appears to remain a lack of confidence that novel information tools and methods will be accepted by academia (publishers and reviewers), and by gatekeepers (funders and global organizations). Consequently, a rich opportunity to explore alternative frameworks for design and implementation, and to develop rigorous and systematic use of stories, especially those that learn from the missed and from failure, remains untapped.

7. *Reflections on what we **experienced as editors**, what helped and what hindered us getting this series completed.*

An irony in M4C is that, in its championing of de-colonized thought, it strives not to be prescriptive of means and methods. This has made it difficult to carry out a systematic review of each of the five proposed principles. But as the intention was not to introduce a framework, but to change practice, in our failure to achieve outcome—use of M4C language—we also see success - in the achievement of a broad range of detailed narratives on changed perspectives and good practice. Future initiatives could gain greater insight through the application of a more structured invitation for practitioners to actively use the M4C framework in their reflective practice, with a systematic guide for potential authors and reviewers to apply in their critical appraisal of the learning.

The starting point for any paradigm shift is to challenge personal frameworks and structures. The conceptualization of what constitutes evidence has shifted for those involved in the production of these series, particularly toward acknowledging engagement in learning as crucial to change. The papers have made explicit the value of an inclusive process for gathering and interpreting information and for considering who is listening. Implicit is the need to create a dynamic, though structured, process to ignite real and lasting change.

Author contributions

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Conflict of interest

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Scaling Nurturing Care Interventions in the Health Sector: A Theory of Change Perspective

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Nurturing care interventions postulated on strengthening caregiver-child relationships have proven to be effective for improving early childhood development outcomes in low- and middle-income countries. Hence, a scale-up of the interventions has been recommended with an emphasis on the health sector given the contact with families in the critical first 3 years of life. However, an effective scale-up of an integrated intervention through healthcare requires a theory of change approach elucidating pathways of sustainable change. From this viewpoint, I reflect on my experience of scaling the intervention in a private pediatric care setting. I realized that buy-in from the health sector required realization of benefits to include health outcomes framed as the potential to improve the quality of life and the process of recovery; sustainable behavior change required a culture that promoted nurturing care highlighting the role of leadership; subsequently improving the experience of frontline staff and at an individual level, this could be achieved through the provision of supportive supervision-rooted in a framework of compassion. The lessons learned are shared to be considered for future integration efforts.

Keywords: nurturing care, theory of change (ToC), private sector, integration, scale-up

Nurturing care (NC) is defined as a "stable environment created by parents and other caregivers that ensures children's good health and nutrition, protects them from threats, and gives young children opportunities for early learning, through interactions that are emotionally supportive and responsive" (1). It has been recommended as a crucial strategy to mitigate the effect of over 250 million children (43%) younger than 5 years in low- and middle-income countries (LMICs) estimated to be at increased risk of not achieving their maximum human potential, with long-lasting impact on adult productivity (2). Health programs can be leveraged as an entry point to scale NC intervention given the extensive reach to these families during the critical early years. Moreover, there is documented evidence of feasibility and effectiveness of integrating additional components of responsive caregiving and stimulation at the point of delivery. However, case studies detailing the implementation process of institutionalizing the integrated intervention remain scarce. In this perspective, I start with a brief description of the assumptions which need to be realized for the desired outcomes of integration to be achieved. Then taking an empathetic approach, I list the challenges of the health sector from their perspective and suggest a way forward that takes their genuine concerns into account (being sensitive). The core strategy was adopting the principles of NC to create an enabling system that allows the frontline staff to experience being nurtured (being responsive). I build this narrative from my experiences of integrating the NC intervention [Care for Child Development (3) module] in a private tertiary-care hospital in Pakistan.

THEORY OF CHANGE

A ToC (4) model of integrating NC in a health system for the goal of improved early childhood development (ECD) outcomes has four broad areas of focus for behavior change: the mother, the frontline worker, her supervisor, and the health system (**Figure 1**). The assumptions for the changes in mothers' behaviors are that they are motivated to improve their children's development once they receive new knowledge and learn new ways to strengthen their parenting skills and, importantly, have the autonomy to do so. The motivation for the frontline worker to change her behavior assumes that the health system can engage the worker for delivery of the intervention through a robust supervision system. The supervisory support would ensure the required dosage was delivered (professional accountability), with adequate quality (enhancing competence), while also treating her as an individual with respect (emotional experience with the work). While there is sufficient evidence around interventions to realize the assumptions related to supervisory support (5), further studies are required to operationalize the interventions for the supervisor and the overall system (at-risk assumptions). The at-risk assumption related to the supervision system is that support strategies for the supervisor/manager are in place along the same principles. These strategies need not just training for the new skill set but are also modeled and encouraged by the higher leadership. The final at-risk assumption with respect to the health system is that supervision pertaining to NC sustains because a culture that values NC is promoted.

THE CHALLENGES

There were multiple challenges when scaling up an NC intervention model which is a behavior change intervention through the health sector. Securing buy-in of healthcare leaders when framing the argument as a case of long-term benefits for adult productivity was not met with enthusiasm and rightly so. Educational attainment does not fall into the realm of the health sector and adult productivity is a long-term outcome. The health sector is appraised against health outcomes just like the education sector is responsible for academic ones. Hence, when the disease burden is high and resources are limited, the natural course of action is to prioritize interventions that will improve health indicators.

Secondly, the routine training of health workers (especially nursing) involved giving didactic messages emerging from a traditional medical model though compassionate care is highly encouraged in medicine. Reframing training of nursing staff to deliver a relationship-based intervention embedded in human empathy required a significant shift of responsibility toward families, to empower them to become partners in the healthcare journey of their child.

A third challenge was that no provision of continued professional education of managers as supervisors existed in both systems–a gap expressed by the participants themselves to ensure the quality of the intervention delivery. An effective supervision characterized by intellectual competence as well as the empathetic approach in relationships is pivotal to an engaged workforce. The skills needed to be built through supervision entailed modeling similar principles of shared decision-making, encouraging dialogue, and mutual respect, creating an experience to flow because of a virtuous cycle.

Leadership practices in healthcare settings in LMIC are generally hierarchical with managers exercising power in a narrow space of decision-making (6). A greater challenge was there was no formal (or informal) training for leadership around skills to engage employees and the positions are usually held based on clinical experience. Such practices affect staff motivation and disengage them. Delivering an intervention that was essentially postulated in human vulnerability would not have been possible for a worker who had never been on the receiving end herself. To ensure quality, the supervision system had to be strengthened and a culture shaped should be valued for promoting relationships and connections, which allowed being sensitive and responsive to nurture the subordinates especially the frontline staff.

THE STRATEGY

At the macro-level, NC was framed as part of the vision of the health system for provision of quality care (7). Literature from high-income countries has indicated that such interventions can reduce morbidities and improve the process of recovery and the quality of life in children (8). Additionally, the intervention can shift the focus to the development and behavior of every child in the system and a greater multidisciplinary approach to healing. These are important indicators of the quality of healthcare systems (9). Another strategy for framing was to reduce anxieties related to the new task. NC considerably overlaps with the notion of "compassionate" and "empathetic" care which is widely used in healthcare services. When NC was presented along those lines, it was perceived as a familiar concept thereby making people feel like doing something which is supposed to be part of their job.

Framing was followed by a shift toward human-centered practices modeled by those in leadership positions using an innovative social media strategy (10) as an opportunity to mentor the next layer of managers (11). Staff were provided space to express their challenges. Just like with the intervention activities (play) serving as an entry point to enhance the quality of mother/child interaction promoting early attachment and bonding, specific activities were envisioned to promote connections between supervisors and the staff.

At the micro-level, building the capacity of supervisors of the frontline workers through mentorship to ensure optimal delivery of health messages, including NC, formed promising inception. A mentorship program was developed embedded in a framework of compassion, enabling supervisors to connect with the frontline staff for a stronger relationship (12). While this meant extra efforts for training for NC, it also served as an opportunity to bring a new approach to counseling that could positively impact all areas of healthcare counseling. The approach of working with
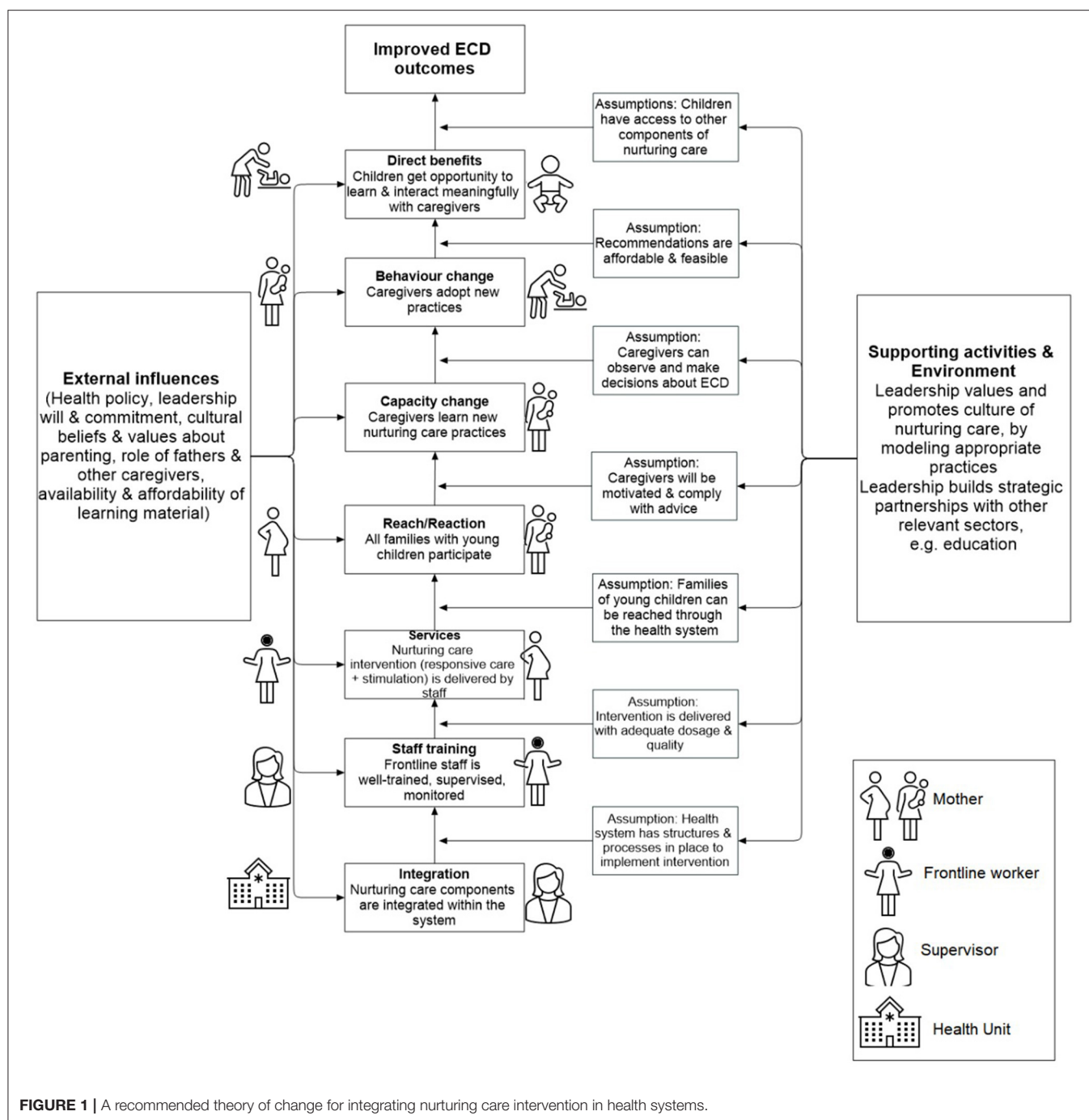
FIGURE 1 | A recommended theory of change for integrating nurturing care intervention in health systems.

the supervisor and allowing her to mentor the frontline worker was found to gain quick buy-in for efficient implementation.

An important non-monetary incentive for health workers is their relationship with the patients and families they serve. Through this training and a focus on counseling skills, this served as an added incentive for uptake of NC intervention. Strengthened relationships can also be a source of strength for families especially for women in settings who may otherwise have no social support at home.

LESSONS LEARNED

The experience with the implementation of the projects has yielded lessons that can be of value to others who wish to support the integration of NC intervention.

- The quality of implementation of NC intervention is inherently dependent on the health system from which it operates. Hence, any strategy for scaling up needs to contain an element of system strengthening. Health system experts who can provide insights about health structures and

organizational psychologists who understand the processes of human interaction at workplaces as part of the core team should be included.

- Approach the support as a partnership model with internal stakeholders. Recognize their strengths and provide them with an opportunity to co-design and co-lead where possible, e.g., the nursing mentorship package was led by the nursing team. This leads to greater engagement and ownership of the stakeholders important for sustainability.

- Instead of the traditional approach which creates parallel structures through research staff, the focus should be on strengthening and engaging the existing structure of training, supervision and monitoring, and evaluation.

- A theory of change model should be created to design the external support mechanism explicitly laying out the causal pathways to effective and sustainable integration. The approach requires a realistic evaluation of the capacity of the health system and their staff to implement nurture care and

then design accordingly since it is not just a new skill but also a new behavior.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

MR review the literature and drafted the perspective.

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The Irie Classroom Toolbox: Mixed method assessment to inform future implementation and scale-up of an early childhood, teacher-training, violence-prevention programme

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Introduction: Violence against children (VAC) is a violation of child rights, has high prevalence in low- and middle-income countries, is associated with long-term negative effects on child functioning, and with high economic and social costs. Ending VAC at home and at school is thus a global public health priority.

Methods: In Jamaica, we evaluated an early childhood, teacher-training, violence-prevention programme, (the Irie Classroom Toolbox), in a cluster-randomised trial in 76 preschools. The programme led to large reductions to teachers' use of VAC, although the majority of teachers continued to use VAC at times. In this paper, we describe a mixed-method evaluation of the Irie Classroom Toolbox in the 38 Jamaican preschools that were assigned to the wait-list control group of the trial. In a quantitative evaluation, 108 preschool teachers in 38 preschools were evaluated at pre-test and 91 teachers from 37 preschools were evaluated at post-test. One preschool teacher from each of these 37 preschools were randomly selected to participate in an in-depth interview as part of the qualitative evaluation.

Results: Preschool teachers were observed to use 83% fewer instances of VAC across one school day after participating in the programme, although 68% were observed to use VAC at least once across two days. The qualitative evaluation confirmed these findings with all teachers reporting reduced use of violence, but 70% reporting continued use of VAC at times. Teachers reported that the behaviour change techniques used to deliver the intervention increased their motivation, knowledge and skills which in turn led to improved child behaviour, improved relationships and improved professional well-being. Direct pathways to reduced use of VAC by teachers were through improved child behaviour and teacher well-being. The main reasons for continued use of VAC were due to barriers teachers faced using positive discipline techniques, teachers' negative affect, and child behaviours that teachers perceived to be severe.

Discussion: We describe how we used the results from the mixed-method evaluation to inform revisions to the programme to further reduce teachers' use of VAC and to inform the processes of training, supervision and ongoing monitoring as the programme is scaled-up through government services.

Introduction

Violence against children (VAC) is a global public health problem with high prevalence in low- and middle-income countries (LMIC). Two thirds of children aged 2–4 years living in LMIC, equivalent to more than 220 million children, experience physical punishment or psychological aggression at home (1, 2). Over half a billion children each year experience violence in and around schools, including VAC by teachers (3). Article 19 of the Convention of the Rights of the Child states that children have the right to be protected from "all forms of physical and mental violence" and VAC is a clear violation of children's rights. VAC has long-term negative effects on children's physical and mental health and academic achievement and increases the risk for later perpetration of child and spousal abuse thus leading to an intergenerational cycle of violence (1, 2, 4–6). There are also large economic costs associated with VAC. In a 2014 report, global costs of VAC were estimated to be $7 trillion (between 3 and 8% of global GDP) (7), while a more recent report on ending violence in schools estimated that school violence alone costs US$11 trillion in lost future earnings caused by children learning less while in school and dropping out of school (3).

With the need to protect child rights, the high prevalence, the long-term negative effects on child functioning, and the high economic costs of VAC, ending violence against children is recognised as a global public health priority. Eliminating violence against children is included in the Sustainable Development Goals with goal 16.2 calling for an end to all forms of violence against children (8). The Global Partnership to End Violence against Children was created in 2016 to address this goal (https://www.end-violence.org) and the World Health Organisation launched the INSPIRE framework which includes seven evidence-based strategies for ending VAC (9). One of these strategies involves implementing parent and caregiver support programmes.

There is growing evidence from LMIC that violence prevention, parenting programmes can be effective in reducing parents' use of VAC at home (10, 11), although most studies have been small efficacy trials and evidence is needed on their effectiveness at scale. There is some limited evidence of the effectiveness of interventions to prevent VAC by primary and secondary school teachers (12–14), but less work has been conducted in early childhood educational settings such as preschools and childcare centers. Ending teachers' use of VAC is critical as schools reach large numbers of children and children spend a large amount of time there. The mission of schools is to promote children's learning, social-emotional competence, wellbeing, and life skills. VAC by teachers leads to school drop-out, poor health and wellbeing, physical injury, and low levels of learning (3). Interventions to prevent violence at school can thus support schools to achieve their mission of providing quality education. Early childhood is a particularly sensitive period for children's development and safe, secure, stimulating and nurturing early childhood caregiving environments promote children's cognitive and behavioural functioning and their longer-term health and development (15).

In Jamaica, violence against young children is common at school and at home with 84% of parents of children aged two-to-four years reporting using physical punishment over the past month (16) and 88% of preschool teachers observed to use VAC over two school days (17). There is thus an urgent need for violence-prevention programming during the early childhood years. This need has been recognised at the national level – Jamaica is a pathfinder country in the Global Partnership to End Violence Against Children and the government has launched 'The National Plan of Action for an Integrated Response to Children and Violence' (18). To respond to the need for violence-prevention programming, we have developed, implemented, and evaluated two early childhood programmes to reduce VAC at school and at home: (1) the Irie Classroom Toolbox: a teacher-training programme (17, 19), and (2) the Irie Homes Toolbox: a parenting programme (20, 21).

During the initial development, implementation, and evaluation of The Irie Toolbox programs, we have utilised key implementation science principles to increase the likelihood that the program will be integrated into the existing early childhood educational system in a sustainable way and maintain effectiveness at scale. These principles include designing the interventions for scale from the outset (19, 20), and embedding monitoring and evaluation activities, (including quantitative, qualitative and process evaluations), into ongoing programme

implementation with lessons learnt used to inform revisions to the intervention (20, 22–24). We have given an overview of the processes involved in designing, implementing, evaluating, and initial scaling of the Irie Toolbox programmes in a recent article (Baker-Henningham et al.)[1]. The processes used include principles of the measurement for change approach that advocates using a monitoring, evaluation and learning (MEL) system guided by five interconnected concepts (25). In the Measurement for Change approach, MEL systems strive to be: (1) dynamic (flexible and responsive), (2) inclusive (involving all stakeholders), (3) informative (collecting and utilising information from a variety of sources), (4) interactive (measuring interactions among participants), and (5) people centered (acknowledging and measuring individual differences). Through utilising this framework, ECD researchers and practitioners can ensure that their MEL systems are used to adapt and iteratively revise interventions to meet changing needs as they are scaled up.

This article demonstrates how we used the Measurement for Change approach by embedding MEL activities into one round of implementation of the Irie Classroom Toolbox. At the time of this study, we had previously evaluated the Irie Classroom Toolbox in a cluster randomised controlled trial in seventy-six preschools and demonstrated that the Toolbox led to large reductions in teachers' use of VAC and significant improvements to the quality of the classroom environment, class-wide child prosocial behaviour and teacher wellbeing (17). However, the majority of teachers continued to use VAC at times indicating the need to further strengthen the intervention. The data for this study was collected when the Irie Classroom Toolbox was implemented with teachers in the preschools originally assigned to the wait-list control group of the trial. The aim was to collect quantitative and qualitative data that would inform future implementation of the Irie Classroom Toolbox including: 1) revisions to the content of the intervention to strengthen effectiveness in reducing VAC by teachers, 2) the design of the training and supervision processes as the programme is scaled-up through government services, and 3) the development of monitoring tools required to promote quality implementation. We conducted a pre-post quantitative evaluation of the effect of the intervention on teachers' use of violence against children, the quality of the classroom environment, class-wide child behaviour and teacher depressive symptoms to evaluate the benefits of the Toolbox training with this cohort of teachers. We also conducted a qualitative evaluation of the intervention to investigate teachers' perceptions of the mechanisms of action of the intervention.

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1 Baker-Henningham H, Bowers M, Francis T. The process of scaling early childhood violence prevention programs in Jamaica. Special issue on promoting early childhood globally through caregiving interventions. *Pediatrics* (submitted).

Methods

Study design and participants

This mixed-method study was conducted with the wait-list control arm of a cluster-randomised trial in community preschools in Kingston and St. Andrew, Jamaica. Community preschools cater to children aged 3–6 years and are run by community organisations with government support and oversight. In the original trial, 76 preschools were randomly selected from 120 eligible preschools to participate in the study. Preschools were eligible to participate if they had two-to-four classes of children, a minimum of ten children in each class and were located in urban areas of Kingston and St Andrew. All teachers and all classrooms in selected preschools participated in the study. Preschools were randomly assigned to receive the Irie Classroom Toolbox program ($n = 38$) or to a waitlist control group ($n = 38$). Measurements were conducted at baseline (May–June, 2015), post-test (May–June, 2016), and one-year follow-up (May–June, 2017) in all 76 preschools. The results of this trial have been published previously (17).

From August 2017 to April 2018, teachers in the preschools allocated to the waitlist control group participated in the Irie Classroom Toolbox training program. All teachers in the sample preschools participated in the study. Measurements conducted from May–June, 2017 in these 38 schools (the one-year follow-up point of the original trial) were used as the pre-test measurements in this study. Post-test measurements were conducted from May–June 2018. For the qualitative evaluation, we randomly selected one teacher from each preschool to participate in an in-depth, semi-structured interview. No teachers refused to participate. Interviews were conducted in June 2018.

Ethical approval for the study was given by the School of Psychology, Bangor University ethics committee (2014-14167) and the University of the West Indies ethics committee (ECP 50, 14/15). Written, informed consent was obtained from the preschool principal and all preschool teachers in each school to participate in the study. Separate written informed consent was obtained for teachers selected to participate in the in-depth interviews.

Intervention

Teachers were trained in the Irie Classroom Toolbox through four full-day teacher training workshops, eight one-hour sessions of in-class support (once a month for 8 months) and fortnightly text messages. The Irie Classroom Toolbox trains teachers in classroom behaviour management and how to promote children's social and emotional skills (20). See Table 1 for full details of the intervention.

TABLE 1   The Irie Classroom Toolbox intervention.

Content

The Irie Classroom Toolbox includes four modules: (1) Creating an emotionally supportive classroom environment, (2) Preventing and managing child behaviour problems, (3) Promoting children's social and emotional competence, and (4) Individual and class-wide behaviour planning.

Procedures

The content was introduced through four 6-hour teacher-training workshops, eight 1-hour in-class individual support sessions (once a month for eight months) and fortnightly text messages over an eight month period (from late August-late April). Teachers were also given monthly classroom assignments.

Workshops

Two workshops were held in the summer holiday prior to the start of the new school year (late-August), one workshop was held in the Autumn half-term and the final workshop in the Spring half-term. Teachers were split into four groups and each workshop was conducted by a facilitator and a co-facilitator with groups of 20-30 participants. During workshops, teachers were introduced to the content through demonstration, live and video modeling, role-play and rehearsal, group discussions, and small group activities. Workshops were designed to be practical, participatory and fun with an emphasis on supporting and motivating teachers through the use of scaffolding, collaborative problem-solving, reflecting listening and positive feedback.

In-class support

Each in-class support session was designed to support teachers with a specific topic covered in workshops. The topics included: (1) Using praise, (2) Teaching classroom rules, (3) Coaching children's academic skills, behaviour, friendship and emotions, (4) Interactive reading, (5) Explicitly teaching friendship skills, (6) Problem-solving stories, (7) Preventing problems in the classroom, (8) Review. The in-class support consisted of three discrete elements: (1) Planning: the coach and teacher discussed the aims of the session (5 mins), (2) Coaching (45 mins): the coach worked alongside the teacher modeling how to use the strategies, encouraging the teacher to use the strategies and giving positive feedback, and highlighting the effects of the teacher's use of the strategies on the children, and (3) Debriefing (10 mins): The coach and teacher evaluated the session, and engaged in collaborative problem-solving and goal setting.

Text messages

Fortnightly text messages were sent to all teachers. The messages related to the content covered during the monthly coaching sessions and were designed to remind and motivate teachers to use the strategies.

Classroom assignments

Classroom assignments involved practical activities that encouraged teachers to use the strategies covered in the coaching session during the next month and record the effect of the strategies on the classroom environment, and on children's engagement and behaviour. Teachers were given classroom assignments after the first seven in-class support sessions.

Materials

The Irie Classroom Toolbox includes resources for teachers and resources for facilitators.

Resources for teachers

IRIE Classroom Tools Book: Describes each strategy, how and why to use it.

IRIE Classroom Activities Book: Lesson plans to teach classroom rules, friendship skills and emotions, songs, games to build children's self-regulation skills, activities to reinforce friendship skills, activities to reinforce children's knowledge of emotions.

IRIE Classroom Resource Book: Behaviour planning forms, Irie Notes (to share positive news with parents).

Three sets or picture cards: Rules, Friendship Skills and Emotions.

Problem-solving Stories Book: 14 pictorial stories of common problems children face at school.

Resources for facilitators

IRIE Classroom Teacher-Training Kit: A kit containing materials required to conduct the training including a fully-scripted training manual, video vignettes, charts, cards for sorting, and selected toys and picture books.

IRIE Classroom Coaching Manual: Guidelines on how to conduct the in-class support sessions.

IRIE Classroom Monitoring Tools: Self-evaluation and teacher-evaluation forms, observation checklists to monitor teachers' use of the strategies in the classroom.

Staffing

The intervention was implemented by eight female staff hired and trained by the research team. All staff had Masters' degrees and had delivered the Irie Toolbox intervention in the first round of implementation in the 2015-2016 school year. Four staff facilitated the teacher-training workshops and four staff co-facilitated the workshops. The co-facilitators also coached the teachers during the in-class support sessions and each coach was responsible for 9-10 preschools (25-30 teachers). During the first round of implementation, facilitators and co-facilitators received twelve days of training in how to conduct the teacher-training workshops and attended weekly group training and supervision meetings over the eight months of implementation to practice the skills required for the in-class support sessions and to problem-solve issues as they arose. Coaches also received monthly field supervision from two of the workshop facilitators. In this second round of implementation, staff participated in four days refresher training in how to conduct the teacher-training workshops (1 day of training prior to each workshop) and participated in weekly group supervision meetings throughout the eight months of implementation. Coaches continued to receive monthly field supervision.

(Continued)

TABLE 1 (Continued)

Implementation

Teacher satisfaction

Teacher satisfaction with workshops was measured using evaluation forms that were completed after each workshop in which teachers rated the content, videos, facilitator skills, group discussions, demonstrations and small group discussions on a six-point scale (0=not at all helpful to 5=extremely helpful). Teacher satisfaction was high with a mean (SD) score across all four workshops of 26.7 (2.6) (out of a maximum of 30).

Teacher participation and engagement

Teachers attended a mean (SD) of 2.9 (1.1) workshops (out of a maximum of four) and participated in a mean (SD) of 7.7 (0.8) in-class support sessions (out of a maximum of eight). Twenty-nine teachers (31.9%) attended all four workshops, 78 (85.7%) attended at least two workshops, 1 (1.1%) attended zero workshops. Seventy-nine teachers (86.8%) participated in all eight in-class support sessions, eighty-three (91.2%) participated in seven or more and all participated in at least four. Teachers completed a mean (SD) of 3.8 (2.7) classroom assignments (out of a maximum of seven). Seventy-eight teachers (85.7%) did at least one assignment, forty-nine teachers (53.8%) did four or more.

We had previously implemented the Irie Classroom Toolbox over a full school year with teachers in the 38 schools assigned to the intervention group in the cluster-randomised trial. During this year, workshop facilitators and in-class coaches received ongoing supervision and support and ongoing revisions were made to the teacher-training and in-class support manuals to address problems and needs as they arose. Hence during this second round of implementation, the staff were more experienced and confident and the facilitator manuals were more comprehensive. The content and process of implementation of the Toolbox and the materials given to the teachers remained largely unchanged.

Measurements

Measurements included quantitative and qualitative data. All quantitative measurements have been used previously in early childhood classrooms in Jamaica (17, 22).

Quantitative data

The primary outcome was teachers' use of violence against children measured through independent structured observations throughout one school day. Event sampling was used to record each discrete act of violence against children including teachers' use of: (1) physical violence (e.g., hitting with hand or object, pinching, poking, forcefully pushing or pulling a child, making a child stand or kneel in uncomfortable positions), and (2) psychological aggression (e.g., name-calling, threatening physical punishment, encouraging children to hit or harm each other, using non-verbal threats). The total score was the number of times the teacher used violence against children throughout the day (see Supplementary material). All behaviours were defined in an observation manual with clear definitions of each behaviour, examples and non-examples, and decision rules.

Secondary outcomes included observations of the classroom environment, a binary measure of observed teachers' use of violence across two schools days, and teacher depressive symptoms. The observations of the classroom environment included: (1) two measures of the quality of the classroom environment assessed using the Classroom Assessment Scoring System Pre-K (CLASS Pre-K): emotional support and classroom organisation (26), and (2) two measures of class-wide child behaviour: class-wide child aggression and class-wide child prosocial behaviour assessed using rating scales that measured the frequency, intensity and number of children involved in aggressive and prosocial behaviour respectively. These classroom observations were conducted over five 20-minute periods over one school day with the mean score over the five observations used in the analyses. They were scored on a seven-point rating scale (1–7) where 1 = low and 7 = high. During these five 20-minute observation periods, the observers also recorded whether teachers used violence against children (including physical punishment and psychological aggression) and a binary score of teachers' use of violence over two school days was created. Teacher depressive symptoms was measured by interviewer-administered questionnaire using the Centre for Epidemiological Studies Depression Scale (27).

Procedure and quality control

Data was collected by a team that included ten teacher observers who conducted observations of teachers' use of violence across one school day, ten classroom observers who conducted observations of the classroom environment over another school day and one teacher interviewer. To prevent bias, the observers and teacher interviewer were unaware that the teachers had participated in an intervention. Teachers were not masked. Each classroom was observed for five 20-minute periods over one school day by a classroom observer and then on a second day, a teacher observer conducted observations of teachers' use of violence across the whole school day. When all observations in the preschool were completed, the teacher

interviewer visited the school to conduct teacher interviews. Only one observer was present in a classroom at a time and a maximum of two observers were present in a preschool each day.

Training for observers was conducted over a 4 week period at each measurement point and included 1 week of in-office training, 2 weeks of field training and 1 week to conduct interobserver reliabilities prior to the start of data collection. Interobserver reliabilities were measured using intraclass correlation coefficient (ICC) and were >0.8 for all classroom observations and > 0.9 for observations of teachers' use of violence over one school day. We conducted ongoing reliabilities once a week with each observer throughout each data collection period and interobserver reliabilities of ICC > 0.8 for observations of the classroom environment and ICC > 0.9 for teachers' use of violence were maintained.

The measure of teachers' depressive symptoms (CES-D) had high internal consistency (Cronbach's alpha= 0.88 at pre-test, 0.89 at post-test) and high test-retest over a 2 week period (ICC = 0.82). For the observational measures, we previously calculated stability over 1 year using data from the wait-list control group (17). Stability was in the expected range for all outcomes except class-wide prosocial behaviour which showed low stability: teachers use of violence against children, ICC = 0.63; emotional support, ICC = 0.48; classroom organisation, ICC = 0.42; class-wide aggression, ICC = 0.59; class-wide prosocial behaviour, ICC = 0.13; violence against children over two school days, ICC = 0.51.

Qualitative data

In-depth semi-structured interviews with each teacher selected to participate in the qualitative evaluation were conducted by one of two research assistants who had not worked with these teachers previously. Both research assistants were female with Masters' degrees in Psychology. They received 10 days' training in conducting the in-depth interviews including theory, demonstration, role play and supervised practice interviewing teachers. The interview focussed on how the intervention led to changes in teachers' use of VAC and/or reasons for teachers' continued use of VAC. The interview guide was developed by MB and HBH and piloted by MB, HBH and the two interviewers with four teachers who were not selected to participate in the in-depth interviews. The interview guide is shown in Table 2. Interviews were conducted in a quiet area on the school property, after all post-test measurements in the school were completed, and were scheduled in advance at a time convenient for the teachers. Each interview lasted between 45 and 90 min and was audio-recorded and then transcribed. Transcriptions were independently checked for accuracy against the audiotape. Each teacher was given an identification number to preserve their anonymity. Children's, teachers' and schools' names were excluded from the transcriptions.

Analysis

Quantitative analysis

The difference between pre-test and post-test scores was analysed using a Wicoxon Paired Signed Rank Test for teachers' use of violence over one school day, a paired t-test for all other continuous variables, and a Chi-Squared test for the binary variable of teachers' use of violence over two school days. Teachers' depressive symptoms was normalised using a square root transformation prior to conducting the paired t-test.

Qualitative analysis

Qualitative Data was analysed manually using the framework approach which is appropriate for applied policy research that has specific objectives and is based on a priori issues (28). The framework approach involves five steps: (1) reading and rereading the transcripts in a familiarisation phase, (2) constructing an index of codes based on the themes and subthemes in the data, (3) applying the codes to the transcripts, (4) creating tables to collate all codes related to each theme and subtheme, and 5) interpreting the data. Steps one and two were conducted by MB and HBH who read six transcripts and collaborated on developing the coding index using inductive and deductive methods. Initial codes were generated using the interview guide and inductive codes were added as new themes and subthemes emerged from the data. In step three, all text was coded and where a section of text included more than one code, all relevant codes were applied. In step four, the data was reorganised into tables of each theme/subtheme and we report the number of participants who mentioned each subtheme as an indication of its salience within the data. In step five, we examined the data and constructed mechanism diagrams to represent teacher reports of the pathways to their reduced use of VAC and continued use of VAC. Data was coded by MB in discussion with HBH with regular meetings to address any queries. In addition, another member of the Irie Toolbox team independently coded six teacher transcripts and we found acceptable levels of agreement (>80% on all codes). Discrepancies were resolved through discussion with HBH and MB.

Results

Quantitative evaluation

In May-June, 2017, data was collected with 108 teachers in 38 preschools. In May-June, 2018, post-test data was collected with 91 teachers in 37 preschools: a loss of one preschool and seventeen teachers. Fourteen teachers had left the school and three teachers were principals who were no longer responsible for teaching a class. There were no significant differences between those found and lost on classroom or

TABLE 2   Interview guide for in-depth semi-structured interviews.

Topic	Questions with suggested prompts
Opening questions	Tell me what you thought about the training programme that you participated in. What are you doing differently because of the training programme?
Corporal punishment	Some teachers tell us that they sometimes need to give children a little slap, threaten to slap them or shout at them to get them to behave. To what extent do you find that? Under what circumstances/for what behaviours do you find you need to 'give a little slap' or shout at children?
	(If the teachers report not using violence against children (VAC) or report a reduction in use)
	Suggested prompts
	What led to the difference?
	What do you do instead?
	What strategies are most helpful?
	What strategies do you use the most?
	What made it easier for you to use those strategies? How do those strategies help?
	[If teachers report that they use corporal punishment (even if reduced)]
	Suggested prompts
	One of the aims of our training programme is to reduce teachers' use of *(use the teacher's words to describe VAC)*.
	What are some of the reasons why you need to use *(use the teacher's words to describe VAC)*?
	Under what circumstances/for what behaviours do you find you need to *(use the teacher's words to describe VAC)*?
	What would you need to help you to manage children's behaviour without needing to *(use the teacher's words to describe VAC)*?
Strategies used the least	What strategies do you use the least? What made it harder to use these strategies? What would need to be different to increase your use of these strategies? Are there any strategies which you do not agree with?
Teacher training workshops	*(If the teacher attended at least one workshop)* What did you think about the workshop(s)? What activities were most helpful? How did the activities help you? What was less helpful in the workshop?
In-class support	What did you think about the in-class support? What did you like about it? What did you dislike? What effect did it have on you using the strategies?
Summary	If you were asked to share one strategy with a teacher who had not received the training, which strategy would you share? Why did you choose that strategy?
	Do you have any advice on how the programme can be improved for other teachers who participate at a later date?

teacher characteristics or on pre-test scores of the outcome variables (see Supplementary Table 1).

Teacher and classroom characteristics are shown in Table 3. At pre-test, teachers used a median [interquartile range (IQR)] of 6 (1–18) instances of violence over one school day and 16 (17.6%) of teachers used no violence over two school days (Table 4). Scores for the quality of the classroom environment (emotional support and classroom organisation) and for class-wide child aggression were in the mid-range and scores for class-wide prosocial behaviour were in the low range.

At post-test, there was an 83% reduction in teachers' use of violence across one school day [median (IQR) = 1 (0–1), $p < 0.001$] and a significant increase in the proportion of teachers using no violence over two school days [29 teachers (31.9%), $p = 0.00$] (Table 4). There were significant increases from pre-test to post-test for emotional support [standardised difference (d) = 0.43], classroom organisation ($d = 0.43$), and class-wide child prosocial behaviour ($d = 0.26$). Reductions to teacher depressive symptoms were marginally significant ($d = -0.20$, $p = 0.06$). There was no change in class-wide child aggression ($d = 0.09$, $p = 0.36$).

Qualitative evaluation

Thirty-seven teachers (one from each school at post-test), participated in the in-depth interviews. There were no refusals. All participants were female, participants had been teaching for a median (IQR) of 15.0 years (8.5–23.5), thirty-three (89.2%) had completed high school, and sixteen (43.2%) had completed a teacher-training qualification. There were no significant differences between teachers who participated in the in-depth interviews and those who were not selected on teacher and classroom characteristics or on pre-test measures of the study outcomes (see Supplementary Table 2).

Teachers who participated in the in-depth interviews also had similar engagement and participation in the intervention as the full sample (see Table 1 for details of full sample). The subsample of teachers attended a mean (SD) of 2.9 (1.0) workshops, participated in a mean (SD) of 7.8 (0.7) in-class support sessions, and completed a mean (SD) of 3.5 (2.8) classroom assignments.

The results of the qualitative evaluation are presented in two main categories: (1) teacher-reported pathways to reduced use of

VAC, and (2) teachers' reports of why they continue to use VAC. The pathways are illustrated in Figures 1, 2. In the figures, each box represents a theme and subthemes are listed within each box with the numbers of teachers mentioning each subtheme in parenthesis.

Teacher-reported pathways to reduced use of VAC

Teachers reported that the training methods used led to increases in their: (1) motivation to use the strategies, (2) knowledge about child development, appropriate teaching practices and behaviour management, and (3) skills in using the strategies. Teachers reported bidirectional influences between their skills in using the strategies and their motivation and knowledge with motivation and knowledge leading to increased skills and use of the skills leading to further increases in teachers' motivation and knowledge. According to teachers'

reports, their use of the strategies led to increased professional wellbeing, improved relationships with children and parents, and improvements in child behaviour including increased friendship skills and reduced child aggression. As teachers recognised the benefits of the programme to themselves (through increased wellbeing and better relationships) and to the children (in terms of improved behaviour), this further increased their use of the positive discipline strategies introduced through the programme. There was evidence of two direct pathways to reduced VAC by teachers: 1) increases in teachers' use of the strategies, and 2) increased teachers' professional wellbeing. See Figure 1 and Table 5 for sample quotes.

Training methods and relationships

The behaviour change techniques used in the intervention were valued by teachers including the use of demonstration, practice, modeling, positive feedback, prompting, fun, collaborative problem-solving and provision of resources. There was a special salience around the theme of relationships with teachers reporting increased positive relationships between facilitators and teachers, between teachers and children, between teachers and parents, and among the children. Teachers described their workshop-facilitators and in-class coaches as being supportive and they felt comfortable freely sharing the challenges that they experienced in the classrooms. This resulted in the teachers feeling motivated to continue using the strategies, even during difficulties. For example:

> "She motivated me… She was calm even when you say you can't bother, she would just [say] 'Alright, try this way, try that way.' So, when she is not here you just remember everything. You want to do your job well, so you just try everything…try all the strategies that she taught you. (Teacher 14) **(Increased motivation via Coach/Facilitator).**

Teachers reported that their use of the strategies led to improved relationships with the children and their parents. Teachers also reported improved relationships among children in terms of increased friendship skills and less aggression:

TABLE 3 Teacher and classroom characteristics at pre-test.

Teacher and classroom characteristics	Pre-test data
Number of children in class [Mean (SD)]	15.26 (6.00)
Number years teaching [Median (IQR)]	14.5 (7.75–22.25)
Number years teaching at this school [Median (IQR)]	8.0 (3–20)
Sex: female [n (%)]	90 (98.9%)
Teacher age n (%):	
<25	1 (1.1%)
25-34	18 (19.8%)
35-44	26 (28.6%)
45-54	31 (34.1%)
55-64	14 (15.4%)
≥65	1 (1.1%)
Completed high school [n (%)]	79 (86.8%)
Trained teacher [n (%)]	32 (35.2%)

TABLE 4 Pre-test and post-test scores for outcome variables and standardised difference.

	Baseline $n = 91$	Post-test $n = 91$	Standardised difference	p-value
Violence over one school day [Median (IQR)]	6.0 (1.0–17.5)	1.0 (0.0–1.0)	83.33% reduction	<0.001
No violence over two school days [n (%)]	16 (17.6%)	29 (31.9%)	14.3% increase	0.004
Emotional support [Mean (SD)]	3.70 (0.77)	4.08 (0.65)	0.43 (0.21, 0.65)	<0.001
Classroom organisation [Mean (SD)]	4.27 (0.80)	4.61 (0.71)	0.43 (0.21, 0.64)	0.002
Class-wide aggression [Mean (SD)]	3.01 (1.43)	3.08 (1.40)	0.09 (−0.12, 0.30)	0.36
Class-wide prosocial behaviour [Mean (SD)]	2.07 (0.79)	2.31 (0.71)	0.26 (0.05, 0.47)	0.02
Depression [Median (IQR)]	12.0 (6.0–20.0)	8.0 (5.0–17.0)	−0.20 (−0.41, 0.01)	0.06
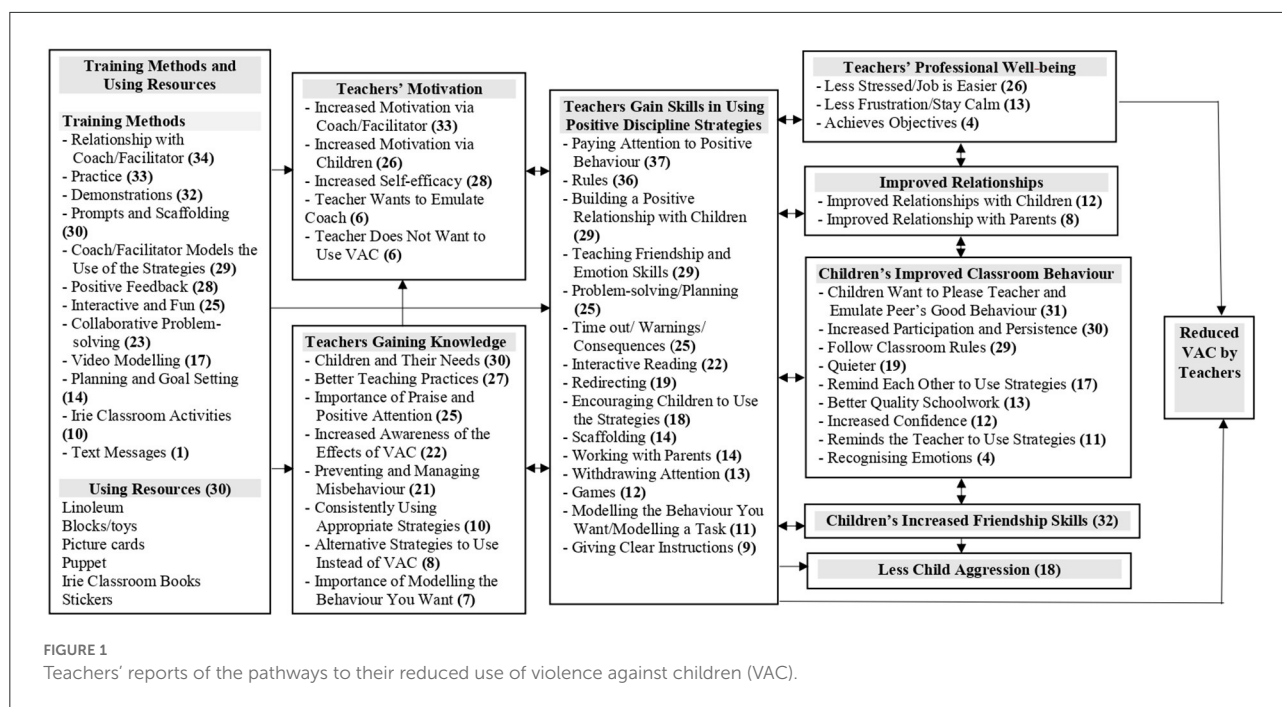
FIGURE 1
Teachers' reports of the pathways to their reduced use of violence against children (VAC).

"…when we encourage them to share, you find that you hear children telling each other that you should share, so rather than fighting for the blocks, they understand [that] I can't have it all, I must give some to that person… (Teacher 18) **(Children's improved friendship skills; Less aggression)**

Teachers' motivation and knowledge

Teachers' reported feeling motivated to use the strategies: (1) when they received positive feedback from the facilitator/coach, (2) when the coach explained the rationale for using the strategies, and (3) because they wanted to emulate the coach.

"…It pushes me more to motivate the children. Because she is praising me, it pushes me to teach them more. If I can feel that way, can you imagine how the children would feel? So that's what I do, I motivate them more. I praise them more." (Teacher 27) **(Increased Motivation via Coach/Facilitator)**

They also felt motivated to use the strategies more when they saw the benefits to the children.

I do it every single day. Because the children love it, they love when you praise them. They smile and they always try to do something more for me to praise them. (Teacher 32) **(Increased Motivation via Children)**

Most teachers reported increased knowledge related to early childhood education including: (1) understanding of children and their needs, (2) using more supportive and fun teaching practices, (3) the importance of praise and positive attention,

(4) how to prevent and manage child misbehaviour and/or (5) the effects of using violence against children. For example, a teacher described the ineffectiveness of corporal punishment in promoting positive behaviour:

"I realise that when I hit them, I have to be constantly hitting them. But when I start to praise the others, that works better." (Teacher 24) **(Increased Awareness of VAC and Its Effects)**

Teachers' skills in using positive discipline strategies

All teachers reported increased use of praise and positive attention and nearly all reported teaching and promoting the classroom rules. The other most commonly used strategies were building positive relationships with the children, teaching friendship and emotion skills, problem-solving when difficulties arose in the classroom, use of warnings, time-out and other appropriate consequences for child misbehaviour, and interactive reading. Overall, teachers reported using strategies that promote appropriate behaviour the most, and using strategies to manage misbehaviour less frequently. There was evidence of a direct pathway between use of positive discipline strategies and reduced VAC by teachers:

"Instead of hitting on a child or shouting at a child, I just use the rules." (Teacher 6) **(Rules)**

"Instead of beating them…I say, 'I like how (child) is doing this' and then everybody wants to do it." (Teacher 26) **(Paying attention to positive behaviour)**

TABLE 5 Teachers' reports of factors that led to a reduction in their use of violence against children.

Training methods and resources

During snack time, she assists the children … if I need any help she would give it. And as she is doing that, she demonstrated some of the strategies. So even while she is helping them, she is also helping me … So that was supportive. (T32) **(Relationship with Coach/Facilitator; Coach/facilitator models the use of the strategies)**

She didn't just come and talk and leave it and gone. The fact that she makes me do it in my class, it makes me feel comfortable. And feel like yes, I want to do this with my kids because I realize that they like it so I would want to do it. (T22) **(Practice;** Also **Increased motivation via children)**

It was helpful for me because when you were involved in it, you do it hands on, you come back to your class you know exactly what to do. It is not a trial and error, because you did it there [at the workshop] already. (T16) **(Practice)**

Maybe you've heard [of] coaching… but then when you go to the workshop they tell you what it is and they show you how to do it, so you know you get a better understanding and try to do it more. (T29) **(Demonstrations)**

They were behaving badly and (coach) said, "You praise the ones that are sitting?" So I said "I like how (child) is sitting down," and (coach) said, "You see it, everybody is sitting down. (T34) **(Prompts and Scaffolding)**

Is not beating or shouting going to help children. I learned from the (Irie Tools) book [that] you have to identify what the problem is. Why is the child behaving a certain way? (T30) **(Using Resources, Problem-Solving)**

Teachers' attitude and motivation

On this particular day, I was talking to this child constantly, getting nothing. Then I started hitting the child, nothing. Then I said but (coach) told me so and so… so let me try it. Then I tried and it worked. Then I said, "Okay. So, I am the one at fault. I need to practice these things." (T24) **(Increased Motivation via Coach/Facilitator)**

Their response, the big smile, and they want to do the work more. So, you want to do that more because if I can get more from you by using this strategy then that's the way to go. (T9) **(Increased Motivation via Children)**

I am a little more confident now in terms of how I am able to deliver my lesson, how I am able to get my children involved, how I am able to control my classroom without having to resort to shouting and hitting. (T32) **(Increased Self-Efficacy;** Also **Reduced VAC by teachers)**

When I see how she demonstrates and she gets the attention of every student, I feel like I would like that to happen to me too. So we say 'If she did it, we can do it too.' So all we need to do is practice it and the following day do it. (T6) **(Teacher wants to emulate coach)**

I want to stop hitting them because I think that is actually violence as well. (T37) **(Teacher doesn't want to use VAC)**

Teachers gaining knowledge

The things that we were taught is that children are malleable, and they can learn - it is just for us to take the time.. to sit with a child.. then you can get what you want out of a child. (T37) **(Children and Their Needs)**

When she (coach) introduced the games and I implemented them in the lesson, it went smoothly because it made them learn the words quickly… So I learned new ways to teach them certain things. (T33) **(Better Teaching Practices)**

Focus on the positive behaviour and not the negative. And if you focus on the negative, you are going to get yourself shouting. But once you say, "Wow I like how (child) is behaving," everybody behaves. (T34) **(Importance of Praise)**

When you slap somebody, it doesn't stop that problem because they are learning that behaviour is what you do. (T17) **(Increased awareness of the effects of VAC)**

If you threaten them, they feel discouraged to come to school the next morning. (T31) **(Increased Awareness of the effects of VAC)**

When the children are bored, they'll give more trouble. So, when you have transitional songs that help them to move from one activity to another, it makes the transition smoother. (T23) **(Preventing and Managing Misbehaviour)**

Teachers use new strategies

My classroom became quieter. When somebody shouts, they would even say, "Remember to use your inside voice…" (T4) **(Rules)**

They started playing with each other, helping each other and when I start coaching and praising them, they said, 'Aunty I am sharing with him,. Look, look!' And everybody wants to feel good about themselves now. (T7) **(Paying Attention to Positive behaviour; Children's Increased Friendship Skills; Children Emulate Peers' Good behaviour)**

Get to the children level… [if] they are playing a game, you not only let them, you also play along with them. Children like those things. They like when the teachers are involved. (T29) **(Building a Positive Relationship with Children)**

Teachers' professional well-being

We find out that when we really focus on the behaviours that we want them to display it's easier, things go more smooth and so it's really easier and it helps the children. (T4) **Less stressed/job is easier)**

My job as a teacher easier because it helps to manage the classroom in a more efficient way, so I don't have to be come in and being loud and aggressive. (T18) **(Less Stressed/Job is Easier)**

I used to shout but now that I got the Irie come in, I am learning how to control those emotions. (T12) **(Stay Calm)**

Sometime the children get really out of hand and you just take a deep breath. Then instead of hitting the children, you do something else to get the children's attention. (Teacher 19) **(Stay calm)**

(Continued)

TABLE 5 (Continued)

The classroom was less noisy, and the children cooperated more so I achieved more. (T19) **(Achieves Objectives)**

Improved relationships

What they try to do is emulate each other for positive rewards. So, it has enhanced the classroom environment a bit, it has made managing it a easier. It also takes away the ugliness of the classroom setting and the stress of the teaching-learning environment. (T1) **(Improved Relationship with Children; Teachers' Professional Well-Being)**

Sending home Irie Notes, I get parents more interested. Saying, "Very good, Kyra has done her homework," they want to do it every time because they see that the child is learning more. (T20) **(Improved Relationship with Parents)**

Children's improved behaviour

Those children who are not working quietly would listen and hear me talking to the ones over there, "Wow, what a lovely coloring you're doing," and so they would try to go over and start to color too. So, my classroom is much quieter. (T15) **(Children Want to Please Teacher and Emulate Peer's Good behaviour; Less Noise)**

There is a child that doesn't like to do any work and when she sees me coaching others, she tries. She sees what they are doing and tries, so I can come along and help her with it. (T29) **(Increased Participation and Persistence; Children Want to Please Teacher and Emulate Peer's Good behaviour)**

The praise encourages them to work harder and finish their tasks in time. (T21) **(Increased Participation/Persistence)**

I think the children enjoy the rules. We get the children involvement more because for instance when we say, "Eyes on teacher," everybody would stop and [have] their eyes on teacher. (T6) **(Follow Rules)**

I will go out and when I come back, I would find one or two of them modeling me. If they are talking too loud they remind each other, 'Inside voice'. (T20) **(Children remind each other to use the strategies)**

To get all of them who participate, say okay 'Simon says we are going to do this' then everybody willing now and they get up and start participating. (T3) **(Games, Increased participation)**

Children's increased friendship skills

I find that when I do the hugging and the praising, they themselves in turn praise each other and hug too. (T16)

I also tried the Big Up Cheer… my class loves it…Whenever I do it, I get total class attention because they are listening and they want to try to find ways in which they can compliment their friends. (T1)

Once you start coaching them and they start feeling special, you notice they start being friendlier. They start [to] play with each other, they share more with each other more. (T28)

Less child aggression

When you model, you're like a role play. You form the line and show them what is expected. So, they know that when I said, "In the line," there is no pushing. They know how to walk instead of run and not to push. (T14) **(Also Rules)**

…when we encourage them to share, you find that you hear children telling each other that you should share, so rather than fighting for the blocks, they understand [I must give some to that person… (T18) **(Also Friendship/Emotions)**

Showing the children how to use the friendship skills. We can share. We can switch and swap, things like those. So, we've been using them and the children aren't fighting again. (T27) **(Also Teaching Friendship and Emotion Skills)**

Reduced VAC by teachers

If I usually do four slaps, now I'm trying to do two until I am going down to one then zero, it's stages. (T25)

Instead of us running them down to beat them we have certain strategies that we use… (T8)

I realize I have been slapping less. We still have children who are aggressive, but [instead] what I do, [is the] naughty corner. (T17)

All teachers reported that the use of positive discipline strategies led to improved child behaviour (including increased friendship skills and/or decreased aggression).

> "We get the children's involvement more because for instance when we say eyes on teacher, everybody would stop and their eyes on teacher. When we say use inside voice everybody would whisper instead. And not that loud talking." (Teacher 6) **(Rules, Follow classroom rules)**

Teachers' professional wellbeing

Teachers reported that a key mechanism to reduced VAC was through their own professional wellbeing, including reduced stress and increased emotional self-regulation. Teachers learnt to stay calm rather than react to children's behaviour in anger, and this helped them to use positive discipline strategies rather than resort to VAC.

> "The training has taught me to pause, I use the word pause because instead of jumping to say something that you shouldn't, you remember and you pause; instead of shouting, you remember and you pause; instead of administering corporal punishment, you remember and you pause, and in these pauses you can think of the strategies that were introduced to you and can figure out in your head which one to use." (Teacher 36) **(Stay calm)**

There was evidence of a bidirectional relationship between teachers' use of the positive discipline strategies and teachers'

professional wellbeing as utilising the strategies also led to fewer child misbehaviours and reduced teachers' frustration and stress.

> *"Before the training programme I would be focusing on the negative behaviour, shouting at that person, calling to that person and wasting a lot of time and draining my energy and so forth."* (Teacher 29) **(Less stressed/job is easier)**

> *"Because the friendship skills cuts down some of the shouting, the fighting, it doesn't frustrate me so much."* (Teacher 27) **(Teaching friendship skills, Less child aggression, Less frustration)**

Teachers' reports of their reasons for continued use of VAC

The majority of teachers (26/37 (70%)) reported that they continued to use VAC at times. The main reasons given for continued use of VAC were due to barriers in implementing the positive discipline strategies, as a response to perceived child misbehaviour, and due to poor emotional self-regulation (Figure 2). Less commonly mentioned reasons were due teachers' attitudes and beliefs to VAC and parent influences. See Table 6 for examples of quotes.

Barriers to using positive discipline strategies

Teachers reported several barriers to their consistent use of the strategies in the classroom. Some strategies were perceived to be ineffective, to work inconsistently, to take too much effort and/or take too long to work in practice. These barriers to strategy use were sometimes related to the context in which the teachers worked. Some teachers reported that larger class sizes and/or insufficient space and resources made it difficult for them to consistently use the strategies.

> *You want the right behaviours now... but some strategies (now just have to..) just take time. The most I had this week is 19 - I find that I can use the strategies with this number of children, but when me have 27 pikney (children) in front of me oh my gosh you going to say things, you don't want it to come out.* (Teacher 2) **(Strategies take too long to work)**

In addition, some teachers of three-year-old children reported that strategies involving teaching rules, friendship and emotion skills were less effective and/or difficult to use with the younger children; while a teacher of the 5–6-year-old children (who were transitioning to primary school), disagreed with some strategies as she believed that the focus on positive behaviour and praise wouldn't prepare children for the primary school classroom.

> *"You have to remember that they are small but at the same time you have to teach them that they are going into a different world (primary school) where they're not going to get that (praise)."* (Teacher 33) **(Disagree with strategy)**

FIGURE 2
Teachers' reports of why they continued to use violence against children (VAC).
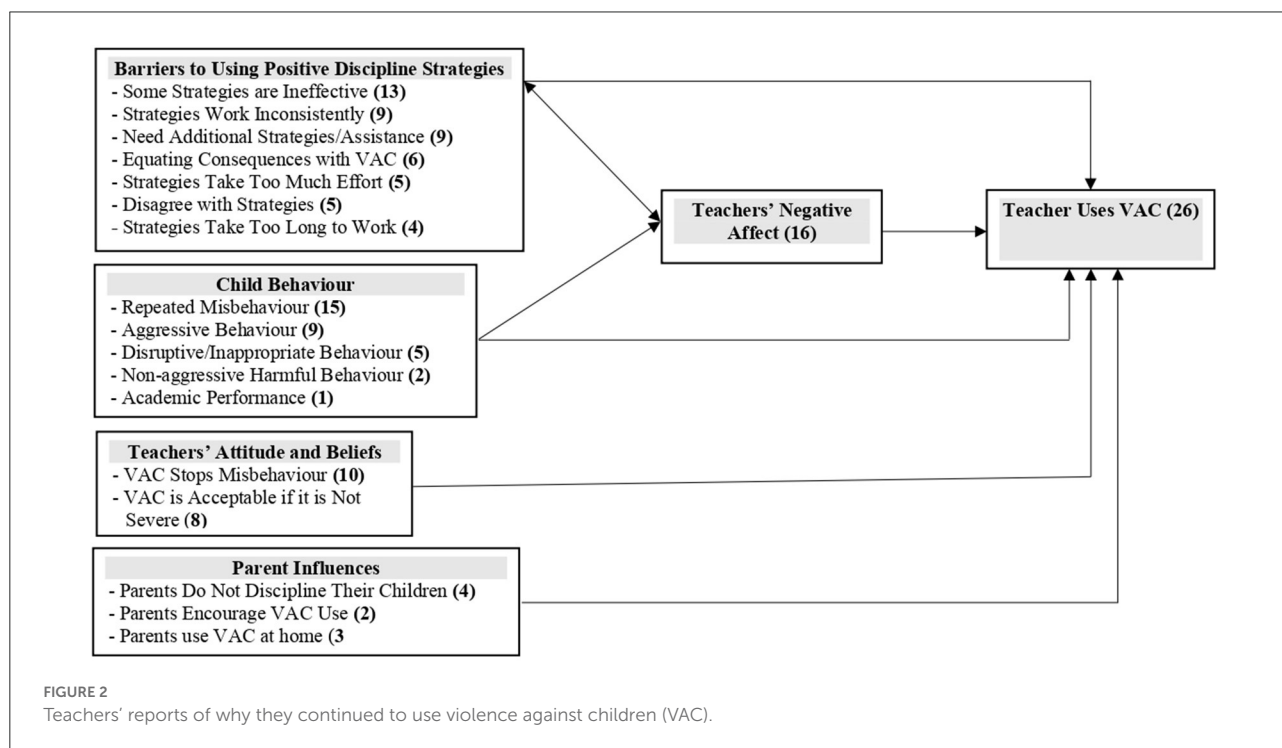
TABLE 6 Teachers' reports of reasons for their continued use of violence against children.

Barriers to using positive discipline strategies

When it's time to pack up [there] is a lot of pushing and fighting. And when you still praise, "Look at that one packing up the toys nicely," you still have a trouble one that is not doing the correct thing. So, you know you have to raise the stick at that one and then he will follow. (T29) **(Strategies are Ineffective;** also **VAC Stops Misbehaviour)**

I don't like [to] see students fighting because they are going to fight a lot and I keep talking to you about it. It is definitely time out or 'If you slap him again I will slap you.' (T28) **(Equating Consequences with VAC)**

I use the clap to rhythm and that worked for a while and it worked in some instances. But as I said because of the distractions from the other class sometimes it just didn't work out at all. (T32) **(Strategies Work Inconsistently)**

Give us other suggestions of what to do when they are being disruptive because it really gets frustrating. How to handle a situation and get through to that child without hitting that child. (T19) **(Need Additional Help)**

You want the right behaviours now. You are in your class and you want them to learn so you want the behaviour right now. (T2) **(Strategies Take Too Long to Work)**

Child behaviour

If I warn him three, four times, the fifth time I'm not going to warn him. I'm going to slap him hard (T33) **(Repeated Misbehaviour)**

The bad word cursing. The kicking and the biting… when they do that stuff I would give them a little slap in their hands or put them in a little naughty corner. (T26) **(Aggressive behaviour;** Also **Equating Consequences with VAC)**

I say, 'Go and color.' And I give her the paper and she is there searching up my cupboard that she should not be in. So I just have to give her a little slap sometimes. (T9) **(Disruptive/Inappropriate behaviour)**

When you carry them out on a field trip and you see that it is very harmful for them to be running wild, not engaging in the line procedure sometimes the human side of you, slaps them… (T20) **(Non-aggressive Harmful behaviour)**

If the work is not done as it should. the child says, 'Yes I understand', but at the end of the day the child go and do the same madness. You say, 'You need two slap man.' (T24) **(Academic Performance)**

Teachers' attitudes and beliefs

You are praising them, and they are still doing that little rude thing and you will say to them, 'Listen. If you don't stop doing that, I am going to slap you.' And hearing that from you, they stop, they don't want you to slap them. (T5) **(VAC Stops Misbehaviour)**

Some students work when they get the slap. (T26) **(VAC Stops Misbehaviour)**

Slapping them is just in their hand middle. It is not really harming them or anything. (T14) **(VAC is Acceptable)**

Parent influences

It would be nice if you could help the parents so that they know how to treat their children so that when they come to school they don't have to be so rude that the teachers have to slap them. (T14) **(Parents Do Not Discipline Children)**

They say, "Teacher, as long as you don't hit him in his eye." And I turn up their bottom and I slap them on it. (T33) **(Parents Encourage VAC)**

Some of the babies are just stubborn and at home them use to the boofing (beating). (T29) **(Parents Use VAC at Home)**

Teachers' negative affect

…When it's lesson time, he will make some funny sounds and he will be staring at me in the eyes and you will try all kinds of things…I'll try the behaviour plan with him…and I'll be there teaching the lesson…and I would be looking at him and he will continue and I will try the strategies. And he will continue to be rude and he will get up out of his seat and run to the other side and hit somebody and sometimes it feels overwhelming that you are teaching and I just want to give him a slap. (T22) **(Also Strategies are Ineffective, Repeated Misbehaviour)**

Teachers' use of VAC

Sometimes I do give them a little touch. (T10)

You give them a little touch but you don't beat like you are at home, no. You may just hold the little hand and say I expect from you, yuh know and they respond. You know, you not going to batter up the children. (T16)

I will tap them. (T21)

Just a little pat. (T28)

There was also some evidence that teachers equated non-violent consequences with VAC use in that they considered either strategy to be appropriate for certain behaviours and didn't appear to differentiate between them:

> *"You spoke to her once and she do it again and the third, so 3 strikes and you are out and so she always let the three strikes catch her so she have to get a little pat or she go in the time-out corner."* (Teacher 9) **(Equating consequences with VAC)**

Child behaviour

Teachers reported using VAC for child misbehaviours that they perceived to be particularly severe, especially repeated misbehaviour and aggressive behaviour.

> *"You only clap them when they harm another person or they are trying to harm themselves."* (Teacher 14) **(Aggressive behaviour)**

> *"If I'm teaching the class and the child is being disruptive and I speak to the child and the child continues, I will give the child a slap or two."* (Teacher 19) **(Repeated misbehaviour)**

Poor emotional self-regulation

Another important pathway to continued VAC by teachers was due to teachers' negative affect (e.g., frustration and anger). When teachers were frustrated by children's behaviour, they were more likely to resort to VAC.

> *"You know when you see certain behaviour and you just feel upset and all that you just want to knock the child."* (Teacher 15) **(Teachers' negative affect)**

Others reported feeling frustrated when they used the strategies, and they are ineffective or took too long to correct the behaviour.

> *"If I keep talking to a child for one particular incident over and over I tend to get irritated at some point or another and as I said I would hold the child and physically, 'Sit! I said you are to sit.'"* (Teacher 1) **Teachers' negative affect)**

Teachers' attitudes and beliefs and parent influences

A minority of teachers reported a direct link between their attitudes to VAC and VAC use. For example, some teachers reported that VAC was an effective method of managing child misbehaviour and some teachers believed that VAC was an acceptable form of punishment as long as it didn't lead to severe physical abuse:

> *"I remember when I was going to school and I get, is not slap I get. They beat you. A tap, right. There is nothing wrong with that. When you take up a belt and beat a child, that is where something is wrong."* (Teacher 21) **(VAC is acceptable if it is not severe)**

Parent influences were mentioned by a small minority of teachers. This included: 1) parents not disciplining children at home, leading to severe child misbehaviour at school, 2) parents supporting VAC use by teachers, and 3) parents' use of VAC at home justifying teachers' use of VAC at school.

> *"I will ask them, 'Your parents slap you at home?' It's like something they are used to. So, if the teacher slaps you, it's like nothing."* (Teacher 14) **(Parents use VAC at home)**

Discussion

In a pre-post evaluation, the Irie Classroom Toolbox reduced VAC by teachers by 83% and increased the proportion of teachers using no violence by 14%. However, 68% of teachers were observed to use VAC at least once over 2 days of observation at post-test. These findings were corroborated through the qualitative evaluation with all teachers reporting reduced VAC, but 70% reporting continuing to use VAC at times. The reductions in teachers' use of VAC were accompanied by significant benefits to the observed quality of the classroom environment and class-wide prosocial behaviour, although no benefits were found for class-wide child aggression. Reductions were also found for teachers' depressive symptoms. Teachers reported that the behaviour change techniques used in the intervention led to increased motivation, knowledge and skills which in turn led to improved child behaviour, improved relationships and improved professional wellbeing. There was evidence of bidirectional influences with improved child behaviour, relationships and professional wellbeing also leading to increased use of positive discipline skills by teachers which in turn increased teachers' motivation and knowledge. Teachers reported that the direct mechanisms to reduced VAC were through their increased use of positive discipline strategies and improved professional wellbeing. The main reasons for teachers' continued use of VAC were due to barriers faced in using the positive discipline strategies, teachers negative affect and certain child behaviours, especially child repeated misbehaviour and child aggression. Attitudes to violence and parental influences were also mentioned as reasons for continued use of VAC by a minority of teachers.

The findings from this mixed method evaluation are useful for informing revisions to the content of the programme to strengthen its effectiveness in reducing violence against children by teachers (see Table 7). For example, the in-depth interviews highlight the importance of training in alternative discipline and emotional self-regulation as these are key factors in the pathways to reduced VAC and are also reasons given for teachers' continued use of VAC. These factors have been recognised as core components of effective violence-prevention parenting programmes (29), and were also described as the most salient mechanism to reduced VAC by parents who participated in the Irie Homes Toolbox (24). Previous qualitative evaluations of violence-prevention programmes in primary schools in LMIC have also reported that training in alternative discipline strategies is a key mechanism to reduced VAC by teachers (22, 30) with emotional regulation (22), improved relationships

TABLE 7   Using the results of the mixed method assessment to inform the further scale-up of the Irie Classroom Toolbox.

Factors related to programme content findings	Suggested actions
• Although large reductions to teachers' use of violence against children (VAC) were found, the majority of teachers continued to use VAC.	• There is a need to identify strategies to eliminate teachers' use of VAC. Suggestions are given below.
• One of the main reasons for teachers' continued use of VAC was due to barriers faced when using appropriate classroom behaviour management strategies.	• Provide more support for problem-solving how to deal with difficult situations. For example: 1) include more role plays and practice activities in workshops and 2) discuss and reinforce appropriate expectations of young children. Teacher may also require ongoing support after the end of programme implementation to fully adopt the practices.
• Another commonly mentioned reason for teachers' continued use of VAC was due to teachers' poor emotional self-regulation skills.	• Include a greater focus on promoting teachers' emotional self-regulation and executive function skills including teaching calm-down techniques and increasing support for goal setting, planning and problem-solving.
• Teachers reported difficulties in managing certain child behaviours, especially repeated misbehaviour and aggressive acts.	• Provide more support and advice on how to manage more severe child behaviours including role play and rehearsal in workshops and increased support with individual behaviour planning for children with behaviour problems.
• We found no benefits to observed class-wide child aggression in this study or in our previous evaluation of the Irie Classroom Toolbox.	• Design additional materials to help teachers to manage children's aggressive behaviour. This will include encouraging teachers to respond consistently to child aggression and continuing to teach friendship and emotion skills.
• Teachers' beliefs and attitudes related to the use of corporal punishment were another reason reported by teachers for their continued use of VAC.	• Include content to explicitly challenge teachers' attitudes to violence against children including the short and long term negative effects of using VAC and positive effects of using positive discipline strategies.
• Teachers' used terms such as 'touch', 'brush off', 'tap' to describe 'milder' forms of corporal punishment and they did not view these as violence against children.	• Provide clear definitions of violence against children, including corporal punishment and psychological aggression.
• Teachers' reports indicated a perceived equivalence between appropriate consequences (e.g. time-out) and use of violence.	• Include more activities to help teachers understand the concept of appropriate consequences including logical and natural consequences, and how these differ from violence against children.

Factors related to programme implementation findings	Suggested actions
• Larger reductions to teachers' use of VAC were found in this evaluation compared to the previous round (previous round, median number of VAC: 7 at pre-test, 3 at post-test; current study, median: 6 at pre-test, 1 at post-test).	• Facilitators had received more training and supervision and were more experienced which may explain this finding. It is important to advocate for a sufficient duration and frequency of training and supervision for the government staff who will be implementing the programme as it is scaled up. Promoting staff retention is also important.
• The behaviour change techniques used in programme delivery were reported to be important in changing teachers attitudes, knowledge and skills.	• As the programme is scaled up, it is important that programme facilitators are given high quality training and support in the use of, and rationale for, the behaviour change techniques used to deliver the training (e.g. demonstration, rehearsal and practice, modeling, giving positive, constructive feedback).
• The quality of relationships between the facilitators and teacher, teachers and children, and teachers and parents were a theme running through the evaluation.	• All stakeholders need to understand the importance of positive relationships for quality implementation and need the skills to develop and maintain these supportive relationships (e.g. reflective listening, collaborative problem-solving).

Factors related to programme monitoring findings	Suggested actions
• Teacher engagement, participation and satisfaction was high when the programme was implemented by staff hired by the research team and it is likely that these are key factors for programme effectiveness.	• It is important to promote the use of monitoring tools to measure teacher engagement, participation and satisfaction as the programme is scaled up and to use the results to ensure high levels are maintained.
• The use of collaborative, participatory and fun training methods and evidence-based behaviour change techniques are important in programme delivery.	• Programme supervisors need monitoring tools and appropriate training in evaluating facilitators' skills in delivering the programme and providing additional support when necessary. Facilitators also need to be encouraged to use self-evaluation tools to reflect on their own skills in programme delivery and identify areas for improvement.
• The quantitative evaluation showed that the intervention was effective in reducing teachers' use of VAC, increasing the quality of the classroom environment in terms of teacher practices and child prosocial behaviour.	• It is important to continue to monitor effectiveness as the programme is scaled up. Assessments of teachers' classroom management skills and child behaviour can be incorporated into the existing government inspections using simple to use checklists adapted from the outcome measurements used in our research.

(22, 30) and improved child behaviour (22) also being described as being on the pathway of change. An important finding was that some teachers understood corporal punishment to be more severe child abuse and they did not differentiate between appropriate consequences (such as time-out) and slapping a child. In Uganda, teachers and students expressed a similar belief that VAC is acceptable if it is proportionate and fair (30). Addressing teachers' knowledge, attitudes and beliefs related to VAC may be one strategy for further reducing VAC by teachers.

The Irie Classroom Toolbox has been designed to be integrated into the early childhood educational network in Jamaica with training and supervision to be provided by government early childhood officers as part of their routine duties. The findings from our MEL activities give insights into teachers' preferred training methods and the mechanisms of action of the intervention, thus providing important guidance related to programme implementation and programme monitoring as it is scaled up in Jamaica (see Table 7). This includes the importance of using evidence-based behaviour change techniques, fun and interactive training methods and building supportive relationships between facilitators and participants. Qualitative evaluations of early childhood parenting programmes in LMIC have highlighted the importance of these techniques in promoting engagement and learning (31–33) and there is growing empirical evidence of their importance for participant engagement [(34); Bernal et al.][2] and programme effectiveness (34, 35) (see footnote 2). In addition, we reported larger reductions to teachers' use of VAC in this round of implementation compared to our previous round (see Table 7) (17). The main difference in implementation was the fact that the programme staff were more experienced and had received more training and supervision. This highlights the importance of providing sufficient training and ongoing supervision to programme staff as learning to utilise effective training methodologies requires practice with skills developing over time (34, 36). As the programme is scaled up, it will also be important to continue to monitor intervention implementation including: (1) teacher satisfaction and engagement with the intervention, (2) facilitators' skills in implementing the intervention, and (3) the effectiveness of the intervention on teacher and child outcomes (Table 7).

Our MEL activities also point to the limitations of teacher-training alone for eliminating VAC at school. Corporal punishment is banned by law in Jamaican early childhood institutions and yet as seen in this study, VAC continues to be widely used. Reviews of the global status of VAC in schools indicate that this situation is common across many countries with legal bans (37, 38). In Jamaica, education and

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2   Bernal R, Gomez ML, Perez-Cardona S, Baker-Henningham H. Quality of implementation of a parenting program in Colombia and its effect on child development and parental investment. *Pediatrics* (submitted).

training alone was insufficient for ensuring teachers' compliance with the law against corporal punishment and monitoring and enforcing compliance is also necessary. In addition, interventions to change attitudes and beliefs relating to VAC within the wider community may be necessary. Implementing complementary teacher and parent, early childhood violence prevention programmes is one step in this process to ensure a shared understanding and co-ordinated approach to positive discipline at home and at school. Conducting violence-prevention programmes in primary and secondary schools with the aim of preventing VAC by teachers in all educational institutions could also help change societal attitudes toward VAC at school. Additionally, mass media campaigns may be helpful for awareness raising and behaviour change at the population level (39, 40).

This study has demonstrated the value of MEL activities to inform future implementation of an early childhood, violence prevention, teacher-training programme. The study illustrates four of the five concepts described in the Measurement for Change framework. The MEL activities were informative and dynamic in that information was gained from quantitative and qualitative methods and this information was used to guide future decision-making related to the content, process of delivery and future monitoring of the intervention as it is implemented at scale. We found evidence of the importance of MEL activities being interactive from the salience of the theme of relationships in the qualitative data. Teachers reported that the positive, supportive relationships they had with the facilitator were mirrored in their relationships with children and parents and in more friendly behaviours among the children. Including methods for monitoring relationships will be an important component of the MEL process as the programme is scaled-up. A further illustration of the interactive concept is given in the evidence of bidirectional effects (see Figure 1). For example, teachers use of positive discipline strategies led to improved child behaviour and improved child behaviour encouraged teachers to use the strategies more. Finally, the data from the MEL activities illustrate the importance of being people-centered. Different teachers faced different challenges and expressed different needs related to implementing the intervention. Although the content of the Irie Classroom Toolbox is relevant for all teachers, how this content is operationalised in each teachers' individual classroom context will differ. Furthermore, additional support may be required at times, for example, in emotional self-regulation skills, in dealing with specific child behaviours, and/or in changing norms and attitudes to VAC. In this study, our MEL activities were not inclusive as due to resource constraints, we were only able to collect data from teachers and classrooms, and not from other relevant stakeholders.

The strengths of the study include the mixed-method approach that included quantitative and qualitative data. The

qualitative data triangulated the results of the quantitative data and provided valuable information on the perspectives of teachers relating to the mechanisms of action of the intervention and reasons for continued VAC use. Incorporating participant perspectives into MEL activities is an essential component of the Measurement for Change Approach (25). Measurements were conducted by persons masked to the study design and most had good psychometric properties, with the exception of class-wide child prosocial behaviour which had low stability. Although, 16% of teachers were lost at post-test, there was no differences between those lost and found on any of the characteristics measured at pre-test. In addition, we randomly selected one teacher from each school to participate in the in-depth interviews and the selected teachers were not significantly different from those not selected on pre-test characteristics and had similar levels of engagement and satisfaction with the intervention. The views of the teachers who participated in the in-depth interviews are thus likely to be reasonably representative of the wider sample. The measurements of teachers' use of VAC were through independent observation, thus reducing the bias of teacher reports which tend to underestimate VAC use (40, 41). The young age of the children prevented the use of child-reported measures. It is possible that teachers behaved differently during the observational assessment. However, the presence of the observer is generally non-intrusive in these preschool classrooms given the structural conditions, with high noise levels and several classrooms sharing a common space. In addition, there is evidence that when observations conducted over a whole school day, the effects of an observer on teacher behaviour are reduced (42) and in our trial we found reductions in teachers' use of VAC did not differ across the school day (17).

The limitations of the study are that this was a pre-post study with no untreated control group. Furthermore, as the preschools were in the wait-list control group of a cluster-randomised trial, they had participated in multiple rounds of measurement which may have resulted in changes to teachers' behaviour. Only thirty-seven teachers (one per preschool) participated in the in-depth interviews and hence the reported mechanisms of action require cautious interpretation and need to be investigated in future empirical research. Social desirability bias may also have influenced teachers' responses during these interviews as the teachers were aware that the interview was being conducted on behalf of the Irie Toolbox Team. All respondents were female which reflects the lack of male early childhood teachers in Jamaica (only 1/91 teacher (1.1%) in the study preschools was male). It is possible that male teachers may experience the intervention differently. We conducted the in-depth interviews at the end of the intervention only and hence we were unable to track teachers' perceptions of the mechanisms of change throughout the intervention implementation and we did not have the resources to get

feedback from teachers on the interpretation of the results. In addition, in this study, we only report data from teachers and classrooms. Other important stakeholders include parents, government field officers and their supervisors, members of the school board, and members of the local communities. It will be important to include the perspectives of a wider group of stakeholders in future studies. Finally, all participating preschools were situated in urban areas and future studies need to include preschools from rural and semi-rural areas of Jamaica.

Conclusion

In this study, we demonstrate how embedding MEL activities into ongoing intervention implementation can help to plan for implementation at scale. We used a mixed-method evaluation of the Irie Classroom Toolbox when implemented with teachers in preschools from the wait-list control group of a cluster-randomised trial. We had previously demonstrated that the Toolbox led to large reductions in teachers' use of VAC, although the majority of teachers continued to use VAC at times (17). The MEL activities in this round of implementation confirmed these findings and provided insights into teachers' perspectives of the mechanism of action of the intervention and their reasons for continuing to use VAC. The information is useful for preparing additional content to further reduce and ultimately eliminate VAC by teachers. In addition to strengthening the intervention, the MEL activities also provide valuable information to guide the process of scaling the intervention, including provision of high-quality training, supervision and ongoing monitoring and evaluation.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by School of Psychology, Bangor University Ethics Committee and University of the West Indies Ethics Committee. The participants provided their written informed consent to participate in this study.

Author contributions

HB-H contributed to funding acquisition. MB and TF contributed to project investigation and

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.1040952/full#supplementary-material

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Implementation of UNICEF and WHO's care for child development package: Lessons from a global review and key informant interviews

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Introduction: In the last decade, there has been increased global policy and program momentum to promote early childhood development. The Care for Child Development (CCD) package, developed by UNICEF and the WHO, is a key tool responding to the global demand. The CCD package comprises two age-specific evidence-based recommendations for caregivers to 1) play and communicate and 2) responsively interact with their children (0–5 years) and was designed to be integrated within existing services to strengthen nurturing care for child development. The aim of this report was to provide an up-to-date global review of the implementation and evaluation of the CCD package.

Methods: In addition to a systematic review of 55 reports, we interviewed 23 key informants (including UNICEF and WHO personnel) to better understand the implementation of CCD.

Results: The CCD package has been or is being implemented in 54 low- and middle-income countries and territories, and it has been integrated into government services across the health, social, and education sectors in 26 countries. Across these contexts, CCD has been adapted in three primary ways: 1) translations of CCD materials (mostly counseling cards) into local language(s), 2) adaptations of CCD materials for the local context, vulnerable children, or a humanitarian/emergency setting (e.g., including local play activities, using activities that are better suited to children with visual impairments), and 3) substantive modifications to the content of CCD materials (e.g., expansion of play and communication activities, addition of new themes, creation of a structured curriculum). While there is promising evidence and examples of good implementation practice, there has been mixed experience about implementation of CCD with respect to adaptation, training, supervision, integration into existing services, and monitoring implementation fidelity and quality. For example, many users of CCD found difficulties with training the workforce, garnering buy-in from governments, and ensuring benefits for families, among others.

Discussion: Additional knowledge on how to improve the effectiveness, implementation fidelity and quality, and acceptance of CCD is needed. Based on the findings of the review we make recommendations for future efforts to implement CCD at-scale.

1. Introduction

The early childhood environment plays a significant role in child development. Evidence across health and social science disciplines shows that the origins of adult disease and wellbeing lie in the developmental processes that occur during early childhood (1–4). Ensuring that children grow up in a stable environment that nurtures and promotes their health, nutritional, and developmental needs while protecting them from threats and providing them with interactions that are responsive, emotionally supportive, and stimulating is therefore a key priority for promoting health across the lifespan (1, 3, 5–7). The Nurturing Care Framework [NCF] (8) advocates services which address these holistic components (*health*, *nutrition*, *responsive caregiving*, *security and safety*, and *early learning*) of nurturing care in multisectoral systems. Early childhood interventions that target one or more of the NCF components are known to effectively promote nurturing care practices and child development (1, 6). However, there remain important gaps in our understanding of how to scale-up and integrate these interventions into existing services while maintaining quality programming and implementation (3). The objective of this paper is to provide a review of the implementation and evaluation of a specific early childhood parenting skills package, namely UNICEF and the World Health Organization's (WHO) Care for Child Development (9), across contexts and to present recommendations to improve its roll-out.

The Care for Child Development (CCD) package was developed by UNICEF and the WHO to promote nurturing care and child development for children aged 0–5 years through integration in existing services, primarily in the health sector (9). Specifically, the package aims to build skills of providers to support caregivers in responsive caregiving and early learning activities, and improve caregiver-child interactions through responsive play and communication. CCD was adapted from UNICEF and the WHO's Integrated Management of Childhood Illness (IMCI) strategy, which sought to address the common causes of childhood mortality in low- and middle-income countries (10, 11). Although the IMCI strategy helped to reduce rates of child mortality, there was concern that the developmental needs of the majority of children who survived were not being met (10). The WHO therefore commissioned reviews of effective early childhood interventions to address this gap (12). These reviews informed the development of the CCD package, which provides guidance to delivery agents on how to help caregivers interact responsively with their young children and provide opportunities for early learning (11, 13). It is important to note that CCD was not intended to be implemented as a standalone package but integrated within existing services to strengthen care for child development.

The CCD package consists of two age-specific evidence-based recommendations for caregivers to (1) play and communicate with their children in a (2) responsive[1] manner. These recommendations are designed to change child and caregiver outcomes over time. In the short-term, expected changes include an increase in the number of available play materials a child can engage with in

the home and the quality and quantity of responsive stimulation (i.e., playing, talking, singing, etc.) a caregiver provides. This can lead to improvements in the quality of responsive caregiver-child interactions and in children's developmental outcomes. To enable delivery agents to administer the CCD package, they are equipped with a participant manual which includes an overview of child development and the importance of nurturing care, some age-specific recommendations for play and communication, counseling cards[2] to use as a visual aid when discussing these recommendations with caregivers, and a checklist[3] to help them identify caregivers' care practices (9). UNICEF and the WHO also provide Facilitator Notes[4], a Guide for Clinical Practice, and a Framework for Monitoring and Evaluating intended to support the training of providers (9).

To date, there have been two reports summarizing the implementation and evaluation of interventions and/or services (henceforth collectively referred to as services) that have incorporated the CCD package (11, 13). The extent to which the CCD package has been incorporated varies greatly across these programs, ranging from those that broadly follow the recommendations of CCD to include developmentally stimulating opportunities and responsive caregiving interactions (henceforth referred to as CCD-informed), to those that use the participant manual and other CCD materials to guide implementation, here called CCD-based. The first report by Lucas et al. (11) focused on CCD-based services. They found that 23 sites had integrated the CCD package within a range of government and non-government services including child survival and health, nutrition rehabilitation, infant care and early education, services to families with developmentally disabled children, and a conditional cash transfer program (11). Despite the implementation of the CCD package in various sites, there were only three sites (China, Pakistan, and Turkey) that published evaluations of the impact of CCD on child and caregiver outcomes (15–17). Overall, these studies found improvements in children's cognitive and language development and parenting practices such as responsive caregiver-child interactions and greater availability of learning materials in the home. However, there was variability in how the CCD package was implemented (2 clinic visits in China and Turkey compared to 40 group sessions and home visits in Pakistan) and one study found that higher quality training and more regular supervision were needed to strengthen implementation (11). The second report (13), a scoping review, included CCD-based and CCD-informed services that used messages regarding play, communication, and

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1 That is, noticing the child's signals and providing timely and developmentally appropriate responses (14).

2 Counseling cards are a job/visual aid for delivery agents with a key play and communication activity shown for each of the following age groups: newborn/birth up to 1 week, 1 week up to 6 months, 6 months up to 9 months, 9 months up to 12 months, 12 months up to 2 years, and 2 years and older.

3 The checklist for counseling on care for child development guides delivery agents to identify practices to support the child's development, counsel the caregiver (look, ask, listen), and praise and advise caregivers.

4 Facilitator Notes is a training manual designed for 3.5 days of training. The notes are to be used by the trainers to promote skills for guiding caregivers to stimulate their young children and interact responsively while playing and communicating with their young children.

responsiveness in their intervention content in addition to ones that used the CCD package to counsel caregivers. The report found that many services had been evaluated and shown to be effective in improving child and caregiver outcomes. However, few of them reported information on implementation processes, except for information about curriculum and workforce training, thus limiting our understanding of how they work. Scale and sustainability information was also lacking.

The objective of this report was to examine the implementation information emerging from both CCD-based and CCD-informed reports by providing a systematic review of CCD to clarify how it is being implemented in different contexts around the world and how it benefits caregivers and children. Specifically, our objectives are to:

i Identify and summarize peer-reviewed and gray literature reports of CCD implementation, including program content and adaptations, delivery modalities, characteristics of delivery agents, monitoring of implementation processes, characteristics of intervention beneficiaries, and evaluation of intervention outcomes;

ii Describe the extent to which CCD has been integrated into government services;

iii Identify barriers and facilitators to CCD implementation.

2. Methods

This report consists of a mixed-methods review of CCD. First, we conducted a systematic review of scientific and gray literature reports concerning the implementation and/or evaluation of the CCD package. Secondly, we supplemented this information by conducting in-depth interviews with key informants (i.e., individuals who have been involved in the development, implementation, or evaluation) of CCD. These methods are further described below.

Reports were identified using both electronic and manual searches. Electronic searches were conducted in PubMed and Global Health Ovid using a search strategy informed by search terms and keywords used in prior systematic reviews of early childhood services (18, 19). Reference lists of relevant studies were scanned for any additional reports that may have been missed. Specifically, we searched the reference lists of two previous CCD reports (11, 13). Additional reports were identified through the key informant interviews and discussions with early childhood development (ECD) experts who are familiar with the CCD package and staff in the ECD Section at UNICEF Headquarters and WHO Headquarters. The sole inclusion criterion was that the report included data on the implementation (e.g., delivery modality and dosage, adaptations to CCD, behavior change techniques, characteristics of program beneficiaries and delivery agents, training, monitoring, and supervision of delivery agents, integration of CCD into existing services) or evaluation (e.g., study design, sample size, impact of CCD on child development and/or caregiving) of a program that was informed by or based on the CCD package. Data on the evaluation and implementation of CCD were extracted according to the Consolidated Advice on Reporting

ECD Implementation Research (CARE; (20)) and Consolidated Standards for Reporting Trials [CONSORT; (21)] guidelines.

The review was complemented by in-depth interviews with individuals who: (1) have been directly involved in the implementation (including training, monitoring, or supervising delivery agents) or evaluation of CCD; (2) have been involved in the development of the CCD package and/or delivery of Master Training workshops; and/or (3) have considered the CCD package for use in a parenting intervention. These individuals were identified during the review (i.e., authors of reports or individuals identified as being involved in implementation or evaluation of CCD in reports) and from discussions with ECD experts and staff from the ECD Section at UNICEF Headquarters and WHO Headquarters. A semi-structured topic guide was developed to include questions about implementation (including training, delivery, monitoring), evaluation, the challenges and successes of the implementation or evaluation processes, and their recommendations for improving the uptake and implementation of CCD (see Appendix 1, Online Supplementary material).

Twenty-four informants were identified and contacted for the first round of key informant interviews. These informants—specifically those who had implemented or evaluated CCD or had consulted the CCD package when developing an intervention—were identified during the review ($n = 8$) and through discussions with ECD experts ($n = 14$) and the ECD section at UNICEF Headquarters ($n = 2$). Of the 24 informants contacted, 19 agreed to be interviewed and the remaining 5 did not respond to our initial and follow-up emails. The first round of interviews was conducted by the first author of this review (MNA) with support from the second and third authors, from 19th January to 24th February 2022 using a semi-structured topic guide (see Appendix 1 for topic guide). The interviews were conducted virtually in English on a password-protected Zoom call that lasted an hour and was recorded to facilitate data analysis. Data were analyzed between 8th February and 4th March 2022 using thematic content analysis. The first author (MNA) initially reviewed notes from 4 interviews and developed an analysis grid of key themes, based on inductively identified codes (see Appendix 1 for analysis grid). This analysis grid was iteratively refined in a meeting with all authors who then used the final version of the analysis grid to independently analyze 3 to 6 interviews each.

Data from the first round of interviews informed the preparation of a semi-structured topic guide for the second round of interviews, which included four key informants [i.e., UNICEF ($n = 2$) and WHO ($n = 1$) staff and a CCD Master Trainer] involved in the development or management of CCD implementation globally. This guide included questions on informants' objectives for the future of CCD and their reflections on the issues raised by informants from the first round of interviews (see Appendix 1). These interviews were also conducted virtually by MNA. They lasted ~1.5 hours and were held on 3rd and 8th March 2022. Data from these interviews were used to complement the themes identified in the first round of reviews and to inform the discussion. Overall, we interviewed 23 informants (19 in the first round of interviews and 4 in the second). Participants provided informed consent and ethics approval was obtained from McGill University's Institutional Review Board (#21-11-029). The results are reported

Map of countries and territories reporting use of CCD package.
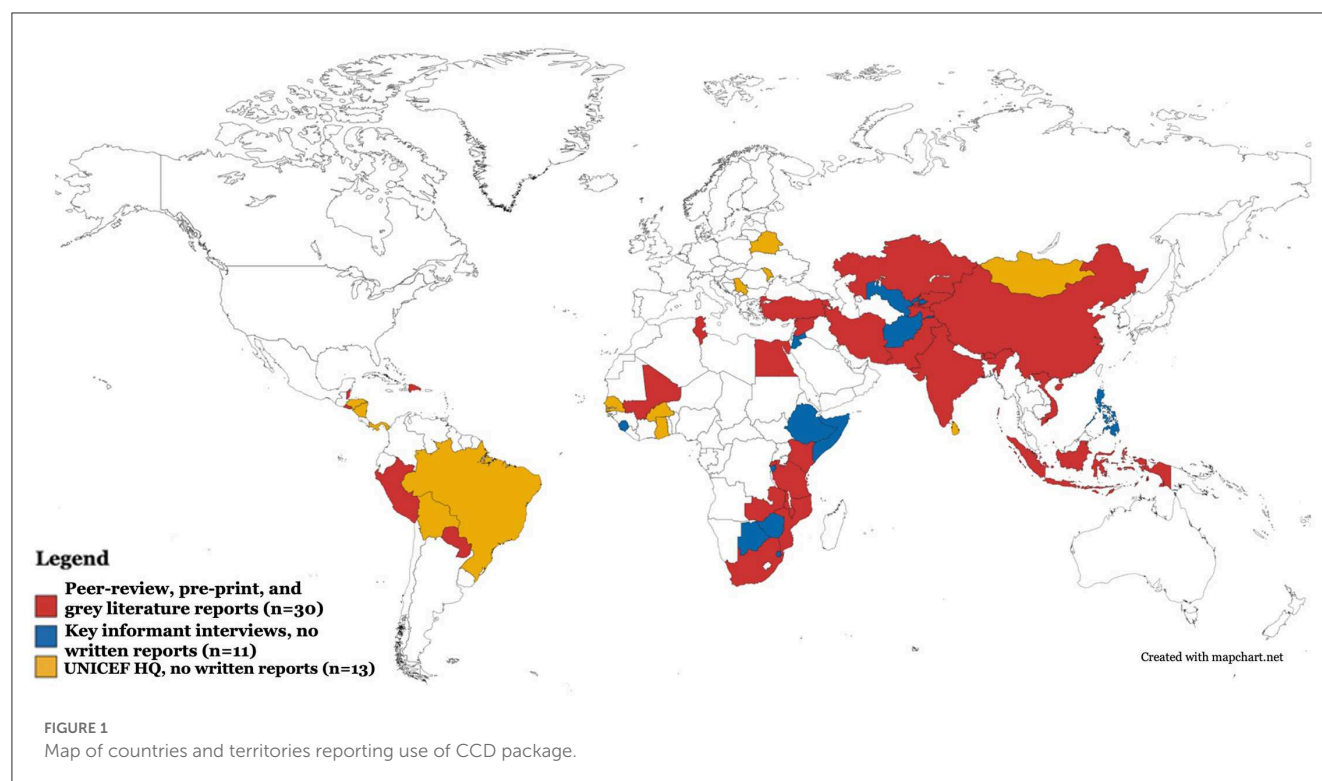
according to the Consolidated Criteria for Reporting Qualitative Research (22).

3. Results

We identified a total of 28 documents (26 peer-reviewed and 2 gray literature reports) describing the training, implementation, or evaluation of the CCD package in 17 services across 14 low- and middle-income countries through the review. Through discussions with ECD experts ($n = 11$) and the ECD Section at UNICEF Headquarters ($n = 2$), and the key informant interviews ($n = 14$), we identified 27 additional documents (8 peer-reviewed, 2 pre-print, and 17 gray literature reports) describing 41 additional services in 21 countries and territories, including 16 countries and territories for which we did not find reports in the review. We also learned about the implementation of CCD in 24 additional countries from the key informant interviews ($n = 11$) and documents shared by UNICEF Headquarters ($n = 13$) which did not meet our inclusion criterion (i.e., they did not include data on the implementation or evaluation of a CCD intervention or service). These UNICEF documents included the Latin America and Caribbean Regional Office's (LACRO) CCD roll-out guide and a survey of countries reporting whether CCD was used in any in-country parenting programs. All countries and territories that are reported to use CCD—including those for which a written report is not available—are shown in Figure 1 and listed by UNICEF world regions in Panel 1. Countries for which we have a written report (peer-reviewed, pre-print, or gray literature) describing CCD implementation or evaluation are shown in red and those for which we do not have a written report are shown in blue (key informant interviews)

and yellow (UNICEF Headquarters) according to the source of information.

The present review focuses on the data obtained from written reports of CCD implementation, training, and evaluation and thus summarizes information across 58 services in 30 countries and territories as described in 55 documents (34 peer-reviewed, 2 pre-print, and 19 gray literature reports) published between 2006 and 2022. A flow diagram of the procedure for including studies is in Figure 2. Where available, information on the content and structure of services (Supplementary Table S1), their settings and beneficiaries (Supplementary Table S2), characteristics and training of delivery agents (Supplementary Table S3), and evaluation of their impact on child and caregiver outcomes (Supplementary Table S4) were extracted into tables which can be found in Appendix 2 (Online Supplementary material). First, we describe the extracted data in Supplementary Tables S1–S4 and provide a general summary of our findings. We then summarize results from the thematic content analysis of the key informant interviews, including informants' perception and understanding of the CCD package, its strengths and weaknesses, and suggestions for how UNICEF and the WHO can better support CCD implementation and evaluation.

3.1. Summary of systematic review

The content and structure of services are described in Supplementary Table S1 (which can be found in Appendix 2). This review includes services which varied greatly in the extent to which they incorporated the CCD package. For clarity, these

PANEL 1   List of countries and territories reporting use of CCD package by UNICEF world regions.

East Asia and Pacific	Eastern and Southern Africa (cont'd)	Middle East and North Africa
● *China	● *Malawi	● *Egypt
● *Indonesia	● *Mozambique	● *Iran
● Mongolia	● *Rwanda	● *Jordan
● *Philippines	● *Somalia	● *Syria
● *Vietnam	● *South Africa	● *Tunisia
	● *Tanzania	
Eastern Europe and Central Asia	● *Uganda	**South Asia**
● *Armenia	● *Zambia	● *Afghanistan
● Belarus	● *Zimbabwe	● *Bhutan
● *Kazakhstan		● *India
● *Kyrgyzstan	**Latin America and Caribbean**	● *Pakistan
● Moldova	● *Anguilla (territory)	● *Sri Lanka
● Serbia	● *Belize	
● *Tajikistan	● *Bolivia	**West and Central Africa**
● *Turkey	● *Brazil	● Burkina Faso
● *Uzbekistan	● *Dominican Republic	● *Ghana
	● *El Salvador	● *Mali
Eastern and Southern Africa	● *Honduras	● *Senegal
● *Botswana	● *Nicaragua	● *Sierra Leone
● *Burundi	● *Panama	
● *Eswatini	● *Paraguay	
● *Ethiopia	● *Peru	
● *Kenya		

*Peer-review, pre-print, and gray literature reports (n = 30).
*Key informant interviews, no written reports (n = 11).
*UNICEF HQ, no written reports (n = 13).

are defined as being either CCD-informed (i.e., authors claimed to use some features of CCD along with their own or other parenting programs) or CCD-based (i.e., using the CCD package as the sole reference for developing a service). An example of a CCD-based service is described by (15) [Turkey], where pediatricians used the counseling cards to recommend play and communication activities and identified care practices using the CCD observation checklist for caregivers. In contrast, Rockers et al., [(23), Zambia] implemented a CCD-informed intervention, where CCD was one of a handful of ECD and parenting packages that researchers consulted and used to develop the intervention curriculum. Most services ($n = 46$) were CCD-based. Although all of these services were based on and formally defined as CCD, among those that reported the relevant data, there was great variation in the delivery modalities used (clinic visits [$n = 8$], home visits [$n = 8$], group sessions [$n = 7$], some combination of clinic and home visits and group sessions [$n = 20$]), the intensity of contacts between delivery agents and program beneficiaries (ranging from one 5-min session to 40 fortnightly sessions over two years), and the use of job aids (26 CCD-based services reported using job aids in sessions). A small number of CCD-based services ($n = 3$) also created playboxes, filled with homemade age-appropriate play objects and reading materials, in clinical settings to encourage caregivers to play with their children while waiting for health services.

There was also variation in the content of CCD-based services, including the extent to which adaptations, if any, were made to the CCD package. Three kinds of adaptations were described across reports: (1) translations of CCD materials into the local language(s), (2) substantive modifications to the content of CCD materials, and (3) adaptations of CCD materials for the local context, vulnerable children, or a humanitarian/emergency setting. Examples of translations of and substantive modifications to CCD materials are described below,

while examples of adaptations for local contexts are provided in the next section on settings and beneficiaries of services using CCD.

Counseling cards were translated into a variety of local languages including Arabic, Chinese, Farsi, French, Guaraní, Gujarati, Hindi, Javanese, Kakwa, Kannada, Kinyarwanda, Kiswahili, Luganda, Marathi, Spanish, and Vietnamese. Some studies simply made cultural adaptations to CCD materials by, for example, using traditional games as play activities. Others made substantive modifications by providing more specific recommendations on how to engage in responsive play and communication activities and creating a structured curriculum to guide delivery agents in their interactions with caregivers. For example, seven studies explicitly reported making substantive modifications to the play and communication activities of the CCD package ((24) [Indonesia]; (25) [Mozambique], (26) [Tanzania]; (27) [Malawi]; (28) [Kenya]; (29) [India and Pakistan]; (17) [Pakistan][5]). In Malawi, this consisted of modifying play and communication activities to focus on touch, hearing, and other senses for children with visual impairments (27). Other substantive modifications consisted of expanding the content of sessions to include additional topics such as mental health and emotional development (e.g., (30) [Turkey]), positive discipline (e.g., (26) [Tanzania], (17) [Pakistan]), and caregiver mental health (e.g., (31) [India], (17) [Pakistan]) among other topics.

Of all the services reviewed, twenty of them reported whether CCD had been delivered alongside (i.e., bundled with) another package. CCD was primarily bundled with health (e.g.,

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5   Note that the play and communication guide developed by Yousafzai et al in Pakistan was used by Jeong et al in Tanzania and by the SPRING Trial team in India and Pakistan.

FIGURE 2
Flow diagram showing the selection procedure of peer-reviewed, pre-print, and gray literature reports included in this review.
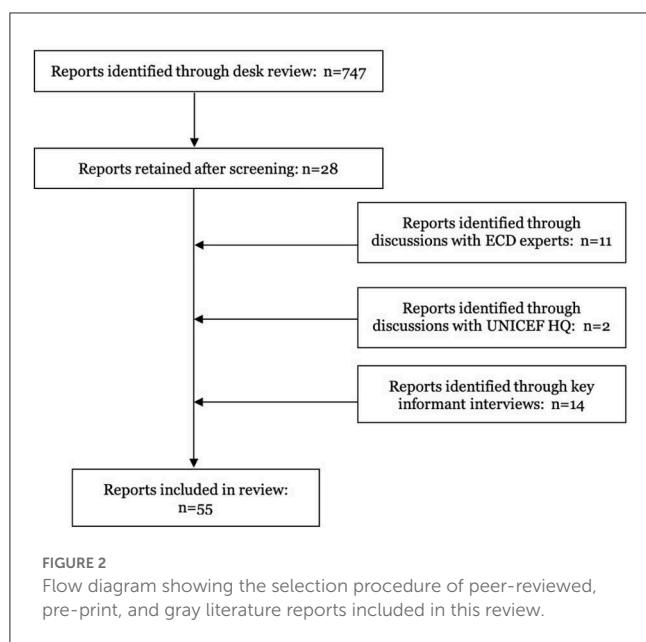
the WHO's IMCI strategy: (32) [Kenya]; (33) [Uganda]; (34) [Malawi]; (35) [Tanzania]; (36) [Egypt]) and nutrition education ((34) [Malawi]; (26) [Tanzania]; (17) [Pakistan]). Only three services delivered CCD alongside a package that targets the mental health and psychosocial wellbeing of caregivers [i.e., (37) the Thinking Healthy Program; (38) [Vietnam]; (29) [India and Pakistan] and Behavioral Activation Therapy: (39) [South Africa]].

Services also used a variety of techniques to encourage behavior change in caregivers. The behavior change techniques outlined in the CCD Participant Manual are print media (i.e., use of pamphlets, posters, flipcharts, or other forms of print media to convey messages), provision/creation of materials (e.g., play objects), self-performance (i.e., having caregivers practice behaviors with their child followed by coaching and feedback from a delivery agent), and problem-solving. Most services included in this review reported using some of these behavior change techniques, and some (e.g., (15) [Turkey]; (25) [Mozambique]; see Supplementary Table S1 for additional examples) used additional techniques such as other-performance (i.e., caregivers watching delivery agents demonstrate/model a behavior with the child) and social support (i.e., leveraging beneficiaries' relationships with family and community members as a source of support to facilitate behavior change). The most common behavior change technique used was self-performance, followed by the provision of materials and the use of print media. The least frequently used techniques were audio-visual media, social support from community members, and problem-solving. The total number of behavior change techniques used in a single service ranged from one to eight.

Supplementary Table S2 provides information on the setting and beneficiaries of CCD-based and CCD-informed services (see Appendix 2). Services were conducted in both rural and urban areas, with the majority taking place in rural areas. The

primary beneficiaries of most services were children <5 years old (many services specifically targeted 0–3-year-olds) and their mothers, although some services primarily focused on the primary caregiver. These beneficiaries mostly came from low socioeconomic backgrounds. Nine studies specifically targeted vulnerable groups: children born prematurely or with low birth weight ((40) [Dominican Republic]), children with visual impairments ((27) [Malawi]), children with other physical and/or cognitive disabilities ((40) [Dominican Republic]; (41) [El Salvador], (42) [Peru]; (31) [India]), children of HIV+ mothers ((43) [Malawi]; (28) [Kenya]), children of incarcerated mothers ((44) [Paraguay]), and children of HIV+ mothers experiencing antenatal depressive symptoms ((39) [South Africa]).

With respect to vulnerable settings, both CCD-based and CCD-informed services were implemented in conflict-affected areas ((45) [Syria]), during the Zika pandemic ((40) [Dominican Republic]), and as part of the emergency response to Hurricane Irma ((46) [Belize and Anguilla]). For example, within the framework of the response to the Zika pandemic in the Dominican Republic, delivery agents from a community-based organization who were conducting Zika awareness campaigns and making home visits to families affected by the virus were trained to incorporate CCD in these services ((40) [Dominican Republic]). A handful of studies also described changes to service delivery for the COVID-19 context ((32) [Kenya]; (33) [Uganda]; (47) [Mozambique]; (26) [Tanzania]; (40) [Dominican Republic]). Changes included moving service delivery to a digital platform, reducing the frequency and length of contacts between delivery agents and caregivers, and switching from a group-based delivery modality to home visits where delivery agents and caregivers respected COVID-19 mitigation protocols (e.g., social distancing, handwashing, meeting outdoors).

In addition to the primary beneficiary, some services ($n = 20$) actively engaged other caregivers in the child's life, mostly their fathers and grandmothers. In terms of program reach, the handful of documents ($n = 8$) reporting this information indicated that 30–99% of targeted caregivers participated in the described service. Reports that assessed beneficiaries' program acceptance ($n = 20$) found that overall caregivers were satisfied with service content and delivery, and they reported increased engagement in play and communication activities with their children as a result of the service. They also highlighted some issues. For example, some caregivers stated that they would have liked a better explanation of the service's purpose ((48) [Mozambique]) and to have more explicit and repetitive messages on why specific activities are important for children's development ((43) [Malawi]). Two of the reports ((24) [Indonesia]; (30) [Turkey]) described the training of delivery agents in the CCD package and one of them reported data on delivery agents' program acceptance. General practitioners and nurse-midwives in Turkey appreciated the content and materials of the CCD package and felt that the training improved their ability to engage caregivers in ECD counseling (30). They also noted some programmatic issues, including that the training focused on improving competence and knowledge rather than developing a comprehensive program that incorporated ECD into health care delivery.

Further information on the characteristics and training of delivery agents are reported in Supplementary Table S3 (see Appendix 2). Delivery agents had varying levels of education (e.g., some or completed secondary schooling, bachelor's degree, medical degree) and came from different sectors including health (e.g., nurse-midwives, pediatricians, community health workers, health assistants), education (e.g., kindergarten teachers), and social (e.g., social workers, community-based rehabilitation workers) sectors, or from the general community (e.g., community-based volunteers, caregivers). Thirty-nine studies reported whether the CCD package had been integrated into an existing government service or delivered as a separate service. All but five of these reported that CCD had been integrated into existing services in the health (Bhutan, Egypt, China, Kazakhstan, Kyrgyzstan, India, Indonesia, Malawi, Mozambique, Pakistan, Rwanda, Syria, Tajikistan, Turkey) and social (Vietnam) sectors. Nine of these reports indicated that CCD-based and CCD-informed services had been integrated into services across multiple sectors including Ministries of Health, Education, Justice, and Social/Human/Gender Development (Armenia, Belize, Dominican Republic, El Salvador, Iran, Kenya, Paraguay, Peru, Tanzania, Tunisia, Uganda). However, the geographic scale of these integrated government services was not clearly or consistently reported across studies. In studies that reported this information, the scale at which CCD-based or CCD-informed services were implemented—primarily in the health sector—ranged from one health facility (e.g., the Kangaroo Mother Care Program in the San Lorenzo de Los Mina Maternity and Children's Hospital; (40) [Dominican Republic]) to an entire county (e.g., routine health facility clinical services in Siaya County; (32) [Kenya]).

Some studies indicated that CCD had been embedded in national policies and strategies for ECD (Belize, Bhutan, Dominican Republic, Egypt, El Salvador, Iran, Mali, Pakistan, Peru, Uganda) but did not clarify whether or how such policies translated vertically into local-level implementation of a CCD-based or CCD-informed service. It is therefore not clear the extent to which CCD has been adopted by national governments. Additionally, only a handful of these reports provided details on how CCD had been integrated into the existing roles and responsibilities of delivery agents or the processes by which the implementation of services were supervised or monitored. This was also true for reports where CCD was delivered as an intervention outside of an existing service or system. Only two reports indicated using data from a job analysis of delivery agents to inform the integration of CCD into an existing service [(34) [Malawi][6]; (50) [Pakistan]]. Four studies also provided data on the feasibility and impact of integrating CCD into the existing responsibilities of delivery agents ((51) [Kazakhstan, Kyrgyzstan, Tajikistan]; (25) [Mozambique]; (29) [India and Pakistan]; (50) [Pakistan]). These data show that although some delivery agents appreciated the importance of CCD and reported some improvements in their ability to coach caregivers, issues such as lack of time due to competing activities, lack of systematic practical training and supervision, and high workforce turnover rates impeded their ability to integrate CCD into their existing roles and responsibilities.

The available data on supervision indicate that supervisory contacts occurred at least once a month and consisted of different strategies such as on-the-job coaching, peer support groups, and shadowing. With respect to monitoring indicators, only five reports described the specific tool used to monitor delivery agents (CCD Observation of Provider's Counseling Checklist ((52) [Tanzania], (32) [Kenya], (31) [India]); Physician Counseling Skills Scale ((15) [Turkey]); and a locally developed CCD Monitoring and Evaluation Surveillance System ((46) [Belize and Anguilla]). Most remaining reports generally indicated that delivery agents had been observed administering the service, with a few (n = 9) indicating that a checklist had been used but did not detail how this was done or what specifically was assessed.

A larger number of reports provided data on one or more aspects of the training of delivery agents including the duration, background of trainers, learning methods used, whether refresher sessions were held, and if process and outcome evaluations of the training were conducted. Out of the 35 services that reported the duration of training, the amount of time dedicated to CCD training ranged from two days to six weeks (most services had 2–5 days of training[7]) and they were conducted by academic researchers and ECD specialists from non-governmental organizations (NGOs, e.g., UNICEF, PATH, World Vision). Twenty-one studies reported using a train-the-trainer model, where government staff, supervisors, or other individuals were trained on service administration and then subsequently trained the delivery agents. Only thirteen services reported using active learning strategies (e.g., demonstration, role plays, practice with caregivers and children) in the training process ((32) [Kenya]; (33) [Uganda]; (24) [Indonesia]; (53) [Rwanda]; (30) [Turkey]; (54) [Rwanda]; (26) [Tanzania]; (39) [South Africa]; (55) [India]; (35) [Tanzania]; (31) [India]; (36) [Egypt]; (50) [Pakistan]) and twelve reported hosting refresher sessions during service delivery ((32) [Kenya]; (33) [Uganda]; (56) [Kenya]; (25) [Mozambique]; (26) [Tanzania]; (54) [Rwanda]; (39) [South Africa]; (57) [Armenia]; (35) [Tanzania]; (58) [Kenya]; (17), (26) [Pakistan]; (59) [China]). The handful of studies (n = 9) that assessed delivery agents before, during, or after training generally reported improvements in knowledge about child development and competencies in delivering the service ((32) [Kenya]; (24) [Indonesia]; (30) [Turkey]; (27) [Malawi]; (55) [India]; (29) [India and Pakistan]; (36) [Egypt, Iran, Tunisia]; (31) [India]; (50) [Pakistan]).

Only nineteen reports included information about the evaluation of CCD services on children's developmental outcomes, caregivers' parenting practices, and some other child (e.g., nutrition, health) and caregiver (e.g., mental health) outcomes (see Supplementary Table S4). All but one of these reports examined short-term (i.e., immediately after exposure or within 12 months of exposure) impacts. The only long-term evaluation was conducted 2 years after exposure to a CCD-based service ((60) [Pakistan]). Both randomized (n = 11) and non-randomized (n = 8) study designs were used for these evaluations and the sample size of

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6   Gladstone et al. used the job analysis of health surveillance assistants in Malawi from Phuka et al. (49) to inform the integration of CCD into health services.

7   Note that the recommended duration of training—according to the Facilitator Notes—is 3.5 days.

participants ranged from $n = 38$ to $n = 2953$. However, only nine studies used a randomized controlled trial to determine the causal impact of the service on child and caregiver outcomes. Most studies ($n = 11$ out of the 16 that assessed child outcomes) reported small-to-moderate effects of the service on children's cognitive, language, or multi-domain development, while the remaining $n = 5$ found no significant effects. Over half of the studies ($n = 8$ out of the 14 reporting caregiver outcomes) also found significant improvements in stimulation-based parenting practices and responsive caregiver-child interactions in caregivers receiving the service compared to caregivers that did not. The single long-term evaluation found continued improvements in child and caregiver outcomes two years later. Only one of the studies examining impacts on caregiving outcomes included quantitative data on fathers ((26) [Tanzania]).

3.2. Summary of key informant interviews

Findings from the key informant interviews are summarized below and the details of key informants (names, affiliated institution/organization, and location (country/region) of CCD experience) are presented in Panel 2.

The analysis grid for the first round of interviews consisted of 6 themes: (1) definition of CCD (how informants defined CCD, what they perceived its objectives to be, and what they thought was unique about CCD compared to other ECD packages), (2) justification for CCD (why informants chose to use the CCD package or not), (3) advantages and disadvantages of CCD (what informants identified as the strengths and weaknesses of CCD), (4) implementation of CCD (what informants identified as common challenges and facilitators to CCD implementation and reports of caregivers' and delivery agents' perception of CCD), (5) how to implement CCD (what advice informants would give those wishing to implementing CCD), and (6) future of CCD (informants' visions and hopes for CCD and reports of what UNICEF and the WHO can do, both in terms of leadership and additional resources, to address existing strengths and weaknesses of CCD).

3.2.1. Theme 1: Definition of CCD

Many key informants defined CCD as an approach or set of recommendations intended to promote skills in delivery agents to promote child development.

> "[CCD] is created as two practical skills that all health workers should have in their contacts with young children and their families to promote and support healthy development. [These skills are] the promotion of a variety and play and communication activities and using that context to guide a responsive interaction between caregivers and their young children." (Academic researcher #1)

Other informants defined CCD as a training package or intervention program that promotes responsive care and stimulation for young children. Furthermore, some highlighted that the messaging of CCD goes beyond counseling as it can also be used in group sessions. Key informants described CCD's

objective as to inform and train health workers and other delivery agents about child development and the need for responsive care. According to informants, elements of CCD that make it unique from other ECD packages are that it is practical and "puts the caregiver first" (NGO staff #1). Additionally, key informants reported that CCD shows why responsive caregiving is important for child development. Overall, informants identified CCD as being suitable for delivery agents' skills as it resembles adult learning with an emphasis on coaching and practical training.

3.2.2. Theme 2: Justification for CCD

One key informant decided to use CCD after a literature review of ECD packages (Academic researcher #2). This informant stated that CCD fit well with their target beneficiaries' access to resources and that they ultimately decided to use CCD because it was already being used in the country they were working in. Some informants used CCD because it was recommended to them by a trusted ECD expert, while others were attracted to it because it is a "WHO and UNICEF package and has this kind of seal of excellence" (NGO staff #2). On the other hand, one informant consulted the CCD package but decided not to use it because it did not contain enough structured activities and detail. They noted that "we were looking for a program and the CCD package was mostly bullet points" (Academic researcher #3). This informant ended up using an ECD package with a structured curriculum that provided clearer guidance for delivery agents.

3.2.3. Theme 3: Advantages and disadvantages of CCD

According to key informants, one of the main strengths of the CCD package is that it is open source and can thus be used by anyone. Informants also appreciated that the messages and trainings are flexible and can be adapted to different countries, sectors, and services. Other strengths of the package highlighted by informants included the counseling card's provision of practical advice on what caregivers can do with their children and that the overall package is suited to be administered by delivery agents in primary healthcare facilities. With respect to the weaknesses of CCD, key informants mostly identified issues with its content and implementation. These included a lack of information on the number of contacts needed to change parenting practices, lack of an explanation for why play and communication is important and why delivery agents and caregivers should invest in it, the need for more support to delivery agents after training—particularly through refresher sessions and monitoring of delivery, the lack of available and easily identifiable master trainers at the regional level, and the lack of specific messages addressing children with disabilities and caregivers' mental health.

3.2.4. Theme 4: Implementation of CCD

Related to these weaknesses, informants also discussed challenges that they and their teams faced in implementing CCD. Challenges occurred at multiple levels including the

PANEL 2   List of key informants*.

Name	Affiliated institution/organization	Country/region of CCD experience
Aisha Yousafzai	Harvard T. H. Chan School of Public Health	Pakistan
Amina Mwitu	Aga Khan Foundation	East Africa
Bernadette Daelmans	World Health Organization Headquarters	Global
Boniface Kakhobwe	UNICEF Headquarters	Global
Florence Kitabire	UNICEF Eastern and Southern Africa Regional Office	East and South Africa
Jane Lucas	Independent Consultant	Global
Jill Luoto	University of Southern California	Kenya
Josephine Ferla	Elizabeth Glaser Pediatric AIDS Foundation and Save the Children	Tanzania
Joyce Marangu	Aga Khan University's Institute of Human Development	East Africa
Lana Drivdal	PATH	East Africa
Maria Paula Reinbold and Patricia Núñez	UNICEF LACRO	Latin America and the Caribbean
Megan McHenry	Indiana University School of Medicine	Kenya
Melissa Gladstone	University of Liverpool	Malawi
Nafisa Shekhova	Aga Khan Development Network	Global
Paul Lynch	University of Glasgow	Malawi
Radhika Mitter	UNICEF Headquarters	Global
Tomomi Kitamura	UNICEF Middle Eastern and North African Regional Office	Middle East and North Africa
Vibha Krishnamurthy, Priyamvada Das, Namrata Edwards	Ummeed	India
Vika Sargsyan	World Vision	Armenia
Zelee Hill	University College London	India, Pakistan

*Any quotes included in the description of the qualitative data are anonymized. Only the type of institution/organization the informant is affiliated with is reported (academic researcher, independent consultant, or NGO staff).

caregiver/community (e.g., building trust with caregivers and other relevant community stakeholders who do not see the need or importance of CCD messages), delivery agent (e.g., high workload and turnover rates, low levels of education and lack of ECD background, lack of post-training follow-up in train-the-trainer model, difficulty in consistently using high-quality monitoring and evaluation materials, lack of specific guidance on supportive supervision), and systems (e.g., low levels of buy-in from local governments, low capacity and support from in-country and regional partners, difficulty ensuring sustainability due to lack of funding) levels. On the other hand, informants identified factors that had facilitated the implementation of CCD in their respective contexts. Common facilitators were having community champions/advocates who helped increase community engagement with CCD services, working in a centralized government system, where receiving government support at one level opened doors for working at other government levels, and working with delivery agents who saw the value and importance of CCD and were thus invested in ensuring its successful implementation.

In terms of caregivers' and delivery agents' perceptions of CCD services, most informants reported that they were positive.

Caregivers in many contexts appreciated CCD because the play and communication activities helped them to better understand and interact with their children. In some contexts, caregivers who had participated in a CCD service went on to become "*champions*" (NGO staff #1) in their communities, which in some cases led fathers and other caregivers to "*[come] along to the group sessions and…participate in the home visits*" (Academic researcher #1). Overall, delivery agents also appreciated the CCD services and enjoyed delivering it. Informants indicated that delivery agents were "*happy to communicate [CCD] messages to parents*" (NGO staff #1), appreciated being able to look at children's development and wellbeing beyond medical issues, and felt that "*they can actually talk to the child and the mother as human beings as opposed to just clients*" (NGO staff #2). However, informants did clarify that although delivery agents had positive perceptions of CCD, some did not see "*counseling mums…as completely their role*" (Academic researcher #4).

3.2.5. Theme 5: How to implement CCD

Implementation of CCD begins with sensitization and advocacy about why ECD is important and how the CCD

package can support healthy development of the youngest children. However, while awareness about CCD has reached a number of countries around the world, key informants generally noted that advocacy efforts often did not reach the level of community (i.e., delivery agent and caregivers).

> *"Advocacy doesn't trickle down to family level."* (Academic researcher #4)

However, it was noted that when families and delivery agents experienced CCD, it was often enjoyed, which was a facilitator to implementation.

While multiple key informants noted the importance of formative research[8] and adaptation of CCD to the local cultural context and needs (e.g., ensuring piloting, testing feasibility in both rural and urban settings), several also pointed to addressing the needs of the delivery agents (e.g., job analysis, strengthening supervision skills, and fostering discussions on why CCD and promoting ECD should be their business).

> *"Supervisors need to be trained to model good teaching rather than use didactic instruction. Supervision skills are really critical."* (NGO staff #3)

Informants also highlighted the importance of intentionality when bundling different packages:

> *"It's about being thoughtful about which messages complement one another...If you're going to bundle things together, why are you bundling things together? The person delivering [the service] has to understand that…so if your training just says 'here's another thing I want you to do' without helping [the delivery agent] navigate 'how am I going to manage all of these in one home visit? Do they all have to be delivered in one home visit?'. If you don't do any of that homework then it's not going to work. It's just another intervention and they'll deliver the one they get paid to deliver."* (Academic researcher #1)

3.2.6. Theme 6: Future of CCD

This theme emphasized what implementers need to support quality implementation of CCD on the ground. This included suggestions ranging from expanding the training guidance to include recommendations on planning refresher trainings, creating guidance on monitoring and evaluation for CCD, and making competency standards available for assessing the skills of delivery agents. Among the most common requests was the opportunity to share experiences:

> *"It would be nice to have a hub, like an online hub, where partners could post their experiences like 'look we've adapted this material and because of this, and this, and this right, and this*

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8   Data from the systematic review show that 17 reports indicated that formative research had been conducted prior to the implementation of the described CCD-based or CCD-informed service (Supplementary Table S1).

is how we are you using it and these are the touch points where we're implementing it'. And if you have any study you put it there to show what happened, any evidence. So just to kind of have live examples of how materials are used...in systems from different parts of the world and sample materials. Right yes, so like a public learning hub would be very helpful." (NGO staff #2)

In some cases, key informants highlighted the need for greater clarity on content and behavior change techniques. For example, one key informant expressed that it was important to ensure that delivery of CCD was a practical experience where caregivers could try play and communication activities with their young child. While this practical approach is central to the CCD content, the response suggests the need for greater technical support and clarity for end-users. Finally, in response to emerging needs, a few key informants noted the need for a more inclusive approach to CCD expanding on how the needs of children with developmental delays and disabilities could be met and considering how to expand the global footprint to high-income settings.

4. Discussion

As the first systematic review of services using the CCD package, we aimed to examine how it has been implemented in different contexts and how it benefits caregivers and children. Our discussion is organized to identify how it has been integrated into government services and systems, common features of the package's content, the training of delivery agents, and engagement of beneficiaries, highlighting the strengths and limitations of each. Key informant interviews provided a deeper understanding of challenges faced when implementing the CCD package, as well as the benefits. Based on findings from the systematic review and key informant contributions, we provide some recommendations going forward.

4.1. Government integration

The systematic review uncovered 55 documents, of which 34 were peer-reviewed publications and 2 pre-prints. Forty-six were explicitly based on the CCD package (9). Of these, 34 had been integrated into the government health service. This was seen as a strength in that health workers with the potential for sustaining the service were trained. In most cases, it was not clear if the integration included the health system at the local level only (e.g., community health workers and clinic staff) or at the district and national levels. Most were not scaled geographically beyond the district or county level. In ten cases, CCD had been embedded in national policies and strategies for ECD, but it was not clear whether the policies had influenced implementation.

4.2. Content and structure of the program

For CCD-based services, the content and structure followed the CCD package, regardless of whether they were delivered in a clinic, home visit, or group session. Because the Participants'

Manual used by delivery agents does not propose a structured program, implementers felt this allowed for flexibility in adapting it to their context. Some saw this as an opportunity to elaborate on the activities conducted with caregivers and so developed manuals with illustrations for delivery agents to use (e.g., SPRING Trial Team), while others used the CCD Participants' Manual and Counseling cards. Adaptations were undertaken to make materials suitable for the country, culture, and education level of the delivery agent. However, regardless of education level, most agents were initially naïve to principles of ECD and responsive play and communication. Common adaptations included translation into the local language, changes to the counseling card illustrations, and addition of local games as play activities. Another adaptation was the intensity of contacts with caregivers, varying from one 5-min session in a clinic setting to 40 fortnightly group and home visits over 2 years. Interventions that were informed by, but not based on, CCD generally deviated by considering other programs that provided more structured play and communication activities beyond what was available from the CCD package. Flexibility of the CCD package may be seen as a strength only if the curriculum developer has the expertise to insert content and structure that is needed by delivery agents and caregivers if they are unable to translate Participant Manual suggestions into practical activities.

In order to encourage caregivers to adopt the proposed practices, most services used more than one technique of behavior change. The most common was self-performance, whereby the delivery agent encouraged the caregiver to engage in the new play or communication practice with their child followed by coaching and feedback from the delivery agent. Another common technique was the use of print media, such as the counseling cards illustrating how caregivers play with their child. Because the suggested game is age-specific it may be insufficient or inapplicable two weeks later. Additional techniques that were less common included watching the delivery agent demonstrate or model a behavior, solving problems to enacting the practice, and encouraging social support from family and peers. The use of multiple techniques of behavior change has been previously associated with improvements in children's development (18).

4.3. Workforce

Training, supervising, and monitoring delivery agents posed a challenge. The length of training was often too short with only 2 or 3 days to cover material in the Facilitators' and Participants' Manual, whereas other trainings lasted several weeks. Most did not provide sufficient practical or clinical experience and only thirteen used any active learning strategy to train, such as, demonstration, role plays, and practice with caregivers and children. Professionals, who were better educated, did not require as much training but often found that the increase in workload was prohibitive. Paraprofessionals and volunteers required more training but complained about the lack of refresher courses and face-to-face supervision. Some had monthly supervision with on-the-job coaching (e.g., (50)), and nine reported using a checklist to observe and provide feedback.

Only a few studies reported using an assessment of delivery quality or knowledge after training [e.g., (30)]. Several implementations developed their own supervisory content and schedule; a few implemented refresher trainings at regular intervals [e.g., (57, 58)].

4.4. Beneficiaries

The intended beneficiaries in all cases were the child, particularly those under 3 years, and their caregivers, mainly mothers. Although CCD was implemented in urban and rural settings, the majority targeted disadvantaged families in rural areas. Recent implementations have been directed at vulnerable groups such as caregivers of children born prematurely, with visual impairments, and with other physical and/or cognitive disabilities. These interventions have required considerable adaptation to accommodate the needs of these children and their caregivers. Some have also addressed nutritional problems of stunted children and the well-being of mothers at risk of depression.

Only nineteen reports described their evaluation of beneficiary outcomes for children and/or caregivers. Approximately half were CCD-based and half CCD-informed. Both randomized and non-randomized designs were used. This is a clear limitation. Of the 16 that assessed child outcomes, eleven reported small-to-medium effects of the service on children's cognitive, language, or multi-domain development, while the remaining five found no significant effects. Of the 14 assessing caregiver outcomes, eight found small-to-medium improvements in stimulation-based parenting practices and/or responsive caregiver-child interactions in caregivers receiving the service compared to caregivers who did not. These are promising findings that call for more interventions to be evaluated using convincing designs and measures. Evidence that an intervention is effective, feasible, and acceptable is important before scaling it up.

4.5. Recommendations

As noted previously, reports did not often elaborate on how the CCD program was being implemented at scale, both within the government system and across the country. This limitation has been addressed in Belize and could be a solution for others. To support the monitoring and evaluation of CCD services at scale, Belize has developed a CCD monitoring and evaluation surveillance system [CCD-MESS (46)]. CCD-MESS was developed in 2019 to set common service provision standards for all service providers involved in CCD delivery. The system defines the building blocks of a CCD session, the schedule of sessions depending on the child's condition (e.g., premature, stunted, disability, or no special condition), and establishes that all delivery agents should be trained at least once a year. Delivery agents are required to submit monthly reports to help track the 12 indicators highlighted in the CCD-MESS. The system also defines a checklist for use by supervisors when monitoring delivery agents (46). The development of similar monitoring and evaluation systems can be used to track the quality and effectiveness of large-scale early childhood services.

Additional challenges in implementing at scale were raised by key informants who were also asked to recommend solutions. Challenges included lack of buy-in from local and national levels of government, low capacity and support from in-country and regional partners, and difficulty ensuring sustainability due to lack of funding. Key informants also highlighted challenges to CCD implementation at the caregiver- (e.g., building trust with caregivers and other relevant community stakeholders who may not see importance of CCD messages) and delivery agent- (e.g., high workload and turnover rates, lack of post-training follow-up training, difficulty in consistently using high-quality monitoring and evaluation materials) levels. When asked about potential solutions to these challenges, key informants suggested expanding training guidance to include recommendations on planning refresher trainings, creating technical guidance on monitoring and evaluation for CCD, and developing competency standards for assessing the skills of delivery agents. Executing these and other solutions will require communication and coordination between UNICEF and WHO (both the headquarters and regional offices) and early childhood researchers and program implementers to ensure sustainable implementation and effective impact of the CCD package on child and family outcomes.

5. Conclusion

Overall, CCD has helped raised awareness of strategies to promote ECD among key program implementers in low- and middle-income countries, especially in the health and nutrition sectors. The open access to the package and the flexibility that permits contextualization and adaptation to culture, context and delivery system is a strength. However, access to technical support is important when adapting and rolling out to ensure the core recommendations are appropriately implemented. This review provides a timely summary of how CCD has been implemented in various contexts, highlighting key strengths that can be built on and challenges pertaining to implementation roll-out for scale and sustainable uptake that need to be addressed. While many of the implementation challenges are not unique to CCD and have been noted in the broader literature that points to the lack of scale-up of effective parenting interventions, here is a window of opportunity to reflect on these results and consider how the CCD package may be expanded to support roll-out in systems for scale (e.g., guidance on how to introduce and foster buy-in for CCD to policy makers, building skills for trainers and supervisors, monitoring CCD in health and nutrition systems) and platforms created to share lessons from large scale implementation efforts. Given new realities of the youngest global citizens and their caregivers, including recovering from the consequences (psychologically and economically) of the COVID-19 pandemic and facing the growing risks of conflict, climate change, and increasing inequities in society, multiple parenting packages and innovations will be needed in which CCD can play a key role in offering solutions.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MA and AY developed the study concept. MA, FA, and CW conducted the literature review and data extraction. MA prepared the first draft of the manuscript. All authors provided critical feedback on drafts of the manuscript and were involved in the analysis of data from the key informant interviews. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1140843/full#supplementary-material

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Measurement for Change: Reflections from innovators' experiences with monitoring, evaluation, and learning systems for Early Childhood Development

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In this review paper, we explore how on-the-ground Early Childhood Development (ECD) innovators are using monitoring, evaluation, and learning (MEL) systems to guide the design and implementation of ECD programs, as well as how MEL systems can influence policy and support the achievement of impact at scale. We reflect on articles in the Frontiers series "Effective delivery of integrated interventions in early childhood: innovations in evidence use, monitoring, evaluation, and learning." The 31 contributions to the series reflect the breadth and depth of complexity that characterizes ECD, including global geographic spread, with studies from Asia, Europe, Africa, and Latin America and the Caribbean. Our synthesis finds that integrating MEL processes and systems into the fabric of a program or policy initiative can broaden the underlying value proposition. Specifically, ECD organizations sought to design their MEL systems to ensure programs fit the values, goals, experiences and conceptual frameworks of diverse stakeholders, so that participating makes sense to all. For example, formative, exploratory research identified the priorities and needs of the target population and frontline service providers, and informed the content and delivery of an intervention. ECD organizations also designed their MEL systems to support a shift of accountability toward broader ownership: They included delivery agents and program participants alike as subjects rather than objects, through active participation in data collection, and by providing opportunities for equitable discussion of results and decision-making. Programs collected data to respond to specialized characteristics, priorities and needs, embedding program activities into existing day-to-day routines. Further, papers pointed to the importance of intentionally involving a variety of stakeholders in national and international dialogues to ensure that diverse ECD data collection efforts are aligned and multiple perspectives are considered in the development of national ECD policies. And, several papers illustrate the value of creative methods and measurement

tools to integrate MEL into a program or policy initiative. Finally, our synthesis concludes that these findings align with the five aspirations that were formulated as part of the *Measurement for Change* dialogue, which motivated the launch of the series.

1. Introduction

Recent influential series on Early Childhood Development (ECD), in 2016, 2018, and 2019,[1] highlight the important contribution of monitoring, evaluation and learning (MEL) systems in guiding the implementation and scaling up of effective ECD programs. Against this background, *Frontiers in Public Health* launched the series: "*Effective delivery of integrated interventions in early childhood: innovations in evidence use, monitoring, evaluation, and learning.*" This provided a forum for ECD implementers to explore the practical solutions they are generating as they integrate MEL systems into the cycle of program design, redesign, implementation, adaptation, and scaling. Altogether, 31 articles were accepted for publication.

The *Frontiers* series built on a year-long (2019–2020) dialogue among ECD practitioners, researchers and MEL specialists working in low-resource settings across the world. The outcome of this dialogue is described in detail in Krapels et al. (1), while van der Haar et al. (2) describe the consultative process involved. The dialogue, facilitated by authors of this paper, was built around the concept of *Measurement for Change*. The goal was to explore the contribution MEL systems can make in both capturing and supporting meaningful change, both at the ECD program level and in national and international policy. The dialogue considered how MEL can become more than a program "add-on" by integrating into collaborative decision making for effective delivery, reaching beyond those tasked with running MEL systems.

With these ambitions in mind, participants in the dialogue articulated a set of *aspirations* for MEL systems that support meaningful and durable improvements for ECD program beneficiaries (1). These aspirations, which together animate the *Measurement for Change* approach, are for MEL systems to be:

> **Dynamic**: With the capacity to adjust frameworks, processes, or methods to be responsive to challenges, surprises, or opportunities, and to be able to reach learning goals.
> **Inclusive**: With the capacity to identify and actively involve all stakeholders in making contributions to, and benefiting from, measurement and learning.

Informative: With the capacity to continuously seek, assess and use information from various sources to guide decision-making.
Interactive: With the capacity to observe, track and utilize interactions, responses, and relationships.
People-centered: With the capacity to be responsive to distinct and different goals, strengths, priorities, circumstances, characteristics of different people and communities" [(1), p. 3].

The majority of the articles in the recent *Frontiers* series were written by participants in the *Measurement for Change* dialogue, sometimes in co-authorship or consultation with authors of this review paper (2). This paper is not intended to summarize all the articles in this series, nor even to touch on all the major insights. Instead, by drawing on selected experiences reported in the series, we explore how on-the-ground ECD innovators are using MEL systems to guide decision-making, and ask to what extent the aspirations of *Measurement for Change* are evident in their narratives.

2. Overview of the publications

The geographic spread of the 31 contributions in the *Frontiers* series includes Asia (India, Pakistan, Bangladesh, Tajikistan, China), Europe (Poland, Austria, Romania, Bulgaria), Africa (Cameroon, Malawi, Kenya, South Africa, sub-Saharan multicountry), and Latin America and the Caribbean (Peru, Brazil, Colombia, Jamaica), with some countries hosting multiple studies (e.g., India). In terms of ECD intervention areas, some papers focused primarily on health, with programs addressing, for example, anemia, nutrition, oral hygiene, and a public mHealth system. Two papers were concerned with assessment instruments for child development in general, and language in particular. Other papers featured parenting programs as the main, or an important, intervention focus. A major theme across papers was the value placed upon community engagement. With families and education being at the center of these narratives, the age of the children involved ranged from the prenatal period through to the age of six, the full ECD period.

Our reflections begin with a group of papers that illustrate how MEL supported program design and implementation, creation of novel approaches, or adaptation to new contexts. We then discuss papers that describe specific MEL techniques or methods, which the developers have also used to support a cycle of review and reflection. The third group of papers report on the

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use of existing implementation science frameworks to guide the implementation process and its evaluation. We next consider papers that report experiences using MEL systems and data more broadly, to support scaling efforts and policy change. Finally, we discuss papers that describe strategies to consolidate information, at national or international levels, to guide decision-making in policy and practice.

3. Using MEL to guide design, implementation, and fast cycle learning

The papers considered in this section describe how MEL systems collected information to guide the development and delivery of specific interventions, with an eye to process, quality and in some cases impact. The results support the longer-term goal of building a delivery system for an intervention to achieve sustainable impact at scale.

Krishna et al. (3) uses two case studies to describe how the NGO Amar Seva Sangam (ASSA) used MEL to improve the design and implementation of an early childhood intervention in India. The program's objectives included early identification of children with delayed development, and effective support for their caregivers through early intervention services. ASSA delivered services to families through in-person visits and a mobile technology platform. Implementation was informed by a deliberate and detailed cyclical process of data collection, analysis, reflection, and adaptation. One example was the way ASSA addressed challenges faced by female community health workers, who are at the heart of the home visiting program. ASSA conducted five focus group discussions with 25 female staff, guided by issues raised in publications from other settings in India (4), as well as those captured in the Gender Equality Strategy Tool developed by Grand Challenges Canada (5). The fears and concerns shared by the female workforce included lack of access to bathrooms and prevalence of menstrual stigma; these in turn were leading to missed workdays. In response, ASSA identified safe bathroom and rest spaces and adjusted the schedule of home visits to enable female staff to access facilities at appropriate intervals. In another example, the paper describes the use of qualitative research and a longitudinal cohort study to explore drivers of low program engagement and low school attendance among children with delayed development. ASSA identified lack of caregiver peer support as one such driver and created parent participation groups to address it.

Nair et al. (6) describe how innovators in Tamil Nadu, south India collected quantitative and qualitative data to inform the design and implementation of a program to promote fathers' involvement in parenting. The program worked within the Integrated Child Development Services scheme (ICDS), a flagship ECD initiative of the Government of India. The initial design was informed by key informant interviews conducted with fathers, mothers, Anganwadi Workers (the delivery agents), district ICDS teams, and statewide leaders. The team also analyzed government datasets for additional contextual information. To investigate impact, the team conducted a cluster randomized trial (reported separately) and a series of qualitative longitudinal

case studies. To refine the model in preparation for scaling, the team analyzed information on beneficiary engagement, drawing on the longitudinal study and cross-referencing data from the impact analysis. The program also engaged with *mothers* from the beginning, and the MEL system tracked related dynamics. This serves as an example of *Measurement for Change*, as the authors observe that "*[t]hough mothers initially served as barriers and gatekeepers in the way of father-child bonding, they eventually became enablers in the process*" [(6), p. 12].

Apte et al. (7) describe how a team from the Indian Institute of Technology Bombay (IITB) embedded MEL in a Theory of Change (ToC) approach to create an intervention to deliver essential micronutrients to infants. The intervention builds on an "*ancient cultural practice of gentle oil massage for infants*" [(7), p. 1]. Working collaboratively with scientists and community members, the team used a series of sub-studies, of varying sizes and duration, some quantitative and others qualitative, to assess technical, social and cultural considerations that would be critical for success. For example, an initial questionnaire among 201 households revealed that massage commonly occurs just before infants were bathed, and identified a potential risk to dosage levels, since oils would be washed off. Based on this information, the team developed guidelines for an acceptable bedtime massage routine, for optimal transdermal uptake of micronutrients. The team also assessed the efficacy of its pilot through a clinical trial. The authors conclude that collaborative, systematic evaluation of causal pathways can effectively guide decision-making and adaptation on the path to scale.

Dzabala et al. (8) describe a year-long MEL process to build an evidence base for the design of a program to support young mothers and their children in three districts in Malawi. A collaboration between the Young Women's Christian Association (YWCA) and the University of Malawi, the team combined evidence from scientific and gray literature, lessons learned from prior projects with a similar focus in the local context, and a baseline survey among 135 adolescent mothers to test assumptions about the priorities and needs of end users, and to guide adjustments to the project design. For example, one a priori assumption was that children born to adolescent mothers would have lower birth weights. Baseline data revealed that this assumption was incorrect: the challenge that needed to be addressed was not growth, but rather achievement of developmental milestones in a wide range of domains, e.g., socio-emotional, cognitive, and motor development. The team therefore expanded the intervention to cover those domains, with attention to maternal wellbeing as a critical component. The evidence that young mothers were struggling with stress and low self-esteem motivated the creation of peer support groups [analogous to those described in another paper in the series, Kachingwe et al. (9)].

Similarly, Muthuuri et al. (10) describe how "A Mile for the Brain" used formative research to inform the design of a program to address malnutrition in children aged 6–24 months, in two counties in Kenya. The program engaged local women as entrepreneurs to increase the availability and uptake of commercially available, high-protein complementary foods. The formative research involved an iterative process of consultations with mothers and women entrepreneurs, as well as other stakeholders such as staff with the Ministry of Health. The team used the findings to selected

foods that children favored, and that could be locally sourced. Further, research identified a challenge to achieving required hygiene standards in home-based repackaging. In response, the team successfully negotiated with a food manufacturer to create small food sachets at an affordable price. Consultation was key for this program to generate the information needed to increase benefits and reduce risks.

The narratives reviewed above illustrate the value of building feedback loops into a MEL system, where various stakeholders such as community members and program staff have voice and genuine engagement, which enables the implementation to respond rapidly to challenges. The example below illustrates how this inclusive approach can lead to beneficial effects in domains not intentionally examined by the MEL system.

González-Fernández et al. (11) report on a multi-sectoral approach to improve health and developmental outcomes for children from birth to age three living in peripheral settlements in Lima, Peru. The program consisted of home gardens, nutrition workshops, and workshops focused on caregiver-child interactions. The MEL system tracked and evaluated multiple outcomes, including child development, feeding, food security, and caregiver behaviors. It also included weekly meetings with the frontline health workers, called "*community health promoters*" [(11), p. 1]. Change was explored through analysis of both quantitative and qualitative measures tracking the pathway from the training of mothers as community health promoters, through their inclusion in the adaptation and delivery of the program, to the achievement of positive child outcomes. The use of open and inclusive dialogue led to a beneficial, yet unintended effect: "*the empowerment, enhanced communication skills and increase in self-confidence*" [(11). p. 15] of community health promoters.

Changes in the status of service providers, whether intentional or unintentional, were also reported by Muthuuri et al. (10) and Krishna et al. (3). These results suggest that empowerment, confidence building, and enhanced status for these stakeholders is not only inherently valuable, but also potentially an important pathway for the effective delivery and the durability of interventions. In the following two projects, MEL supported the introduction of additional responsibilities for people serving families.

Mehrin et al. (12) describe the role of MEL as the International Centre for Diarrhoeal Disease Research, Bangladesh (Icddr,b) and partners prepared the Reach-Up and Learn curriculum for implementation within the government community health services in rural Bangladesh. Reach-Up and Learn (13) is an international program, developed by researchers at the University of the West Indies, to promote caregiver-child interactions and learning for young children through a series of home visits. Icddr,b had previously shown, in two randomized controlled trials, that versions of the curriculum were effective in Bangladesh. The challenge addressed in this paper was to integrate the program into the government community health system. A key consideration was the workload demands being made on community health workers, the intended delivery agents. The team adapted the original curriculum, notably for delivery in clinics rather than home settings; piloted two alternative group delivery models; and tracked both implementation processes and child outcomes. Focus

group interviews with mothers and local health workers, alongside monitoring of attendance at meetings with families, identified a series of areas for further adaptation. For example, the MEL system uncovered that continued participation by mothers was more difficult in a clinic setting than at home. To promote participation, the team introduced motivational community meetings, calibrated the number of sessions per week to fit workloads, and made session content more simple and collaborative. The authors recommend continued, iterative rounds of implementation, evidence collection and participant feedback as an overall strategy for adaptation to new contexts.

Slemming et al. (14) describe the use of MEL in the Healthy Pregnancy, Healthy Baby (HPHB) program, a hospital-based intervention that integrates promotion of nurturing childcare into routine maternal antenatal care. The program, in Soweto, South Africa, used ultrasound sessions to share with parents information on fetal and infant development and on the importance of parent wellbeing for infant care. The team established a broad stakeholder network from the beginning, and used formative research involving interviews with pregnant women to inform program design. These methods "*confirmed the importance of including partners [generally fathers] in the intervention and the need for information on their role during pregnancy and parenting*" [(14), p. 5]. A workload issue here emerged again as key, as the research highlighted that the intervention needed to be "*light touch*" [(14), p. 5], for feasible delivery by sonographers. During implementation, the team developed a dashboard to monitor key indicators, and they organized regular "*whole team*" [(14), p. 7] meetings to discuss data collection and review findings. This enabled timely, informed adjustments to the program, including revision of the dashboard itself. The paper emphasizes the value of creating "*dynamic, inclusive and interactive approaches to intervention development and implementation*" [(14), p. 1].

Shaw and de Cácia Oenning da Silva (15) document a case study from the CanalCanoa program where indigenous communities took center stage in the development of program content, program delivery, and MEL. CanalCanoa works in Brazil with indigenous communities in the Amazon Basin under pressure from urbanization and colonization. The intervention intentionally facilitated opportunities for indigenous communities to reflect on and adapt traditional practices and knowledge in the promotion of early child development. Through videography, including short films made by children themselves, indigenous communities created a bank of materials documenting traditional child-rearing practices and perspectives. These materials served as core content to trigger reflective discussion in community meetings, led by community members. MEL work was carried out through interviews with participants in the meetings, with the results fed back immediately into program design. For example, early on (and consistently thereafter) participants noted the connection between reflections on early childhood practices in the community meetings and the resulting opening up of space for interactions within and across communities that urbanization had seemingly blocked. This finding encouraged continued investment in the community sessions and emphasis on social connections as the program proceeded. In sum, the program as a whole functioned as a collaborative learning system. Shaw and da Silva report, "*In the*

language developed by the Measurement for Change initiative, the entire intervention was inclusive*: the community contributed to the development of the project, benefited directly from learnings, decided on indicators, provided data, and in the end had access to all elements of the data and conclusions*" [(15), p. 4, emphasis original].

4. Tools and methods that combine measurement of and for change

Reflective discussions with the community around materials and processes also played a key role in the program delivery and development described in three papers considered below, which reported on specific measurement tools and methods.

Gaidhane et al. (16) describe how photographic records ("photostories") provided the Stepping Stones program in rural communities in central India with a rich source of information about local parenting practices that guided training for home visitors on a parenting curriculum. Sharing photostories in group sessions with caregivers and other community members triggered reflection and discussion, serving as a distinctive, effective basis for community engagement. The photostories were used to both monitor change in child care practices and engage the community in generating further change. A standardized rating system illustrated existing positive practices, e.g., the way parents provided children with opportunities to play and explore, as well as targets for change, e.g., the appropriate matching of learning activities to children's developmental level. The ratings also highlighted changes in parental behaviors following the intervention. For example, at baseline, "*the photostory would describe young children sitting alongside a busy parent. At endpoint, the photostories showed parents involving their children directly in the activity, increasing both the engagement of the child, and the level of communication between parent and child. This level of detail, embedded as it is in the local setting, provides data that is accessible and meaningful to the community*" [(16), p. 9].

Muhamedjonova et al. (17) discuss integration of a MEL network mapping tool into a program in Tajikistan designed to shift the delivery of support for vulnerable children from institutional care, in publicly run Baby Homes, to family-based care, supported by Family and Child Support Centres. Mapping networks available to caregivers helped the team to monitor the way caregivers sought and used available support. Service providers and caregivers collaborated to develop and reflect on the maps, enabling learning at multiple levels. A review of the data identified the need for new program components, for example: group-based support for mothers with anxiety and depression to help build positive relationships; and a suite of activities for fathers, who were commonly unaware of available support services. The mapping also revealed that the main government agency operating at the neighborhood level had yet to be included directly in the implementation process. At the program level, the team gained a greater understanding of how their intervention's theory of change unfolded in practice, and program staff gained awareness of the value of systematic and regular review of practices. At a more general level the results both "*brought to life*" and "*add[ed] an extra dimension*" [(17), p. 8] to Bronfenbrenner's Ecological Systems Theory (EST) (18), by identifying the need to structure support in

a more networked rather than a nested distribution. The authors quote Neal and Neal (19) in this regard, pointing to an insight potentially relevant to policy design in similar contexts. The value of the network mapping process extended beyond the data collected by the tool, to include social benefit to both individual participants and the program as a whole, arising from the opportunity to meet, to make connections and to enhance participant voice, thus further strengthening individual support networks.

Anziom et al. (20) take community engagement in measurement one step earlier in the MEL process, by working together with the community to create a valid and reliable measure of change. This paper highlights how building capacity to measure change can begin with indigenous concepts and constructs and use participatory methods and local expertise to develop corresponding instruments and procedures, while also drawing upon international expertise. The study describes the development of the Socio-Emotional Learning (SEL) framework and measurement tool among the indigenous Baka communities in Cameroon. The team recognized that while tools developed outside this community could inform a conceptual understanding of SEL, attempting to adapt those tools for local use "*risks carrying over assumptions about valuable skills from one culture to another*" [(20), p. 2]. Therefore, the team developed the new SEL framework "*from the ground up with caregivers*" [(20), p. 3], starting with indigenous concepts and perspectives. The team established key constructs that defined successful social and emotional development, through multiple stages, using local narratives and question- and-answer sessions. The authors observed that "*the Baka SEL framework displays high regard for skills and behaviors that support collaboration and community wellbeing, and notably lacks those related to individual identity and goals*" [(20), p. 15]. The local community continued to play a key role in item selection and definition, and in guiding the design of administration procedures. At the same time, the team sought confirmatory evidence of the reliability of the tool, and of its contribution to a more global understanding of SEL. In this phase of the study, the team collected and analyzed more quantitative information.

5. Applying standard evaluation frameworks

Three papers reviewed here discuss how the use of standard evaluation frameworks guided systematic collection of inputs from a wide range of stakeholders to inform decisions across each program's lifecycle.

Westgard and Fleming (21) detail the selection and use of the *Active Implementation Framework (AIF)* (22) in the design and implementation of a community-based mHealth intervention called the Child Health Education and Surveillance Tool Application (the CHEST App). Community health agents used CHEST in managing child health in the Amazon region of Peru. AIF distinguishes four stages involving continuous, iterative cycles of learning and modifying, from (1) "exploration" through (2) "installation," (3) "initial implementation," and (4) "full implementation." For example, an Acceptability Assessment Form allowed the team to identify ways to improve the CHEST App, including: using more localized terminology to increase

message clarity; tighter control on the selection of images, to avoid confusion; and flexibility in the recording of a child's ID number, to account for children without government-issued IDs. These adaptations helped the program achieve high rates of fidelity and acceptability in its distinctive community setting. As the authors conclude, *"The AIF highlighted several potential barriers to implementation that may have been overlooked without the guidance of a science-based implementation tool"* [(21), p. 1].

Francis and Baker-Henningham (23) selected a different evaluative framework, the *UK Medical Research Council Guidance on Developing and Evaluating Complex Interventions* (24), for their work to develop the Irie Homes Toolbox in Jamaica. The toolbox is a violence prevention program for use with parents of children aged 2–6 years. The evaluative framework, like the AIF described in Westgard and Fleming (21), included four stages. Stage one, preliminary design, included efforts to learn from other evidence-based parenting programs, matching to the perspectives of the end users, Jamaican parents. This was followed by further formative research around a small, preliminary pilot with iterative adjustments (stage 2) to yield an "initial draft" intervention design. This was in turn modified through a second small pilot (stage 3). The "final draft" of the intervention design was assessed through a small-scale efficacy trial and a process evaluation (stage 4). The net result, achieved over a period of 15 months, was a project design ready for large-scale trials. The authors highlight how design decisions were informed by "*an approach that integrates formative research, theory, empirically derived content and behavior change principles, with extensive piloting in the context*" [(23), p. 17], to assure "*the acceptability, feasibility, relevance, and effectiveness of the intervention with the target population*" [(23), p. 17].

Finally, Luoto et al. (25) report on the use of the Consolidated Advice for Reporting ECD implementation research (CARE) guidelines (26) by the Msingi Bora ("Good Foundation" in Swahili) program, a responsive parenting and nutrition education program in Western Kenya. As the authors note, the CARE guidelines provide a structured framework for understanding and reporting implementation in a way that addresses previously existing gaps in relevant literature, for example by assuring attention to "*contextual factors…such as how the needs of parents influenced the program content, and how the capacity of providers influenced the training offered*" [(25), p. 2], as well as "*the determinants and consequences of implementation outputs*" [(25), p. 2]. Before the full implementation, Msingi Bora conducted a small pilot, where the team identified, for example, a "*need to reduce lengthy speeches by the CHV [community health volunteers] in favor of practical activities*" [(25), p. 4]. Examining the full implementation *via* the CARE framework and related published measurement strategies (27), Msingi Bora systematically captured and evaluated key implementation linkages, from inputs to outputs and outcomes. For example, the paper reports on details of preparation and training, the quality and fidelity of delivery, and participant engagement. A complementary RCT effectiveness evaluation enabled the team to connect delivery fidelity to parent and child outcomes. A key finding was the importance of "*upfront investment in training local trainers and delivery agents, and regular supervision of delivery of a manualized program*" [(25), p. 15]. In sum, the authors provide detailed documentation of the dynamics of a successful implementation of an effective parenting intervention and conclude that the "*results represent a promising avenue for scaling similar interventions in low-resource rural settings to serve families in need of ECD programming*" [(25), p. 15].

6. MEL in support of scaling up interventions and changing public policy

The three papers described below discuss the role of MEL in the process of scaling up interventions developed by civil society organizations, where the scaling strategy involved public sector adoption, collaboration, or support. In each case, scaling required the MEL approach to be adapt over time, engaging diverse and sometimes changing sets of stakeholders, from end beneficiaries to local and national government authorities. This process spanned the life cycle of the program, from initial buy-in and project design to large-scale implementation or adoption by public sector authorities.

The paper by Mesa et al. (28) illustrates how different MEL activities helped the scaling of "aeioTU," a center-based early childhood program in Colombia providing children with high quality ECD services inspired by the Reggio Emilia approach. As the authors report, "*In January 2009, aeioTU opened its first for-profit center in Bogotá and two fully subsidized centers in low-income communities in Barranquilla and Bogotá*" [(28), p. 3]. By December 2015, aeioTU had 28 centers, funded largely through the public sector and philanthropy. In 2016, it modified its scaling strategy to extend its reach beyond centers operated by aeioTU. The new strategy involved developing support services for existing government early childhood education and development (ECED) centers and expanding reach through a new internet resource platform, a professional development and capacity building program, and a membership network. As the authors note, "*As of December 2019, aeioTU had reached 228,667 children in 1,851 ECED centers*" [(28), p. 6]. The paper emphasizes that evaluation and continuous learning played a key role in aeioTU's adaptation and scaling process. For example, aeioTU used the Balanced Scorecard technique to continuously assess progress. To demonstrate effectiveness and identify areas for improvement, aeioTU organized a series of process and longitudinal impact evaluations in collaboration with academic institutions. The results, combined with a background of evidence on the importance of ECD, were used to inform and strengthen partnerships essential for scaling, especially with the national government (including at high levels), but also with global partners, for example in philanthropy.

The paper by Gheorghiu et al. (29) also underscores how MEL was essential to generate initial interest and secure stakeholder buy-in for scaling up. The paper describes how a Romanian NGO pre-school project achieved scale through the adoption by the Romanian parliament of a new law. The 2015 law provided food coupons to poor families conditional on children attending preschool. It was modeled on the project "Every Child in Kindergarten," designed and launched in 2010 by a small local NGO called Asociatia OviduiRo (OvR). The paper

highlights how the initial project, like the corresponding work by aeioTU in Colombia, drew on a background of increasing global interest—supported by scientific evidence—in expanding ECD opportunities. Project monitoring was an important part of MEL activities, and the authors note that implementation "*was most successful in communities where the school director, social workers and municipal personnel participated in the monitoring process*" [(29), p. 6]. Findings from a quasi-experimental impact evaluation were "*extremely helpful*" [(29), p. 5] to cement partnerships with local authorities and corporate sponsors, and "*also valuable*" [(29), p. 5] with members of Parliament. After the new law passed, the learning process continued through an evaluation of the implementation of the 2015 law by another NGO. The evaluation led to further recommendations submitted to Parliament and enacted in a 2020 amendment to the law.

Volen and de Laat (30) document a parallel process in Bulgaria, where in 2020 Parliament adopted a law that provides funding to municipalities to remove attendance fees at ECD centers for the poorest 40% of children. The law was modeled on a project, Springboard for School Readiness (SSR), implemented by a non-profit organization, the Trust for Social Achievement (TSA). The 2014 launch of SSR was motivated by international evidence of the importance of investment in early education and was designed to address low kindergarten participation rates among poor children in Bulgaria, Roma children especially. Effectiveness of the SSR project, which included removal of attendance fees, was demonstrated through a World Bank funded RCT conducted in collaboration with academic researchers. However, while the results generated considerable interest, they proved insufficient to motivate key decision-makers to advocate for public policy change. TSA, with the support of a network of local NGOs, built up a portfolio of information to support the advocacy process. They collected both qualitative and quantitative data that documented cases where municipalities had already removed attendance fees, and they combined this information with the RCT's impact estimates. They used a national survey to collect data on citizen attitudes toward policy change and completed a stakeholder mapping of potential influencers. These efforts culminated in the 2020 passage of the new national law. This Bulgarian project, like those in Colombia and Romania, used a collaborative MEL process to bring about change at the national level.

7. Consolidating information to guide decision-making

We end this review by reflecting upon three papers that describe initiatives to combine and consolidate data to inform national and international ECD practice, and to support policy change and scaling.

The paper by Mithra et al. (31) illustrates the value of the "*bird's-eye view*" [(31), p. 20] provided by data synthesis across multiple, well-executed systematic reviews (SRs) to guide policy, intervention strategy, and further research. The article synthesized 31 published systematic reviews of interventions to manage anemia in children and adolescents. The authors report that "*[r]esults were favorable for fortification and supplementation with clear reduction in the risk of anemia and increase in hemoglobin levels across all age groups. Other interventions reported by the SRs were inconclusive*

and suggest further research" [(31), p. 1]. The paper describes dosing strategies and outcomes for children in different age ranges (infancy through adolescence); reviews potential beneficial effects on anemia and hemoglobin levels, along with possible adverse effects; and identifies gaps in knowledge (e.g., effects on anemia of antimalarial or water, sanitation and hygiene interventions) that suggest potential foci for future research.

The paper by Pushparatnam et al. (32) illustrates possibilities and challenges in achieving a different kind of "*bird's-eye view*" (31), through developing an ECD assessment instrument that captures both universal and local context-specific measurement needs, yet remains short and feasible. The team developed a set of statistical criteria "*to identify items that show robust psychometric properties across countries*" [(32), p. 4], and they undertook a step-by-step analytical process to select items from a database from use of MELQO (an international set of assessment tools) (33) in multiple settings, in the aggregate involving 16,015 caregivers and 24,533 children in 12 countries in Africa, Asia, and Central and South America. The result was a set of 20 items to be assessed through caregiver reports and 84 items for use in direct assessment of children. The authors find that literacy and numeracy items showed relatively consistent performance cross-culturally, while psychosocial items performed less consistently. The authors also note that the core items will often need to be supplemented in particular applications, for example to provide more nuance or to respond to local contexts. The challenge here involves instrument length, given the importance of having a short, feasible scale.

Related, the paper by Raikes et al. (34) illustrates how effective *use* of early childhood data at scale can guide the national early childhood policies. Their study derives lessons from the development and early work of the Consortium for Pre-primary Data and Measurement in Sub-Saharan Africa (CPDMA), a project initiated in 2018 by USAID and the ECD Measure Group at the University of Nebraska Medical Center. The project convened multi-disciplinary and multi-stakeholder teams in four countries—Ethiopia, Liberia, Rwanda, and South Africa—comprising government officials, local university researchers, early childhood education (ECE) practitioners from civil society, and USAID education officers. A Data for Impact framework and toolkit was developed, which guided the country teams to build data-driven ECE systems. The authors highlight the importance of: attending to the composition and perspectives of the teams expected to use these data for decision-making; aligning the scope of the data collected with national ECD priority areas; and covering not only child outcomes, but also processes for achieving and maintaining high-quality program delivery. They suggest that national data dashboards, like the National Early Childhood Development Program's dashboard in Rwanda, could help achieve national alignment.

8. Conclusions and recommendations

When Cavallera et al. interviewed implementers of ECD projects in low- and middle-income countries in 2019, their respondents "*agreed that M&E was necessary to guide structured data collection and ensure transparency. Yet interviewees reported that data collection in ECD projects was often seen as intended solely for scientific publications, and of little use for project improvement*

or addressing implementation challenges" [(35), p. S47]. These findings were reported as part of the 2019 *Archives of Disease in Childhood* series "Informing design and implementation for early child development programs". However, the papers in the recent *Frontiers in Public Health* series illustrate that integrating MEL processes and systems into the fabric of a program or policy initiative can create a broader value proposition.

Specifically, the examples discussed above illustrate how ECD organizations sought to design their MEL systems to ensure programs fit the values, goals, experiences and conceptual frameworks of diverse stakeholders, so that participating makes sense to all. This is consistent with insights from behavioral science that interventions are more successful when they create the least possible hassle and fit most naturally with existing habits and behaviors [see also Behavioral Insights Team (36)]. For example, our review of papers in the series highlights how:

A. ECD organizations employed formative research that was exploratory, to identify the priorities and needs of the target population and frontline service providers, and to inform the content and delivery of an intervention. This formative research frequently included program delivery agents.

B. ECD organizations designed their MEL systems to support a shift of accountability toward broader ownership: They included delivery agents and program participants alike as *subjects* rather than *objects* of MEL activities, through active participation in data collection, and they provided opportunities for equitable discussion of results and decision-making.

C. Programs used data in a way that went beyond a focus on averages and responded to specialized characteristics, priorities and needs; this approach supported ECD organizations to embed program activities into existing day-to-day routines, be they work or family routines, for better engagement, impact and durability.

D. Experiences with using ECD data at scale to inform policy point to the importance of intentionally involving a variety of stakeholders in national and international dialogues in a way that respects local diversity and community decision-making. Such involvement can ensure that diverse ECD data collection efforts are aligned and multiple perspectives are considered in the development of national ECD policies.

E. Integrating MEL into the fabric of a program or policy initiative may benefit from creative methods and measurement tools, such as network mapping, photography and film.

The integrated approach to MEL described by contributions to this series aligns with the five aspirations that were formulated as part of the *Measurement for Change* dialogue. The *informative* aspiration underpins this approach in a fundamental sense; papers throughout the series describe the systematic use of data to support decision-making in a cycle of learning. The *inclusive* aspiration expands "learning about" into "learning with" (so that, as noted above, participants are subjects, not objects), and overlaps with the aspiration of being *people-centered* (understanding goals, needs and effects at different levels of granularity). The direct and active inclusion of delivery agents in tracking and monitoring the reaction to, and reception of a program by beneficiaries and delivery agents themselves, and to use this information to make appropriate program adjustments, illustrates how the *interactive* aspiration can build empowerment.

Contributions to the series also illustrate the *dynamic* aspiration—anticipating that information needs will change and that MEL systems must respond accordingly to support each phase of the ECD program, from initial design, to piloting, modifying and further piloting. Dynamic MEL systems respond when new groups of beneficiaries enroll as the program expands, when the mix of delivery agents changes as the program is modified, or when different types of public authorities are drawn in when the program scales up. Similarly, in dynamic MEL systems, a large, formal evaluation like an RCT is not seen as a one-off answer, but rather as part of a series of actions that enable ongoing learning and adaptation on the pathway to large-scale impact. Being *dynamic* therefore involves not only responding to people's priorities and needs, but also selecting appropriate methods to address appropriate questions at appropriate times. Iterative application of measurement, reflective learning, and adaptation thus enables each measure *of* change to become a measure *for* change.

The way the ECD organizations shape these five MEL aspirations in practice creates a strong link to the human rights based approach to development, as advocated by the United Nations (37). ECD implementing teams have tried to design MEL systems that reflect the ethical principle of subsidiarity, which holds that "*decisions about efforts to help others and to attain the common good (e.g., by using knowledge to achieve equity in global health) should, by default, take place at the smallest or most proximate level/scale of organization possible, and only when necessary at a larger or more distant level/scale of organization*" [(38), p. 2]. Abimbola (38) advocates this principle not only on moral grounds, based on equity, justice and human dignity, but also on practical grounds, since local decisions can lead to better adapted programming and to better use of initiative, feedback and learning.

Taken together, the papers in this series show that it is helpful to view the five aspirations of *Measurement for Change* not as a checklist, but as stimulus for reflection in developing MEL systems that truly support the effective delivery of interventions. MEL becomes a constant process of intentional inquiry, nudging program implementers to slow down, reflect, and course correct when necessary, thereby paving the way for meaningful change in the lives of families and communities.

Author contributions

JL led on writing and editing, but substantial written contributions were provided by PH, JR, LH, WS, JK, MH, AR, AS, and CD. All authors contributed equally to the development of the ideas presented in this review. All authors contributed to the article and approved the submitted version.

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Scaling the *Moments That Matter*® early childhood development model: how communities' monitoring for change contributes to sustainable impact

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This paper presents a community case study of how the *Moments That Matter*® (MTM) Program community-led monitoring, evaluation and learning (MEL) system contributes to a scalable model with quality and sustainable impact. With a faith-based approach, MTM is an early childhood development program partnership of Episcopal Relief & Development which is rooted in parenting empowerment and community ownership. MTM empowers Primary Caregivers, strengthening nurturing care of some 60,000 children aged under three since 2012. Launched in Zambia, MTM has expanded to five other countries. Based on MTM Zambia and Kenya, this paper examines how an innovative, community-led MEL system functions to drive sustainable impacts and scaling. Measurement for change has been critical to the community MEL system. MTM is *people-centered* with community leaders, early childhood development service providers, volunteers and Primary Caregivers all setting their specific goals. The program is *inclusive* with all stakeholders engaged in monitoring and making adjustments; *interactive* with relationship-based social and behavior change strategies; *informative* with continuous data gathering used for decisions and problem-solving; and dynamic with built-in flexibility and an adaptation process. The community-led MEL propels scaling up through two channels: (1) *New communities for MTM program start up:* As MTM communities graduate to community ownership, program staff and budget are then invested in new marginalized and underserved rural areas. (2) *Deepening reach within MTM communities:* Over the first two cycles, communities transition to community ownership, then continue independently of staff and budget. They identify a new set of vulnerable Primary Caregivers of children under three and carry out the caregiver parenting support and learning activities. The success of the program's community-led MEL in achieving sustainable change and fueling the program scale up hinges on three factors: (1) *Initiating the community-led MEL dimension at project start, gradually increasing the community role* while reducing the staff role. (2) *Provision of Community MEL capacity-building and effective, user-friendly* tools to be tailored locally. (3) *Three program stakeholder types leading MEL and collaborating closely with each other:* ECD Committees with MTM-trained faith leaders, ECD Promoters, and Primary Caregivers of children under three.

1. Introduction

The vast scope of early childhood development (ECD) challenges in sub-Saharan Africa is well-documented (1). With so many young children at risk, there is a tremendous need for strengthening nurturing care parenting. Yet, there is also vast untapped potential in faith-based and other community leadership and volunteerism. The *Moments That Matter®* Early Childhood Development Program Partnership (MTM) of Episcopal Relief and Development galvanizes rural communities and the most vulnerable families around their shared goal of young children thriving. MTM prioritizes responsive care, early learning and child safety and security in the home from birth to age three (2). Episcopal Relief and Development and its faith-based implementing partner organizations have co-designed and developed MTM through monitoring, evaluation, learning and adaptation loops. Over the last 10 years, MTM has expanded from Zambia to five other African countries, impacting more than 59,000 children under 3 years old with their Primary Caregivers (3). MTM is currently implemented by Episcopal Relief and Development's in-country faith-based partner organizations in Ghana, Kenya, Malawi, Mozambique, Namibia and Zambia.

The MTM Program model is a community-led approach that transitions to community ownership over three implementation cycles. As such, MTM partner organizations and local communities have been co-developing an innovative community-led monitoring, evaluation and learning (MEL) process. This work is ongoing, which is strengthening the five Measurement for Change aspirations of being people-centered, inclusive, interactive, informative and dynamic (4). The community-led MEL functions at three levels: MTM community and faith leaders; MTM frontline volunteer implementers known as ECD Promoters; and Primary Caregivers[1]. ECD Promoters are a new type of volunteer, dedicated to parenting responsive care, early learning and child safety and security. They also refer caregivers to health and nutrition services as needed through community health workers and health clinics.

Moments That Matter® is currently implemented in Kenya by the Anglican Church of Kenya Development Services Nyanza (ADS Nyanza) and in Zambia by the Zambia Anglican Council Outreach Programmes (ZACOP). In 2021, the African Population and Health Research Center (APHRC) concluded an independent implementation research study of the MTM Programs in Kenya and Zambia, with a summary report available online (3, 5). Key findings include the following:

- The MTM Program was effective in achieving Primary Caregiver ECD parenting outcomes.
- MTM demonstrated significant achievements in catalyzing social and behavior change, at both community and family levels, by producing a community-owned nurturing care

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[1] The person in the home who has primary responsibility for, cares for, and spends the most time with the child (children) on a daily basis. The Primary Caregiver is not always the mother, it could be a father, grandparent, other relative, sibling or unrelated adult.

ecosystem in civil society and effectively linking with government ECD services.
- The program demonstrated to be acceptable, appropriate, feasible and sustainable.
- The model has scaled effectively by combining a required core set of strategies and quality standards with local adaptations.
- A critical driver of successful impact and scaling is the community-led structure of the program, which encourages ownership by communities and their own monitoring, evaluation and learning of a shared ECD vision.

Based on learnings from the APHRC study and internal assessments, Episcopal Relief and Development and its MTM partners have been improving the program and strengthening the community-led MEL system with measurement for change (M4C) dimensions. In line with the M4C informative aspiration, program staff with community volunteers and participants are drawing on multiple types of evidence gathering, such as externally conducted research and participatory community MEL. This case study presents key learnings from the community-led MEL of the previous MTM phase 2018–2021, with efforts underway since 2022, to strengthen the MEL process and deepen its measurement for change dimension.

The paper describes how community-led MEL processes reinforce both the motivation of caregivers and MTM volunteers to strengthen nurturing care, as well as their sense of ownership for sustaining and expanding the work. It illustrates the contributions of community-led MEL processes both to sustainable nurturing care social and behavior change and to successful scaling with impact through two channels: (a) expanding MTM to new communities and (b) engaging more vulnerable families within existing MTM communities.

2. *Moments That Matter®* Program context

Moments That Matter® is designed for rural communities and the key rural socio-demographics for MTM are similar across different African countries: smallholder farming, severe poverty, poor health and nutrition and HIV prevalence. Typically, health facilities are remote and community health workers have large caseloads. Religious institutions are often the only entity with a local permanent presence and their faith leaders are influential in their communities.

2.1. *Moments That Matter®* program model and theory of change

Moments That Matter® combines standard core functional elements and quality standards with flexibility to apply them in context-specific ways in different country and local rural settings. MTM equips community agents of change as well as empowers Primary Caregivers to be self-directed agents of their own parenting change. MTM's theory of change and results are summarized in Figure 1.

Moments That Matter® is a civil society, community-implemented program that starts from a faith base. The program leverages these

FIGURE 1
Moments That Matter® (MTM) logic model.

faith-based assets to mobilize leaders and communities, which are inclusive of all faiths, denominations and those without religious affiliation in a project area.

Local ECD Committees are formed and trained with three main functions:

a. To provide oversight and support to ECD promoters.
b. To collaborate with MTM-trained and other faith leaders.
c. To coordinate with ECD-related service providers and stakeholders.

In Zambia, the ECD Committees are multi-sector, with representatives from different parts of local civil society and government. Each ECD Committee has at least one faith leader member representing the other MTM-trained faith leaders. After each Committee meeting, they share with other faith leaders the resolutions and emerging issues, while follow up actions they need to take. In Kenya, the equivalent ECD Committees for MTM purposes are called *ECD Faith Leader Consortia,* a group formed solely by MTM-trained faith leaders. Though, there are already existing government-organized multi-sector early childhood development groups, which are focused more on pre-primary education. Once local ECD Committees are established, volunteers are identified and both volunteers and faith leaders are trained as ECD Promoters.

3. Key monitoring, evaluation, and learning elements

The MTM community-led MEL process is carried out by three types of MTM stakeholders, identified below with the number active in 2022:

- *Community Leadership*: ECD Committees [Kenya—5; Zambia—87] and MTM-trained faith leaders [Kenya—160; Zambia—175].

- *Frontline Implementers*: ECD Promoters, including ECD Lead Promoters (who have some additional supervisory and reporting responsibilities) [Kenya—223; Zambia—1,361].
- *Focal Participants*: Primary Caregivers [Kenya—2,899; Zambia—10,895] with children under three and their families.

Early childhood development Committees and MTM-trained faith leaders promote nurturing care parenting and social and behavior change with both MTM registered families as well as other families. As frontline implementers, ECD Promoters serve as a bridge between the MTM Primary Caregivers and MTM community leadership and program staff. MTM is implemented and monitored in cycles. ECD Committees become a joint implementing body with MTM Program staff during the first two program cycles, then transition to an independent implementer starting in the third cycle. Each cycle engages a new set of vulnerable Primary Caregivers with children ages zero to three in the MTM community. As seen in Figure 2, over the first two cycles, a MTM community takes on greater responsibility with diminishing program staff and budget support. In the third cycle and beyond, MTM is community-owned.

The community-led MEL process is people-centered and functions in tandem with a more traditional, staff-executed project MEL system during the first two cycles. Initially, MTM Program and MEL staff facilitate a process whereby the ECD Committees, MTM faith leaders and Lead Promoters design and plan their community MEL framework. Staff provide capacity-building, mentoring in organizational management, supportive supervision and MEL to ensure successful uptake and eventual transition to community-ownership. The two types of MEL overlap, serving to meet multiple purposes:

- *Staff* track standard MTM indicators to meet organization needs for effective project management and improvement, plus any additional funder-required data.
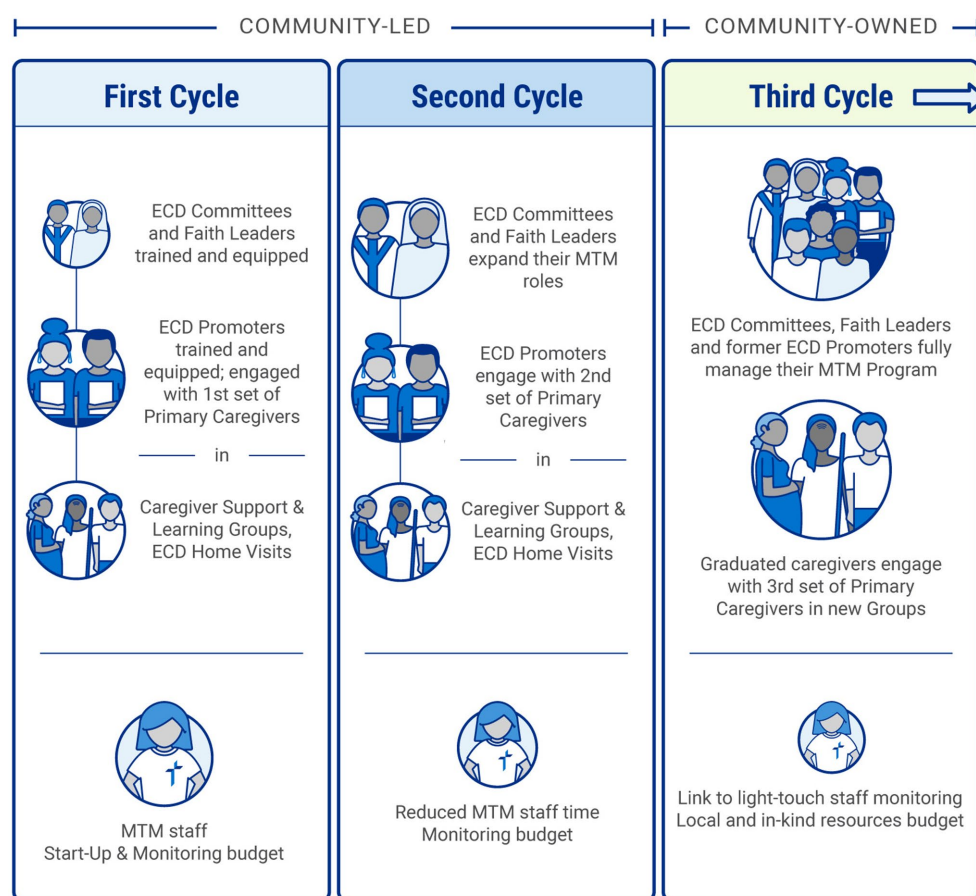
FIGURE 2
Moments That Matter® (MTM) implementation and monitoring cycles.

TABLE 1 Examples of indicators with users of the data.

Standard program indicators	Data collector	Data used by
Number of groups sensitized to nurturing care, with topics discussed	ECD committees	MTM community leadership
Resolution of critical issues arising with MTM families or program implementation		MTM staff
Primary Caregiver tried the parenting practice introduced at previous meeting	Primary caregivers ECD promoters	Primary caregivers ECD promoters
Health, nutrition and other referrals made for children and caregivers	ECD promoters	MTM community leadership MTM staff
MTM community-set indicators		
Child cries when father-secondary caregiver leaves him/her (*demonstrates bonding*)	Primary caregivers Father-secondary caregiver ECD promoters	Primary caregivers Father-secondary caregivers ECD promoters
Increased playtime with my child	Primary caregivers ECD promoters	Primary caregivers ECD promoters
Tried positive discipline methods		MTM community leadership
Received assistance from my spouse to care for the children		

- *Communities* track and use some of the standard indicators, as well as setting and monitoring their own specific goals with indicators of success meaningful to them.

Indicators for measuring MTM results are mostly parenting practices (rather than knowledge or attitudes) since it is these behaviors

which generate the impact on children's development. A few examples are provided in Table 1; "MTM Community Leadership" refers to ECD Committee members, MTM-trained faith leaders and ECD Promoters–or some combination depending on the particular situation.

The data is primarily collected by the MTM community leadership, shared and used within the community MEL process for

FIGURE 3
Moments That Matter® (MTM) community-led data use journey.

TABLE 2 Interconnected staff and community monitoring data collection.

Type of output data	Responsible	Data collection tool
ECD activities in communities, linkages to service providers	ECD committees	Committee and project records outreach tracking tool
ECD promoter reflection/in-service meetings	Project field staff, lead promoters	Reflection meeting guide
Primary caregiver support and learning groups	ECD promoters	Group meeting progress tool, group facilitation quality checklist
	Lead promoters, project field staff	Group facilitation quality checklist [*observation tool version*]
	Primary caregivers	Actions to practice passport
ECD home visits	ECD promoters	Home visit progress tool, Home visit quality checklist
	Lead promoters, Project field staff	Home visit quality checklist [*observation tool version*]
	Primary caregivers	Actions to practice passport
Referrals for children, caregivers	ECD promoters	Home visit progress tool
Project activity outputs	Project field staff managers	MTM output data collection forms

local action, as depicted in Figure 3, with ECD Committees taking the lead. Selected community-collected data is also aggregated and reported via the staff project MEL system. Examples of this intersection include:

- ECD Committees monitor project activities on a monthly basis. From the monitoring visits, ECD Committees share findings, recommendations and learnings with both ECD Promoters and program staff.
- Lead ECD Promoters regularly review and consolidate data collected from the ECD Promoters before submitting to project field staff and program managers.

The monitoring tools ensure fidelity to implementing the interventions as designed and for quality assurance based on MTM quality standards. Using the home visit and group facilitation checklist observation versions, for example, program staff and Lead Promoters reinforce ECD Promoters' positive actions and help them improve in weaker areas through additional coaching and problem-solving. Starting in 2023, Primary Caregivers themselves will use the *Actions to Practice Passport* tool at their Group meetings and their ECD home visits. The communities currently use paper forms with the exception of Lead Promoters who have tablets for mobile data collection; project staff also use mobile data collection. See Table 2 for types of data collected, by whom and with what tool.

4. Measurement for change and community MEL

In MTM, community committees, frontline implementers and focal participants all monitor for change from the outset of the program. This combined effort strengthens impact and fuels the transition to community ownership. All community participants engage in community MEL activities using specific MEL tools, but their MEL engagement shifts throughout the life cycle of the program. At present, longer term community ownership of MTM and its MEL is being demonstrated in more than 70 MTM communities in Zambia, the oldest MTM program country. In Kenya, the first set of MTM communities will enter its third cycle in April 2023.

5. Strengthening impact and transition to ownership through monitoring for change

5.1. Early childhood development committees leading community MEL

At the outset, ECD Committees set up their basic MEL when they first form and launch the program in their community in the first implementation cycle. In the first cycle, MTM Program staff work closely with the ECD Committees at their monthly meetings to ensure Committees successfully take up their responsibilities and fulfill their functions. During the second cycle, staff gradually reduce their direct involvement while gather a core set of indicator data.

5.1.1. First and second cycles' community-led MEL

During the first two cycles, Committees use the standard MTM community MEL tools to set and carry out specific goals with annual action plans for their communities, track progress and prepare reports used by them as well as the staff. Within this standard framework, each ECD Committee tailors the MEL process, data gathering, assessment, learning and project improvements for what will work best in their context. On a monthly basis, ECD Committees also collate MEL data, discuss achievements of their targets, progress in uptake of nurturing care and plan how to address challenges. They document learning as well as the adaptive actions. Fundamentally, ECD Committee members see direct results from their committee work, which is not dependent on program staff.

In Mapulanga, Zambia, for example, the ECD Committee adapted the outreach tracking tool, with the assistance of the program manager, to better monitor MTM progress in their community and take action as problems arose. Through the utilization of the tool and interaction with ECD Promoters and caregivers, the ECD Committee linked 12 children with severe malnourishment to the Scale Up Nutrition Program at health facilities. Their monitoring for change approach identified 40 MTM families suffering from extreme poverty due to pandemic effects, and the ECD Committee was also able to connect Primary Caregivers to the government social cash transfer program.

5.1.2. Second cycle community-owned MEL

During the second cycle, staff gradually reduce their direct involvement while gather a core set of indicator data, and the activities continue much as before—deepening practice and ownership.

5.1.3. Third cycle community-owned MEL

In the third cycle, now reached in Zambia, MTM communities carry on independently with their own program implementation and MEL, with only periodic sharing of progress with program staff. In Zambia, the project team check in quarterly with ECD Committees and MTM faith leaders rather than monthly. It is the ECD Committees that provide brief monitoring reports with a limited set of key data using third cycle tools. ECD Committees also continue to manage and oversee all MTM ECD activities in their respective communities. A set of graduated Primary Caregivers are equipped to facilitate caregiver groups composed of vulnerable Primary Caregivers and their children under three. The ECD Committees continue to make use of the participatory tools and resources acquired during the implementation and project funding phases. For instance, they use Venn diagrams in identifying and selecting new caregivers, stakeholder analysis exercises, self-reporting templates and registration books for basic income and expense tracking.

Furthermore, ECD Committees maintain the existing relationships with various stakeholders by using a management/MEL tool that they adjust to align with their particular context. They manage communication plans and feedback loops which allow them to obtain and share information on challenges, opportunities and lessons learned. In 2023, drawing on the Zambia experiences and MEL tools, Episcopal Relief & Development is working with the ECD Committees themselves to develop a community monitoring system that supports community-owned MEL in their third cycles and beyond.

5.2. *Moments That Matter*®-trained faith leaders' monitoring for change

5.2.1. First and second cycles' community-led MEL

At the outset, local faith leaders are engaged as key influencers in their communities with ongoing connections to families. MTM mobilizes clergy and lay leaders, both women and men, as agents of change for nurturing care parenting and early childhood development. Faith leaders provide counseling and other direct support, as well as sermon guides and scripture studies, to promote nurturing care parenting particularly focused on harsh punishment/positive discipline and expanding the fathers' role with young children.

Faith leaders document issues that arise, as they promote nurturing care, and meet with families in the course of their pastoral work. They also, identify gaps and bring those to the ECD Committee meetings for action planning. For example, a male faith leader was able to persuade a father that was resistant to attending a caregiver group session, following up on a concern arising at the ECD Committee. In another case, a faith leader supported a father that had rejected a baby born with spina bifida. The pastor counseled him and helped refer the family to services, again working with the ECD Committee. Both faith leaders' direct work

with MTM families and their nurturing care social and behavior change communication with their faith groups are monitored through ECD Committees.

5.2.2. Third cycle community-owned MEL

By the third cycle, MTM faith leaders synthesize their own MTM work quarterly using a tool to document specific activities, as well as new issues, successes, challenges and recommendations for program implementation improvement. These are shared at ECD Committee meetings. The engagement with faith leaders and faith-based social and behavior processes also helps to broadly spread ECD knowledge and MTM social and behavior change communication in a more informal, economical way through faith networks.

5.3. Early childhood development promoters leading interactive and dynamic monitoring for change

5.3.1. First and second cycles' community-led MEL

Early childhood development Promoters are frontline implementers in the first two MTM cycles in their community. They carry out project MEL while serve as leaders in the community-MEL, fostering caregivers' participatory MEL. ECD Promoters commit to serving one implementation cycle with a set of Primary Caregivers. The vast majority of them continue to serve through a second cycle with a new set of Primary Caregivers. ECD Promoters build their relationship with Primary Caregivers by facilitating learning, practicing parenting skills and solving their own parenting problems, while making referrals as needed. ECD Promoters use standard monitoring tools that focus on behavior change. They focus monitoring practices on the high-impact parenting actions learned and practiced by MTM caregivers.

ECD Promoters convene at monthly reflection meetings to assess and use data gathered from tracking tools, which guide improvements in their work with families. Drawing on the tracking tools and their own memories, ECD Promoters share challenges they have encountered with their caregivers/families, generate solutions and support one another with resources or referrals. They share successes observed in caregivers and best practices in their facilitating role. Lead Promoters and project field officers document key points and agreed action steps, which are later followed up to improve overall programming.

During the first cycle, caregivers commit to trying new parenting practices at home that they learn about each week in their caregiver group support and learning group session led by ECD Promoters. Progress and challenges with the curriculum and commitments are documented and followed by ECD Promoters and caregivers themselves during ECD home visits.

Progress, challenges and actions are captured in the following tracking tools:

- *Caregiver support and learning group meeting progress tracking tool:* Captures attendance, topics covered and challenges to be addressed. ECD Promoters facilitate a learning-practice-reflection loop with eight to thirteen Primary Caregivers during these meetings using the progress tracking tool. Progress through the curriculum and caregiver reflections is tracked on each unit.
- *Early childhood development home visit progress tracking tool:* In the home, ECD Promoters observe the relationship between

Primary Caregiver and child or children directly, assessing their progress towards more nurturing care parenting, learning in more detail about caregivers' questions and concerns and responding accordingly. The home visit provides an opportunity to dialog about specific barriers and how to overcome them, respond to specific concerns and make referrals as needed. The tracking tool captures this key information for follow up. For instance, if a referral was made in the previous visit, the tracking tool reminds the ECD Promoter to check and see if a Primary Caregiver took the child to receive the service needed.

5.3.2. Third cycle community-owned MEL

At the end of a community's second cycle, the ECD Promoters' direct volunteer role ends. They pass on to selected Primary Caregivers the basics of how to facilitate new caregiver groups formed by a new set of most vulnerable Primary Caregivers with children under three. These new groups will now be peer-run by graduated caregivers. The former ECD Promoters then serve as resources to be called on as needed by caregiver facilitators and they also often serve on ECD Committees to contribute to the community-owned programming. As residents of the MTM communities, former ECD Promoters informally check on the peer caregiver-led groups every 2 months to ensure that they are going well and to provide mentorship support or additional information required by the caregiver groups.

5.4. Community MEL lessons learned

MTM partners expected there to be some variations between the two country programs (though the rural MTM communities share many sociodemographic similarities). However, the positive experiences with leading their own MEL and their challenges described below were common to both settings. The exception are lessons on the third cycle transition—due only to the fact that the Kenyan MTM program is newer and has not yet reached that stage.

- In addition to ECD Committees, MTM faith leaders and ECD Promoters are critical for the facilitation of community-led MEL. Their initial training should include key elements of community-led MEL so that its practice can be strengthened over the first two cycles prior to ownership.
- Early childhood development Committees need specific skills training in data analysis, interpretation and reporting of MTM standard and project-specific indicators. This training should be conducted early in the program to allow time for mentorship and capacity-building throughout the program life cycle.
- Community-led MEL reporting formats should harmonize with relevant government reporting templates to ensure appropriate ECD data and information is incorporated into government health information systems.

Lessons specifically on the transition to an independent third cycle in Zambia:

- Due to low literacy levels among caregivers in MTM project communities, peer facilitator caregivers need simplified reporting tools. For this reason, caregivers were first paired with lead ECD Promoters that mentored and provided guidance. Simplified

reporting tools are being created as part of the 2023 monitoring system development.

- Exchange visits across ECD Committees from different MTM communities provide valuable knowledge transfer, skills building and inspiration. These visits contribute to the strengthening of leadership and organizational management and ECD advocacy work, engaging government health and other service providers and local civic organizations.

6. Primary caregivers' self-monitoring for change

At the outset and periodically thereafter, Primary Caregivers set their own individual parenting goals and share progress. In Kenya, during caregiver learning and support group meetings, caregivers set goals on how to improve their parenting practices. The caregivers share their situation and compare notes on what works and what does not work. In Zambia, ECD Promoters ask caregivers to share what they would like to achieve in that particular quarter concerning parenting. In both country programs, caregivers would share and celebrate achievements and also set higher targets for continuous improvement.

In addition to the examples in Table 1, other specific goals caregivers have set include:

→   Reduce the use of physical punishment.
→   Create a safe environment for child nurturing, such as clearing bushes, leveling ground, removing stones and sharp objects for a safer place for children to play.
→   Play with the child for 1 h in the morning and 2 h in the afternoon.
→   Develop "co-parenting" goals of what the mother and father will be doing, on which day of the week.

Another type of monitoring for change is found in family "research experiments" on nurturing care practices. When caregivers observe positive changes in their children and relationships, they are motivated to continue. For example, fathers are normally requested to create time to play with children but often find it difficult. However, if they can be convinced to try, after a few "trial" playtimes with their children, fathers develop a passion for it and intentionally create regular time to play with children.

Each Primary Caregiver Support and Learning Group elects its own officers to lead the group together with the ECD Promoter. Leading up to graduation from the ECD Promoter-led phase (completing the 24-month or 18-month curriculum), members in each group decide whether they want to continue as a fully member-run group. Regardless, when their MTM community reaches the third cycle, there is a locally-set selection process for interested graduated Primary Caregivers to become peer leaders for new groups, which are formed with other vulnerable Primary Caregivers of children under three. These peer-led new Caregiver Support and Learning Groups are monitored by ECD Committees. In instances where peer mother-led groups face challenges, the caregivers consult with the former Lead or ECD Promoter within their communities.

7. Moments That Matter® community-led MEL and successful scaling up

The community-led MEL contributes to successful scaling through two channels.

7.1. Moments That Matter® scaling to new communities

As current MTM communities graduate to community ownership and implementation, project staff and budget are invested in new geographic areas, working with new communities to start their own MTM programs. In conjunction with the Ministry of Health, marginalized, underserved areas are selected for MTM based on a set of criteria including: poverty level, poor child health and nutrition indicators, HIV prevalence, lack of other ECD programming and access, and community leadership interest in and commitment to carrying out the MTM Program.

7.2. Moments That Matter® scaling through deepening reach within MTM communities

The community-led MEL system contributes to the sustainable development of community ownership of their local MTM programming. This means engaging new vulnerable families or Primary Caregivers during pregnancy and/or with children under three in the same area primarily through volunteers implementing more MTM Program cycles–without project staff and budget resources from faith-based organizations leading the MTM Program Partnership in the country.

Moments That Matter® Zambia began its third cycle in 2017. To date, 73 communities have completed the transition to third cycles; of these, 81% of the ECD Committees have registered as community-based organizations (CBOs) with another 12 communities in the process. As CBOs, they will be able to manage their MTM programs more effectively and raise funds to sustain them.

ZACOP has done some participatory assessments of third-cycle MTM communities with the aim of sharing ideas, motivating caregiver groups, collecting information on the changes sustained and gathering any learnings and adaptations made by peer-led groups. This information is then shared with other groups and MTM communities to improve the implementation of third-cycle activities.

In Kenya, the MTM Program is planning for its first set of MTM communities to transition to their third cycle beginning in April 2023. Drawing on the Zambian MTM experiences, the Kenyan MTM program staff and ECD Committees are undertaking the following in preparation:

- Organizing before action review meetings that reflect on successes, challenges and adaptive actions.
- Orientating on third cycle project design, key indicators as well as reporting, sharing and agreeing on community MEL tools.
- Planning for periodic reflection meetings.

8. Discussion

Episcopal Relief & Development and its partners concluded that MTM community MEL demonstrated to varying extents the measurement for change aspirations. The M4C approach—people-centered, inclusive, interactive, informative and dynamic has been critical to achieving a quality, well-functioning community MEL system during the first two cycles with program staff. The MTM experience in Zambia illustrates that the community MEL system also undergirds and fuels a dynamic process of transformation from the initial community-led, time-bound project with staff and budget to third cycle community ownership of independent MTM programming. Thus, it also supports with MTM scale up through the two channels of expanding reach within MTM communities and launching MTM in new areas.

Moments That Matter® is designed with the *people-centered* dimension. Community leaders, ECD service providers, volunteers and Primary Caregivers all set their specific goals and priorities to tailor the MTM program to their distinct context, while using user-friendly tracking of progress. In this way, the community MEL is *inclusive*, with all stakeholders engaged in defining success at their level, monitoring and making adjustments over time. The *interactive* nature is demonstrated by the relationship-based social and behavior change strategies such as Primary Caregivers with each other and their ECD Promoters; faith leaders with MTM families; and community leaders with ECD service providers. The recurring, regular monthly or quarterly check-ins at three levels–caregiver/family, ECD Promoters, ECD Committees–provide the *informative* dimension, ensuring the capacity for continuous gathering and use of key information from different sources to guide decision-making and solve problems.

Through the APRHC implementation research study and MTM's own MEL community case study, MTM partners also concluded that further strengthening of measurement for change was needed. Contribute to MTM's increased impact and sustainability while scaling. Recommendations for improving the MTM intervention as it continues to scale are reflected in the following actions.

In the MTM implementation phase now underway in 2023, program staff and MTM communities are working to deepen the *dynamic* dimension in particular. For the ECD home visits, MTM is providing a more user-friendly tool for the ECD Promoter and introducing the Actions to Practice Passport, a new visually-oriented tool for Primary Caregivers to track and share their progress using nurturing care parenting practices and to achieve their goals. These tools will support the caregivers and ECD Promoters' capacities to be more responsive to challenges and opportunities in the process of strengthening nurturing care parenting.

In 2023, MTM will share new and updated social and behavior change resources that are more effective and user-friendly, incorporating some of the lessons learned and ultimately enhancing the dynamic dimension. These include structured ECD Committee training and tools with integrated program and MEL management, such as the updated *ECD Promoter Home Visit Booklet* and the new Primary Caregiver *Actions to Practice Passport* tool. The Passport tool provides a visual, an easy way to record what was previously only a verbal commitment at group meetings, to practice what was learned at the session and report back on it later. The ECD Committee tool has an expanded section to track referrals and strengthen referral pathways. Other improvements to strengthen the interactive and inclusive dimensions, such as expanded community MEL training,

will be undertaken in 2023–2024 as part of planned further development of the third cycle MEL framework and the community monitoring system.

The community-led MEL system is founded on the shared community vision of children achieving their potential, fueled by a positive, self-reinforcing dynamic of goal setting, progress-tracking, learning, problem-solving, adaptation and celebration. This system contributes to the sustainability of program outcomes at the child, parent/caregiver, family and community levels. The sustained program outcomes are due to the ownership of changes, residing not only in MTM leaders and volunteers but also with the participating Primary Caregivers and families themselves. The *Moments That Matter®* community-led program, with its monitoring and measurement for change, drives both sustained impact and effective scaling of the MTM Early Childhood Development Program Partnership.

With its permanent presence and commitment to serve the most vulnerable, the extensive faith network in rural Africa provides a systematic pathway for MTM scaling in civil society. These MEL processes have contributed to successful scaling with quality through two channels: deepening reach to new families through sustainable community-owned MTM and investing in MTM community start-up in new geographic areas.

With so many children at risk in sub-Saharan Africa, there is a tremendous need for ECD parenting empowerment and community ownership of nurturing care. MTM partners recommend that other ECD programs incorporate community MEL from the outset of implementation and invest in local capacity strengthening. As demonstrated by the MTM Program experiences, community-led measurement for change processes reinforce ownership and motivation mutually within families and ECD community leadership. This results in channeling these forces into a powerful catalyst for and commitment to sustained nurturing care so that young children thrive.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Transdermal delivery of micronutrients through fortified body oil and cosmetics: a potential roadmap for future scale up

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1. Introduction

The initial challenge was to address micronutrient deficiency in early childhood, an important determinant of poor neurocognitive development (1, 2). The innovation selected for transdermal delivery of micronutrients has been scaled up from the laboratory level into clinical trials. It has now received a buy-in from the industry as well as from public health programs and the next challenge is to ensure a continuous and sustainable scaling pathway.

Although iron and folate oral supplementation in under-five children is the strategy adopted by public health programs in India, poor absorption of iron and gastrointestinal adverse effects associated with oral iron are drawbacks associated with the oral supplements leading to suboptimal adherence to the supplements (3, 4). Transdermal drug delivery is associated with peculiar advantages as non-invasive nature of delivery, improved compliance and avoidance of first pass metabolism as well as gastrointestinal irritation (5). We developed an innovative intervention in the form of a liposomal encapsulated micronutrient fortified (LMF) oil for supplementation of iron, vitamin B_{12}, folate, and vitamin D which can deliver micronutrients transdermally. The journey of the development of the intervention has been described earlier using a theory of change approach which reflects how the intervention of LMF oil was modified based on the learnings at each step (6). The intervention was evaluated in a community-based randomized controlled study which showed benefit in improving vitamin D levels and partial efficacy in improving anemia (7).

Despite the mixed results of the community-based research study, the intervention received good acceptability in the community. Importantly, there is keen interest and buy-in from the industry partner involved in the clinical trial scale-up. We describe here a potential road map for evaluating this innovation further and scaling it up in the public health program using a theory of change approach.

2. Challenges faced so far and lessons learnt

The earlier work focused on translating a laboratory-level innovation in clinical trials through interinstitutional academic collaboration between KEM Hospital Research Centre, Pune, India, and Indian Institute of Technology Bombay, Mumbai, India. Currently, the technology is out-licensed to an industry partner, Murli Krishna Pharma Pvt Ltd, Ranjangaon, Pune. While moving from academic research settings to more commercial

FIGURE 1
Potential road map for future translation of technology for transdermal micronutrient delivery.
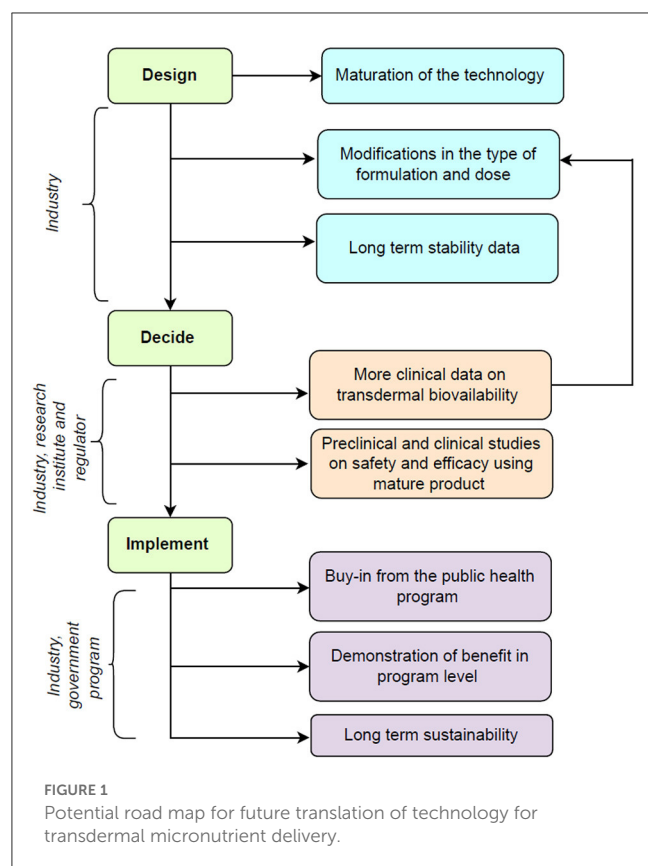
and program environments, we need to understand the role of additional stakeholders in the entire process—industry, regulator, and public health bodies. Considering the existing Indian regulations (8) for new drug development, there is a need for comprehensive scientific evidence on this innovation through translational studies. The transdermal route of intervention is an innovative route of supplementation. The extent of transdermal absorption depends upon several factors such as molecular size, lipo or hydrophilicity of the molecule, type of encapsulation, thickness of the skin and use of any penetration enhancers (5). There is limited information available about the exact mechanism of absorption of the ingredients from the skin (5). The extent of absorption in children cannot be completely predicted from animal studies as animal skin is different from human skin. Additionally, the formulation of the LMF oil may need changes to improve the shelf stability and ability to incorporate higher doses of micronutrients, especially iron. Due to these factors, more rigorous standardization and clinical evaluation of the intervention are needed before scaling it up.

3. Translation of the innovation—Theory of change

A theory of change framework can help to integrate the monitoring, evaluation, and learning into the decision-making process while transitioning from clinical research to program implementation

of this intervention (9). Figure 1 shows the potential roadmap for this innovation and includes the following phases.

3.1. Design—Innovative application of previous knowledge

Lipid nanostructure can be a useful platform for the transdermal delivery of micronutrients as they can reversibly fluidize the stratum corneum to deliver the entrapped substances into the deeper dermis and can be synthesized using food-grade materials that are safe for human use (10). The previous study pilot-translated the technology for encapsulation of iron, folic acid, vitamin B_{12}, and vitamin D and its incorporation in body oil from a bench-level technology to clinical trial settings using methods that did not involve any organic solvent (5). The technology used was frugal and thus can be affordable for larger public use. The future work will involve scaling it up by the industry partner further for large-scale production. This will involve the use of lyophilization methods for long-term preservation and better stability of the liposomes and refining of the manufacturing processes to deliver purely encapsulated micronutrients in liposomes, to avoid any residual free actives on the skin. Also, to incorporate higher doses of micronutrients, the exploration of alternate formulations in the form of lotions and creams is planned.

3.2. Decide—Answers and more questions

The technology has demonstrated safety and efficacy in *in vitro* and *in vivo* animal models for transdermal delivery of nutrients at supplemental doses (Supplementary Table 1). The technology has also demonstrated no irritation potential during irritation patch testing in healthy human volunteers and showed good acceptability in terms of texture, odor, color, consistency and ease of use (6). In future, industry-academic collaboration is required to generate more evidence on the transdermal penetration of micronutrients, i.e., iron, vitamin B_{12}, folate, and vitamin D. Evidence from the completed study shows there is scope for increasing the amounts of ferrous bisglycinate and vitamin D as the presently included doses resulted in partial efficacy, however, were safe to administer especially in young infants (7). Modification of the dose will require clear evidence of efficacy and safety from pharmacokinetic studies in animals and humans. Additionally, we plan to utilize the bio-samples of the earlier study to evaluate the changes in the vitamin B_{12} and folate levels. It is known that iron uptake may be better in children with iron deficiency as compared to those without (11). Estimation of the bio-samples for specific biomarkers for iron deficiency i.e., ferritin is the next step to understand whether the intervention works betters in iron-deficient children than non-iron-deficient children. In addition, there is scope for conducting transdermal bioavailability studies on each of the micronutrients using stable isotope techniques in adults and children that allows for accurate measurement of the bioavailability of micronutrients (12). These studies will help in understanding the dose-response

relations and can help to finalize the dose to be incorporated into the unit volume of the formulation. The previous study focused on the prevention of micronutrient deficiencies and used doses less than recommended dietary intakes for the given micronutrients. The intervention needs to be evaluated using higher doses and in therapeutic studies for the treatment of anemia and micronutrient deficiencies where pivotal studies may need regulatory approvals.

3.3. Implement—Partnerships and networks

The intervention has received a buy-in from the Anemia Mukt Bharat (AMB) which is a public health program by the Government of India for the prevention of anemia in children and pregnant women (3). Government of India's ease of doing business (EODB) initiative to transform healthcare in India through technology and the latest innovations in the field of healthcare (13). The purpose is to envision and develop sustainable models in the health tech sector to significantly improve access, quality of care, and efficiency. The industry partner will be participating in the EODB initiative to scale up this innovation to the AMB program beneficiaries in a stepwise manner. This will involve a demonstration of program implementation at the district/state level followed by implementation over several states. The data gathered from the clinical efficacy studies will help in refining the intervention further before large-scale implementation.

4. Summary

The innovation for transdermal delivery of micronutrients has successfully transitioned from an idea into clinical trials, receiving support from industry and public health systems. Further development and translation of this innovation will depend upon continued buy-in from multiple partners, which in turn will depend upon generation of more scientific evidence on efficacy and safety. In structuring a process of continuous learning, we consider the need for monitoring and evaluation to be dynamic and inclusive to generate knowledge about the effectiveness of the intervention followed by effective delivery and scale-up.

Author contributions

AA conceptualized the idea, drafted the framework for M4C, and finalized the manuscript after review from the M4C reviewers. AA and JP drafted the manuscript. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

JP is an employee of Murli Krishna Pharma Pvt Ltd, Ranjangaon, Pune, an industry partner in scale up of the innovation.

The remaining author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1136912/full#supplementary-material

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One size (doesn't) fit all: new metaphors for and practices of scaling from indigenous peoples of the Northwest Amazon

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Ten years of field research and collaborative development of programs for early childhood in the Upper Rio Negro region of the Amazon provide the authors with new metaphors for achieving wider social impact and new frames to add to the international debate on 'scaling' social change initiatives. Using anthropology and ethno-ontology to think questions of universal and particular, center and periphery, the article reflects on the dangers of monolithic scaling to cultural diversity and future innovation. Instead of the metaphor of scaling — adopted in the discourse of public policy and international development from the Fordist or Taylorist efficiency of the economy of scale — indigenous people speak of exchange, sharing, and transformation. These ideas seek to connect local and decolonized models and value the diversity of local knowledges, epistemologies, and practices around early childhood development. Based on the expansion of the CanalCanoa project among diverse indigenous communities, the paper proposes a flexible and bottom-up model of achieving impact at scale through empowering local actors to teach each other and establish local criteria of learning and evaluation.

KEYWORDS

early childhood, Amazon (Brazil), indigenous knowledge, scaling, anthropology

1. Introduction

One evening in 2018, after a group of Baniwa and Coripaco families came together to see a film on early childhood development made in collaboration with local indigenous experts, an older women shared an insight she had been developing for some time. "For some kinds of illness, we know that our traditional ways are the best. When a child is sick from *quebranto* or *pitiú* [forms of diarrhea and illness caused by the evil eye], I know that the hospital cannot help me, but a shaman can. On the other hand, I see that the white way to cure a broken femur works better than the way we cured that for many years; I will go to the hospital if my grandson breaks a leg. The challenge is for those things that come in the middle: how do I decide what works?"

The discussion that followed did not offer any simple answer to the Baniwa grandmother's question. Instead, the group concluded that everyone in the community should keep talking and evaluating, trying to understand each case, learning what worked, and evaluating based on locally valid criteria. This paper proposes a similar response when considering impact at scale. Certain kinds of interventions lend themselves to a what we will argue is a classically European form of scaling, where one tries to find an ideal intervention and then adapt it for the complexities of diverse contexts. Other kinds of impact demand a different kind of learning and creativity, more similar to what we will describe as an Amazonian methodology of impact at

scale. As the Baniwa women eating the fish and pepper stew in concluded, the hardest cases lie in the middle, demanding thought, research, discussion, and creativity. We hope this paper provides insights into how to think a larger range of possibilities for impact at scale, as well as providing insights into the relations among media, agency, and voice in the development of anthropological theory and public policy.

Over the course of almost a decade, Usina da Imaginação, with the CanalCanoa project, collaborated with indigenous leaders, midwives, shamans, educators, and public policy professionals to script and then film traditional child-rearing practices of indigenous groups on the upper Rio Negro. Indigenous intellectuals then showed the seven resulting films on early childhood to dozens of neighborhood groups in small cities, using the films as a stepping stone for conversations about how urban-indigenous families could adapt traditional best practices to a new and modern context.[1] After the success of these "*ajuris de conhecimento*" (literally "knowledge barn-raising sessions") — where local families dramatically increased multilingual education, improved nutrition for their children, and strengthened local support networks for young children (1) — we have observed and accompanied an expansion of impact at scale around the whole region, a process where many people and groups share agency, and with very little intervention from funders or the government. The results of this de-centered, rhizomatic, and often chaotic process provide important new frames and concepts — often emerging from indigenous Amazonian philosophy — that can contribute insights to the international debate on "scaling" social change initiatives.

The structure of knowledge development and reproduction among indigenous people in the Amazon does not fit the metaphor of scaling used by most international funders and government agencies. Ideas of scaling emerged largely during the second industrial revolution, when Fredrick Taylor's "scientific management" and Henry Ford's production line showed that large scale enterprises could produce goods more cheaply and efficiently. Many other fields then generalized this "economy of scale" to other fields, including government and social services.

The immense diversity of cultures — each with specific and often conflicting rituals, beliefs, and practices around pregnancy, childbirth, and early childhood — makes it impossible to create any single protocol for maternal and child health, caregiver education, or nutrition, the first element for producing a scalable "product." In this paper, we think together with indigenous people to find other metaphors for impact at scale; these metaphors can help us to understand better ways to work with indigenous and other minority groups, but they also develop insights into how successful models can

better promote local autonomy and creativity while reaching large numbers of people.

This paper follows a three step argument:

1. An explanation of the CanalCanoa methodology and how it emerged both from systems of indigenous knowledge exchange and dialogic education.
2. An analysis of nine different forms of replication, inspiration, and transformation of the CanalCanoa model in the upper Rio Negro region, focussing on how local indigenous communities used the work to become social agents around the public health of young children.
3. Using the epistemology and education of the Amazon — how indigenous people come to know their complex world and then intervene in it — we show how these forms of adopting and adapting knowledge and practice provide important lessons to impact at scale in any context.

This reflection opens new ways of thinking the connection between world-view and impact at scale, so that funders and practitioners can propose and evaluate other forms of scaling in non-European contexts.

2. CanalCanoa

Given that different communities face different challenges around how to raise children as they come to face technology, schools, and the national economy, CanalCanoa emerged as a way for various ethnic groups to dialogue, think, and strategize early childhood education as indigenous families move from traditional villages to urban centers. CanalCanoa began by developing films that documented and explained traditional child-rearing practices: indigenous leaders, children, midwives, shamans, grandparents, parents and other community members suggested both content and structure for the script, made the arguments, and provided interviews and visual examples. This was no easy task, given the extraordinary geographic, linguistic, and cultural diversity of the region. Remote towns like São Gabriel da Cachoeira are accessible only by plane or boat, and reaching many indigenous villages requires a 15-day canoe trip from there. There is also a wealth of linguistic diversity in the region, with 22 languages spoken among 27 ethnic groups.[2]

With drafts of the films in hand, indigenous educators then facilitated community gatherings called *ajuris de conhecimento: ajuri* means "collective effort" in Nheengatu, so the full meaning would be similar to "knowledge barn-raising sessions." In traditional villages, the whole community comes together early every morning to discuss concerns of the day and develop a response. The *ajuris* — as a place

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where parents and grandparents could join neighbors to brain-storm the challenging of rearing a child in the city — served a similar purpose. The indigenous educators organized the ajuris in several radically different contexts:

1. In urban indigenous communities, where families from the villages have migrated in search of work and education, often leading to a crisis in indigenous identity, language, and practice.
2. In villages close to town, where indigenous migrants from distant villages try to maintain traditional forms of living while having easier access to banks, markets, and schools.
3. In distant villages (sometimes as far as 10 days away by canoe), where contact with modernity is more distant and irregular.

The films and *ajuris de conhecimento* were organized around seven themes that local communities identify as priorities for child development: (1) pregnancy and childbirth, (2) child stimulation, (3) language and song, (4) education, (5) protection and care, (6) orientation, and (7) public health. Each *ajuri* began with a short animated or fictional movie made by CanalCanoa on the basis of local stories and legends, with live acting or drawings made by indigenous children.[3] After these playful shorts, the children moved off to play and adults would watch a 10 to 12-min film about one of the seven key themes. The indigenous educators then facilitated conversations with families and helped think through ways that the group could make a difference in the problems that concerned them. For the next seven weeks, the process would repeat on different themes. During *ajuris*, participants would share traditional meals from the region, including açaí, game, fish, and other items prepared using traditional methods, which are often unavailable or inaccessible in urban settings. The workshops followed the logic of traditional indigenous festivals, taking some elements from the *dabucuri* — a traditional ritual in the region that formalizes the exchange of goods and ideas with new visitors and other cultures (2) — while using aspects from other social encounters as well. The popular educators organized dinner for all participants — generally *mujeca* or *quinhampira* (peppery fish stews), açaí with manioc *farinha* or tapioca, or other local foods — to take advantage of the comensality that both anthropologists and local leaders cite as so important in the region (3).

The most important result, however, was not these pragmatic actions in themselves, but the improved social networks that emerged from them. As families move from villages to the city, they lose the strong intergenerational support networks necessary to raising children. By bringing parents and grandparents together – often with shamans, midwives, nurses, and public health agents – CanalCanoa re-created this informal social safety net. Every single interviewed participant mentioned strong social supports as a benefit of the project.

CanalCanoa showed the seven movies to over 50 groups of 10–15 parents from 24 indigenous communities, who viewed and discussed the films over the course of two months. 1,186 adults and 1,148 children participated in the project, and the evaluation conducted at the end of the *ajuris* showed improved results in 1) intellectual stimulation of babies and small children, 2) better nutrition and healthcare for families, and 3) stronger support networks(1). In interviews, 91% of participants reported that after the *ajuris* they spoke with their children and grandchildren more often in indigenous languages, told more stories, and sang more; in 56% of the urban *ajuris*, participants began to plant food at home. Three-fifths of participants said they had learned how to complement traditional and western medicine. In 70% of the *ajuris*, participants used more herbal and home remedies and in more than half of the groups, older women began to sell or distribute herbal remedies.

3. CanalCanoa: nine examples of impact at scale

The funding for CanalCanoa ended in 2019, but the authors of this article continued in contact with indigenous leaders, friends, and educators over subsequent years and returned in 2022. In spite of the COVID-19 pandemic and quarantine, which had terrible consequences for indigenous populations in the region, local people developed at least nine different projects we see as inspired, catalyzed, or motivated by CanalCanoa, and which we detail and examine in this portion of the paper. Most of these initiatives emerged from indigenous people with no or very little formal funding, and we see them as a powerful lens through which to see other ways that decentralized and decolonial impact can happen at scale.[4] Most importantly, indigenous individuals and groups imagined, initiated, and brought these examples to life: though the ideas emerged in dialogue with CanalCanoa and the films it produced, the list that follows exemplifies cultural traditions of learning from and transforming what indigenous peoples learn from others.

3.1. Upriver

The Pastoral da Criança (Children's Vicarate) is one of the most effective and wide-reaching programs for small children in Brazil. Run by the Catholic Church, the program trains community members (generally women seen as "successful" mothers or grandmothers) as educators for young parents, teaching about care during pregnancy and childbirth, nutrition for young children, and intellectual development in early childhood. The program is practical and pragmatic, and often gives substantial autonomy to the local educators [See (4, 5)].

Several Pastoral da Criança educators participated in the *ajuris* in São Gabriel and began to use CanalCanoa films and methodology in their work; this adoption led to a conversation where the Pastoral da Criança suggested replicating the CanalCanoa methodology in a

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3 There were almost 50 of these films; local children and adults most liked "Long ago, fire did not exist" (https://vimeo.com/324968243), "The jaguar and the tortoise" (https://vimeo.com/240032370), "The Party in the sky" (https://vimeo.com/usinadaimaginacao/festanoceu), and "How to make a top" (https://vimeo.com/205583833).

4 Usina da Imaginação — the Brazilian non-governmental organization that created CanalCanoa — has continued and extended this dialogue with indigenous peoples on public policy for indigenous children with the annual conference MIMUS: Multiple Childhoods, Multiple Knowledges. https://mimus.usinadaimaginacao.org/.

dozen villages up many of the rivers in the region, some as many as 10 days by canoe from the urban center of the city. Over the next several month, CanaCanoa and Pastoral educators organized *ajuris* in more than a dozen different communities on four different river systems (see map), reaching close to a thousand people.

The extreme distances demanded certain changes: instead of one movie a week for seven weeks, the educators showed three to four films per day over an intense two evenings of movies and conversations. In the city, most *ajuris* were held in Portuguese, given that the groups were multi-ethnic and multi-lingual, but village sessions were spoken in Baniwa, Coripaco, Nheengatu, Tukano,

they said they provided new tools and insights to make their decisions and to take advantage of the best parts of the decisions they made.

Finally, these village *ajuris* were some of the most creative and productive in developing new forms of impact and scale. We address these developments below in 3.5–3.7.

3.2. Teaching indigenous pediatrics

The Tukano and Desana village of Balaio lies some eight hours from São Gabriel on an almost impassable road; during our 2019 trip
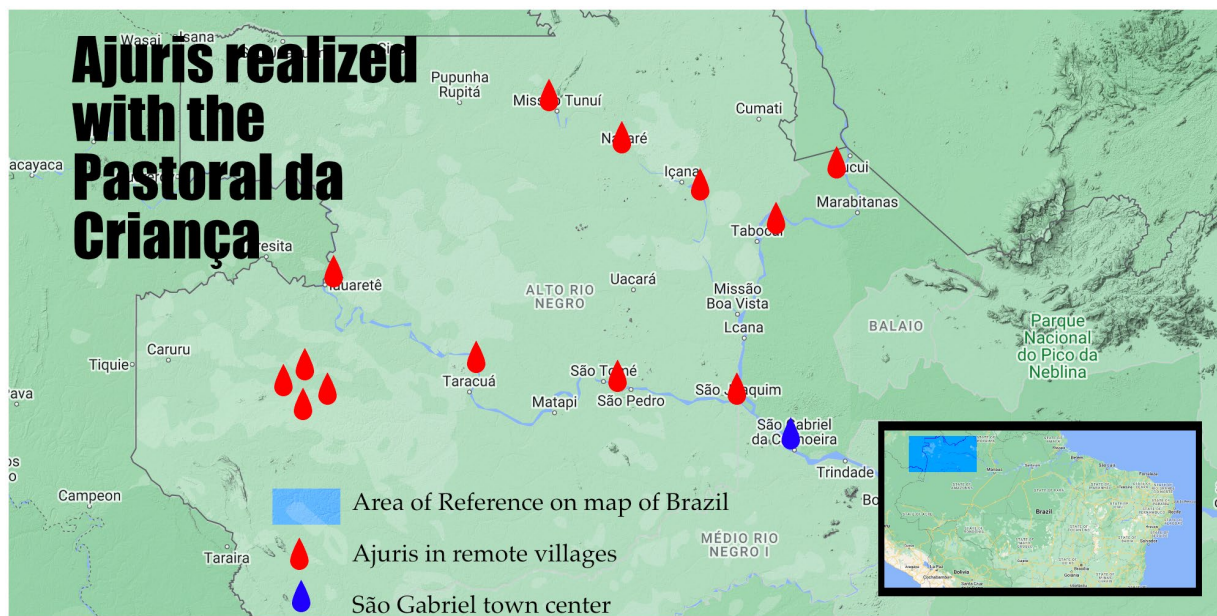
Desana, and Tuyuka (fortunately, educators spoke all of these languages). Perhaps the most important difference, however, is that the conversations in the city largely revolved around how to re-constitute or adapt traditional child-rearing to a new world, while in the villages people used the films to understand how precious and unusual their traditions were, thus focussing on maintenance more than adaptation.

When asked to evaluate the *ajuris*, parents and grandparents in the villages emphasized the way that the discussions had helped them to evaluate and resist the pressures to move their families to the cities; in fact, the discussions had helped them to elaborate what an academic might call "evaluation tools," which had previously been implicit in their thinking. Many families move to the city "for the good of our kids," because only the urban area has a high school. Others go because of the challenge of receiving government benefits: welfare and social security checks must be cashed every three months, and when a trip to the bank demands ten days downriver and ten days back up, the temptation to stay in the city is powerful. For others — like for village dwellers everywhere in the world — the city seduces with an air of modernity, hope, and change. Participants in the *ajuris* did not say that the films and discussions motivated them to stay or go, but

to the village, the jeep drivers literally had to build their own bridges over 5 meter wide, 6 meter deep craters opened by seasonal rains. Everyone knew than the ancient village shaman did not have many years to live, and no member of the younger generation had yet memorized the long stories and blessings essential to local medical practice, based on a tripod structure of herbs, blessing, and narrative. CanalCanoa movies inspired the community to film dozens of hours of interviews with the shaman in order to preserve his knowledge, now indispensable after his passing in 2020.

During the 2020–2021 quarantine, the shaman's daughter and granddaughters began a new plan for impact. They founded a school for indigenous medicine, especially medicine dedicated to pregnancy, childbirth, and early childhood. In the middle of the pandemic, the school took an online form, with lessons on different medicinal herbs and how to prepare them. The shaman's daughter — now the chief healer of the region — showed how to prepare the medicine as her own daughter filmed on a cell phone. Another daughter and son then edited the film (a skill they had learned in CanalCanoa workshops) and distributed the videos by WhatsApp and social media.

By 2022, the school of indigenous medicine had inspired and hosted a shamanic medical conference funded by the indigenous

health system of the Federal Government — including traditional healers from all over the region and policy makers. The community had re-built the village *maloca* (great-house) as a space for rituals, events, healing ceremonies, and rites of passage. A well-cut 2.5 km trail traversed the local biomes and soil types where different medicinal herbs grow; local children and visitors used the trail to learn about both biology and medicine. The lead healer had been invited to the city several times to lecture on traditional medicine, especially during the pandemic, when São Gabriel had one of the highest mortality rates in the world. During our last visit, the community was building a greenhouse for a medicinal garden and developing a label and brand for low-cost sales of traditional medicine.

3.3. School lunches

The urban ajuris attracted parents who worked in many different areas. During one of the events — directed largely to a Baré community living close to the city center — the head of the procurement office for the local school cafeterias and her two young children participated. After the film on nutrition, the group collectively lamented how their diverse and healthy diet in the villages had degraded into industrialized food in the city. Some women offered to teach others how to turn their back-yards into gardens; others invited new friends to join them in their farm plots outside the city. The procurement director got on her cell phone and began to research federal school lunch policies.

After discovering that federal rules favored local and organic producers, the procurement officer sought out local indigenous rural cooperatives, evaluated their capability to produce and deliver their goods, and taught them how to apply for government contracts. A group of urban Tuyukas who kept collective manioc fields and tropical orchards some five minutes by canoe from the city won the contract.

Today, children in São Gabriel get local produce in their school lunches and snacks. Instead of crackers or pasta shipped from Manaus made from wheat grown in Argentina — wheat cannot grow in the Amazon and has never been a part of the indigenous diet — children now eat *chibé* and other forms of manioc porridge, tapioca and *beiju* instead of bread; they drink açaí, tucumã, pupunha, cupuaçu, and other local fruits instead of soda pop or boxed grape juice. Unfortunately, school closures due to the pandemic made it difficult to measure the results on childhood health, but local nutritionists and indigenous leaders are optimistic [For a more detailed analysis, see (1)].

3.4. Training new indigenous health staff

The indigenous health service along the Rio Negro amalgamates many different government agencies: the National Health Service (SUS), the indigenous health service (DSEI), hostels for indigenous health (CASAI), the municipal health secretary, and the military hospital (the city is an important border garrison). Though some staff are local — an increasing number of indigenous youth have trained as nurses and doctors — many more come from distant parts of Brazil and even abroad and stay for only a year or two. Interviews with new staff exposed prejudices we had imagined eradicated half a century ago, including fear that white children would be abducted by

indigenous people, terror of cannibalism, refusal to allow indigenous food in the hospital, and brutally high levels of obstetric violence.

After observing the CanalCanoa *ajuris*, the indigenous health service contracted one of the team's indigenous educators as staff anthropologist and trainer. She used the films and the dialogic methodology in training sessions for health staff from almost all of the different agencies in the years leading up to the pandemic, when quarantine forced the end of in-person training (6).

3.5. Theater groups

The upriver *ajuris* inspired some of the most creative brainstorming to solve local problems; the next three examples of impact at scale may be considered second or even third level impact, because they emerged from the second-level scaling already carried out by the Pastoral da Criança.

The seven principle films of the CanalCanoa corpus inspired most of the scaling initiatives we detail here, but the more playful films also had an important impact among a younger audience. Among the 54 films distributed on CanalCanoa USB drives — a medium chosen because even in the most remote villages, someone has purchased a smart-TV and runs it on solar energy or a gas generator — almost two dozen have scripts based on traditional legends, folk tales, myths, or bed-time stories. In some cases, indigenous children act out these stories as if they were a play or fictional movie; in other cases children's drawings serve as the basis for animated cartoons; and other movies simply film the best adult storytellers in the region.

From the beginning of the *ajuris*, we recognized a powerful and productive dynamic: the audience saw the films as incomplete. During conversations with indigenous educators, many people would say, "I know a midwife from a different tribe who has an interesting perspective on that … why don't you interview her?" or, "you might talk with a shaman who blessed my son when he was sick from …" We always followed up on these ideas, which enriched the films immensely; we would often joke that each edition of the film was version 2.1 or 3.2, as in software development.

Young people in several Baniwa and Coripaco villages saw the fictional CanalCanoa films in the same light: not as a finished movie to be watched, but as the inspiration for dialogue and challenge. Sometimes children and teenagers would insist that they had heard the story of the origin of fire in a different way or that they knew other tales of the conflict between the jaguar and the tortoise.[5] In other cases, they wanted to include different kinds of stories so that other kids could learn from them.

As a result of these movies, conversations, and debates, the young people in at least three different villages along the Aiari and Içana rivers created theater and film clubs where they develop scripts from traditional stories, assign roles, direct actors, and present their plays at schools and *malocas* (great-houses) in both Baniwa and Portuguese. Some of these groups also planned to film their plays and distribute

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5   Interestingly, Claude Levi-Strauss, working in another part of the Amazonian cultural sphere, developed much of his structural anthropology on exactly these same differences between common tales told among different indigenous groups (7).

the result through pen drives and WhatsApp, but their communities are so distant that recent news has been slow to get to us.

At first, this impact at scale might appear distant from the goals of public health, but we must remember two things. First, one of the three legs of the Rio Negro healing process is narrative. As a patient takes medicine, he or she must always listen to the correct story. Whether because of the documented power of the placebo or of "bedside manner," indigenous people in the Rio Negro believe they will only be healed when the cure is accompanied by the story. Second, the process of documenting and performing stories serves as a motivator to keep children in the villages, with the better health and nutrition that implies. As such, theater groups can play a significant role in public health, and not only cultural persistence.

3.6. Lullaby research nucleus

Song is essential to Baniwa women: they sing to grow their peppers, the center of their culinary traditions and their medicine. They sing their blessings, which mark their rituals and their healing. And traditionally, they teach their children through song. After an *ajuri* relating to song and language acquisition in the ethnically mixed community of Yamado, many of the women compared their own childhoods to that of their babies. Their mothers and grandmothers had sung many lullabys to them, they remembered, but when their babies had a hard time sleeping now it seemed so much easier to play the radio or an mp3 on the cell phone. When given the opportunity to think about the change in their relationship to sleeping babies, they saw the loss of song as one of their reasons that their children developed more slowly than they had, and that the youngest generation spoke Portuguese instead of Baniwa.

As they sat down in the brain-storming session, the women developed two strategies. First, they would use their cell phones for something else: they would go to their grandmothers and aunts — many of them who still lived upriver in the more traditional villages — to record their traditional lullabys and children's songs. They would bring all of the songs together and share them in the community, practicing them together. And finally, they would return to the tradition of singing their own children to sleep. They recognized that the consequences would include language and culture, but also in the relationship with their babies — essential to early childhood development in the eyes of neuroscientists and Baniwa midwives.

Second, the women in the village voted to turn off the community electrical generator every Monday night for an evening of "children's stories and jokes" in the Baniwa language. The television, they argued, replaced the great-house and the fireside as the privileged space for storytelling — and with it, Portuguese replaced Baniwa. This change is immensely important for the multilingualism that is essential to the Rio Negro, where kinship rules demand that one must marry a person that speaks a different first language than her own. It is also important for the development of executive function and the prefrontal cortex (8).

For the indigenous people of the Upper Rio Negro, resources and ideas flow up and down the numerous rivers of the region. By recording lullabys upriver, the women in the research group not only came back downriver — in their village close to town — but gave in exchange the resource of recognition. When they asked the older women upstream for permission to record their songs, they also

showed those women that their voices mattered, that the lullabys they sang to their grandchildren deserved to be preserved and that these older women has something immensely important to contribute to early childhood development.

3.7. Seed bank

In the large village of Taracuá — some 120 km by river upstream from the town of São Gabriel — the film about nutrition and health inspired a long debate among a group of Tukano, Desana, Tariana, and other women. Though many of them regularly traveled up and down the river to town, the movie showed them the challenges that many urban mothers faced to feed their children. The lack of *farinha* (a special manioc flour produced in the region) and the expense of açaí, bacaba, tucumã, and other fruits made them aware of how fortunate they were to be able to produce and consume healthy, traditional food. They were particularly concerned at news that the state agriculture department pressured farmers close to town to use exotic or genetically manipulated forms of the manioc root (9).

In order to preserve and value traditional food and agriculture, these women created their own seed bank of traditional foods. "Seed bank" may be a poor translation — though some tropical palms and fruits reproduce through seeding, women plant manioc from the branches cut from the plant when the root is planted; local potatoes and pineapple have their own forms of germination — but the basic concept is correct: to document, store, and archive all of the different species and variants of edible plants.

Because of Rio Negro kinship practices — which require marriage with a partner who speaks a different mother tongue and comes from a different village — and because of the *dabucuri* festivals — where communities exchange dance, stories, food, and seeds — women from all over the region live in Taracuá. Each had brought different seeds with her to her new home, as well as new ways of preparing the food. Many foods also have their own stories — myths of the origin of the plant that also explain its nutrition, preparation, and dangers — and women from different regions also found their their stories were different. They decided to record this diversity as well.

This seed bank provided even more diversity to the diet of adults and children, helping with trace nutrients needed for early childhood development and providing a more regular food supply in a region with little refrigeration. Perhaps more importantly, however, the women began to send seeds downriver to where the jungle had been degraded, allowing their family members to plant more traditional food and provide a healthier diet for urban children.

3.8. Training early childhood educators

Criança Feliz is Brazil's federal program to support early childhood development. Adapted from the Pastoral da Criança methodology in the last years before the 2016 parliamentary *coup d'état*, it has nonetheless survived two subsequent regimes. Among other activities, the program trains local women as family peer educators, so that they can teach young mothers good practices for nutrition and stimulation of babies and young children.

During the pandemic, the program hired a new coordinator for the upper Rio Negro; upon arrival, she discovered that the training

materials provided to her were inadequate for the indigenous context where she was to work. She found CanalCanoa films and materials to provide exactly the tools she needed for training and discussion. First, she used the films and the *ajuri* methodology for her research, creating several focus groups of 10 young indigenous mothers. She then brought together her research with CanalCanoa publications to present a proposal for adaptation to the state-wide planning committee for Criança Feliz.

As a result of the conversations that emerged from these adaptations of the *ajuri* methodology, the local office of Criança Feliz began to integrate young indigenous mothers in city planning strategies. Mothers and grandmothers began to demand shaded benches for nursing, places to change their babies diapers, and green spaces for children to play. Though these demands are only now working their way through the city planning system, the support of Criança Feliz offers hope for real architectural change.

After the films, the young mothers also asked Criança Feliz to facilitate contacts with midwives and shamans; they reported that the migration to the city cut them off from the traditional medical experts who are so important in the village. As a consequence, Criança Feliz workshops now include time with local experts who live in the city, and Criança Feliz volunteers are trained to connect local women to traditional medical services as well as to hospitals and government health posts. Finally, Criança Feliz has developed a new sector just to deal with herbal remedies.

3.9. Post-modern shamanism

During an *ajuri* with a group of about twenty urban families close to the center of São Gabriel, one of the participants was impressed by the film called "Protection," which included techniques on how to keep kids safe from dangers of life in the jungle, both natural (animals, disease, drowning) and supernatural (spirits of the forest, witchcraft, the evil eye). Indigenous and scientific forms of research both show that shamanistic cures work for many of these ills — whether because of the placebo effect, improved immune system response, herbal medicine, or some other explanation — but the participant in the *ajuri* lamented that few young people were learning these traditional cures "Kids like movies like this," he continued. "If I could make a movie, maybe I could interest them. Pity I can't."

"Maybe you don't know how to make movies," another participant chimed in. "But you do have this thing." She showed him her cell phone. "Record the lessons and the blessings on the phone. Send them by WhatsApp. People can play them, repeat them … what a great way to learn!"[6]

Over the next several months, the older shaman did exactly that, circulating lessons and recording blessing over WhatsApp. Many young men and some young women began to train with this resource, and both shamans and the CanalCanoa team were optimistic about the technique as a democratic way to have an impact at scale.

Three years later, follow up research discovered complications. The shaman related that he had been forced to end the experiment for a reason that neither he nor we had expected. Because WhatsApp messages can be copied and distributed, he could not control who received the lessons; he had come to learn that some of the recipients used his lessons for nefarious purposes. "Your medicine can be a cure or a poison," he told us.[7] "Ours as well. When I found that some young men were using my lessons for witchcraft, I stopped."[8] Here, we see how the process developed an evaluation criterion which many larger programs might not have considered or in a formal proposal: moral evaluation.

The shaman did not allow this negative result to stop what had generally been an effective experiment. Now he uses WhatsApp and other social media only as a way to attract students; he then teaches them in person, only after he has come to trust in their motivations for learning. The attention that the WhatsApp experiment brought to his work also earned him employment at the local hospital: CanalCanoa materials, pressure from the local indigenous federation (FOIRN), and grass roots demands forced the hospital to hire shamans and midwives to work alongside university-trained medical staff.

4. Lessons for impact at scale

"A scientist might look at a certain type of manioc and see how it grows better than anything else, so he says, 'This is the perfect manioc. Everyone should use it everywhere.' But he brings that type of manioc here where there is a different soil, and it does not thrive." A Tukano shaman explained this idea to us before detailing the 19 types of manioc planted in his community. "Here by the river, we have many kinds of soil, and we need many kinds of manioc. Each quality [type] grows better in a different kind of soil. And we use it for something different" (10).

After many encounters with researchers and government agricultural agents, the shaman had seen that European agriculture looks for the ideal variant of a crop, then transforms the land and ecosystem with pesticides and fertilizers to grow that platonic agricultural ideal. He would later point out that the schools and health centers built by the government had the same logic; a school building in an indigenous village looked little different from schools or clinics he had seen on a trip to Brasília.

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6   It is notable that many younger indigenous people saw the cell phone as a tool to make films; the ajuris and the presence of a film crew among them inspired grass-roots film-making. Older participants thought much more of the aural possibilities pf the cell phone, perhaps because they had become used to the voice messages on WhatsApp (the preferred means of communication in the region) or because they had experience with tape recorders in the past. In both cases, the locally produced films helped to re-frame accessible technology as a tool for culture.

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7   In Greek, the word φάρμακον can mean medicine, poison, or scapegoat, and indigenous languages and the Portuguese spoken in the countryside maintain this ambiguity. For more reflection on the subject, see (10).

8   Baniwa and Coripaco people believe firmly in the power of witchcraft, which can be a challenge in conversations with an outsider. Whether witchcraft is true or not, however, isn't really the point. When people on the Rio Negro believe they are the victims of evil magic, they become sick unless they have some stronger form of medicine to protect them. Even if witchcraft is not true, the symptoms (and the cure) are visible and measurable.

As we reflect on the lessons from the success of CanalCanoa, we want to use the Tukano shaman's analysis of crop adaptation to think about social interventions for early childhood. The metaphor provides an excellent way of seeing why many social programs fail in minority communities, but also how a re-framing of impact at scale opens new possibilities for impact and social change. Here, we want to look at three of the many reasons that this way of thinking impact at scale is so powerful:

1. Creative responses to diverse local challenges.
2. Stakeholder ownership/*protagonismo*.
3. Diversity and resilience.

4.1. Creative responses to diverse local challenges

Krapels et al. (11), coming from another vantage point, make a similar argument to that of the Tukano shaman.

> "Scaling frequently diminishes or even eliminates the positive effects seen at small scale. With scale, the elements surrounding the delivery of an intervention frequently change. Even if the content or curriculum of an intervention remain the same, consistency in effectiveness cannot be assumed as key delivery mechanisms may need to alter. Adaptations may be required in light of new delivery agents (e.g., different teachers, health workers), different target groups (e.g., different children, parents), and differences in prevailing social and cultural norms and economic circumstances."

The logic of the "economy of scale" can often imprison policy designers in a limited concept of impact at scale. The example of CanalCanoa shows that social change does not always work like industrial design, but can instead flow[9] in unexpected (and unexpectedly productive) directions. No policy expert could have dreamed up the multiplicity of uses that local indigenous people found for the ideas, films, and methodology that emerged from CanalCanoa. As such, the experience provides useful tools to think new metaphors for scaling and to develop creativity and autonomy in public policy.

The Brazilian anthropologist Eduardo Viveiros de Castro has argued convincingly that where Europe developed ideas and virtues based on representation – and thus the correspondence theory of truth and the Platonic theory of forms – Amazonian indigenous peoples developed a philosophy of perspective and relationship. In the Amazonian ethical-ontological world, the most important commandment is to gain the ability to see through the eyes of the other:

> [In European thought,] subjects, just as much as objects, are the result of a process of objectification: the subject constructs himself or recognizes himself in the object that he produces, and he comes

to know himself "objectively" when he manages to see himself "from outside," as a "that" … Amerindian Shamanism appears to be guided by the opposite ideal. To come to know [a thing] is to personify [it], to take on the point of view of that which you want to know … transforming a "something" into a "someone," another subject or agent (12, p. 258).

This insight lies at the base of the most important contribution that indigenous people can provide to re-think impact at scale. While European policy design tends to search for ideal solutions that can then be replicated or adapted in many different contexts (emerging from a Platonic concept of form and existence), Amazonian perspectivism tries on the skin of the other like clothes, learns from it, and then invents something new based on the encounter of these two perspectives. We see this most clearly, perhaps, in the way indigenous people took on the role of film-makers and then adopted and adapted digital technology to their own ends: recording lullabys, teaching shamanism, turning myths into children's plays filmed on cell phones. Just as the hunter learns from his experience in the skin of a jaguar but will never hunt as a jaguar, these local innovators experienced digital technology and then molded it to their needs. Perspectivist philosophy, with its experimental form of learning, hybridizes into an immense diversity of different solutions.

4.2. Stakeholder ownership/*protagonismo*

Each of the innovations we listed in part 3 emerged from the diverse communities of the upper Rio Negro, each of them responding to local problems and based on local strengths. In addition to the creativity this process implies, it also fits into one of the great virtues of Latin American social thought: *protagonismo*.

Many Latin American social movements insist that when the *victims* of centuries of slavery, colonization, and oppression became the *objects* of government interventions, they only exchanged one form of passivity for another. In this perspective, good policy and education must instead create the circumstances where people become the active *subjects* or *protagonists* of their own lives, not passive victims or objects. Though the translation is inadequate, this idea maps across European or North American analyzes of the locus of social agency or of stakeholder ownership.

For this reason, the creativity and problem-solving of these different forms of impact at scale go far beyond the impact on pregnant women and young children. When indigenous individuals, families, and collectives learned that they could solve problems around early childhood, they saw that they could also solve other problems. They did not need to wait for the agency of the other — the government, an NGO, or some other external actor — but could act on their own. This lesson revived and renewed the traditional indigenous values of autonomy and self-help, often weakened by the encounter with the west and the difficult adaptation to urban, modern life.

The evaluation of the results of the *ajuris* shows that this sense of community ownership of the project was one of the reasons it made such an impact (1). Many interviewed participants explained that they learned to value their own knowledge after sharing it with others. "I have always known what was right when it comes to my babies," one Baniwa mother told us, "but I haven't always done it. You come to the

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9   Living in a world of rivers, the metaphor of flow is, of course, important in Amazonian thought.

city and everybody does it a different way, and you come to suspect you were wrong, that you should do it like the white people do. But we watched the movies, we talked, and I remembered what is right and started to do it like I should." Other mothers explained that when they began to teach others about indigenous ways of raising children, they had to live up to their own teaching, to "practice what they preach."

Another participant — a mother of five children, an elementary school teacher and wife of a health agent on the Içana river — told us, "you come to the city and no one values your culture. Other things matter. But when other people start to value what we know — and it appears on that TV screen — then we see that it really is valuable." A Baré mother from the Ilha do Açaí said something very similar: "It's like a mirror. If people from outside value it, we learn to do so too." When a community sees itself as both the messenger and the message, as the producer and receiver of knowledge, it increases the success of the intervention. In this way, the community and its members also see the opportunity to control their own story and the way they see themselves presented to other people. Though this presentation will continue to be contested through mainstream media presentations, it does provide a new tool for indigenous self presentation and self-examination.

This community buy-in (or stakeholder engagement or *protagonismo*), has huge implications for sustainability. Because of community commitment and creativity — because they believed in their own way of raising children and were inspired to create new ways to preserve those traditions — each village, tribe, and neighborhood continued the project on its own and in its own way. Pierre Bourdeiu points to *habitus* — the way that habit and social pressure interact with body memory and context to establish the ways that people behave and interact — as what sustains a practice over time (13). Indigenous cultures have a long *habitus* around pregnancy and early childhood, but modernity and urbanization challenged that culture and habit. In an important way, the *ajuris de conhecimento* served as a way that indigenous people could adapt their *habitus* to the modern world in a conscious way, both in family relations and in the creation of new forms of social impact.

These new habits require inputs in order to be sustainable: cultural pressures, the mirror of the media, the effort of many people in the community. Importantly, money is not the most important factor in this sustainability. With the exception of the upstream replications by the Pastoral da Criança (in which we invested less than US$5,000 to pay for gasoline for outboard motors), none of these interventions required a cent of additional fundraising. In the villages and communities — the theater groups, seed banks, lullaby research nucleus — they demanded no funding at all. When the impact happened through transformation of government programs, budgets were adjusted but never increased.

4.3. Diversity and resilience

Perhaps the greatest challenge for scaling any government program for children is that indigenous families are different from the model assumed by the programs. In many indigenous groups, the nuclear family is not the prime agent of socialization of children. In some cases, other children or adolescents care for and educate little kids. In others, grandparents, godparents, uncles or aunts play this role. The Kaduvéu love children, but they think that pregnancy and childbirth are beneath them, so many parents adopt children from other communities (14). Among the Laklãnõ, young parents will give their first child to the paternal grandparents or great-grandparents to be raised as their child – even putting grandparents' names on the birth certificates as parents (15). Among many Jê cultures, babies receive the names of deceased family members; interactions with those children are based not on play, but on the respect given to those elders. Regardless of the details, in almost every indigenous group in Brazil, the whole community is responsible for raising every child.

During one of our meetings with indigenous leaders and intellectuals to design CanalCanoa, we tried to explain how important it was for funders to support initiatives that could be scaled. "Scaling," we explained, "is when you take a certain model that works in one place, and you implement it in many other places so that it can help more people."

"Oh, like colonialism, then?" one of them responded.

For contemporary indigenous people in the Amazon, colonialism is not simply the presence of a foreign people occupying their territory. More than anything else, it is the idea that there is only one correct way to live in the world: a single best way to educate children, certain goods that everyone must consume to be included, one single model of what it means to be human. This colonization happens through individual colonists, but even more through television, schools, social workers, the internet … all of the different ways that contemporary society has developed in order to teach people to be workers, citizens, and consumers.

In the same way that the Tukano shaman pointed out that a strain of manioc that grows well in one field will fail in another soil, a single model simply may not work in other contexts. The resiliency of many alternatives might be equally important. In the same way that genetic monotony leaves plants open to plague and pests — the Irish potato famine being the classic example — monochromatic interventions may collapse before unexpected social change or may simply not work in contexts of diversity. The diversity of responses increases the chances that many of the variations will thrive over time.

5. Conclusion

The Baniwa grandmother at the *ajuri* in the village of Yamado compared what indigenous medicine does well with what Western medicine does well. We might engage in a similar exercise with impact at scale, comparing the Amazonian way being inspired by new perspectives with the Platonic search for an ideal intervention that can be adapted across the board. The Platonic model of scaling works well for certain kinds of interventions; the Amazonian form works for others. Undoubtedly, other kinds of epistemologies that emerge from Africa, Asia, and Oceania will contribute even more ideas to impact at scale.

We understand why the idea of scaling that emerges from the encounter of Platonism and industrial design is seductive to governments and funders. It standardizes and appears to treat everyone equally. It is less expensive and easier to implement. And it makes intuitive sense to policy makers trained in the European intellectual tradition. However, when we see only this form of scaling, we close our eyes to the multiplicity of creativities that emerge from other kinds of learning and impact at scale. Foundations and governments select projects that will fit into the European paradigm,

while leaving out projects that might be more creative, resilient, and effective but that are more difficult to measure or to scale in an industrial way.

The experience of CanalCanoa — like that of many other cases in this special issue of *Frontiers in Public Health* — argues that we need to expand the size of our intervention tool-box, not to exclude the model of scaling that emerges from European and North American modernity, but to include the myriad of other forms of impact at scale that emerge from other cultures, other epistemologies, and other ways of learning and acting in the world. If scaling is a priority in a contexts of diverse and rich cultures — as is the case in the northwestern Amazon — one should not scale any particular model. Instead, one scales the *concept* of diversity and multiplicity, providing the support so that local people have the opportunity to learn and teach as they make an impact in the lives of small children.

Data availability statement

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by CONEP Comissão Nacional de Ética em Pesquisa. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Now that kindergarten is free of charge: laying the foundations for future pre-school policy change in Bulgaria

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Since April 1, 2022, all children in Bulgaria attend nursery and kindergarten completely free of charge. This paper makes the argument that without improving the quality of kindergarten services, policy gains toward expanding access remain fragile. The public early education system will continue to be challenged to realize the full potential of its impact. Strengthening demand for high quality kindergartens could bolster efforts to enhance the supply of such services. This could be achieved by reframing the role of kindergartens to society, improving the capacity of parents to voice their demands, and creating opportunities for them to do so. Moreover, civil society could encourage the establishment and communication to the public of process quality measurement in an effort to secure a broad foundation of support for greater investment in early education.

KEYWORDS

early education process quality measurement, affordability of kindergarten, policy sustainability, demand for high-quality early education, issue reframing, public awareness, parental voice voice or exit

Introduction

In 2014 the Trust for Social Achievement (TSA), a Bulgarian non-governmental organization (NGO) initiated a nationwide project (the Springboard for School Readiness project, or SSR) in collaboration with the World Bank to gain high quality evidence on the most effective way to increase kindergarten enrollment and attendance among children from disadvantaged minority (Roma and Turkish) communities. This first impact evaluation, carried out using a randomized controlled trial, proved that fees were a burden. Their removal resulted in the halving of non-enrolled children and a 20% increase in attendance (Huillery et al., 2017). A follow-on evaluation carried out in 2017–2018 showed that 3 years of regular attendance helped the most at-risk children from minority communities catch up developmentally to their less at-risk peers (Huillery and de Laat, 2019).

The SSR project (which ran from 2014 to 2018) and the two reports on it formed the backbone of an advocacy campaign initiated in late 2017 by TSA and its 23 partnering NGOs. In 2019, the government announced its intention to provide partial funding to municipalities that wished to remove kindergarten fees for children in the mandatory preschool age range[1]. This policy left the decision about which groups of children should benefit up to municipalities.

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1 Three years of mandatory pre-school are currently the law (ages 4−7) and kindergartens are the only early education institutions licensed to provide it.

A voucher scheme was approved starting in 2021 to compensate the high cost of private kindergartens for parents whose children were unable to secure a place in the free state system (Municipality of Sofia city, 2021).

Since that first legal amendment was adopted in 2020, Bulgaria has seen four parliamentary elections and cumulative inflation of 29% (National Statistical Institute, 2023). The COVID-19 pandemic and the war in Ukraine have also contributed toward shifting societal priorities. Yet somehow, the removal of kindergarten fees not only survived as a fledgling public policy; it doubled in scope (to include nurseries as well) and became universal starting in April 2022. A comfortable majority in Parliament voted to remove fees as part of the State Budget Act for 2022, this time legally preventing municipalities from charging any fees[2] (Parliament of the Republic of Bulgaria, 2020). The estimated value of the policy for the 9 months of 2022 exceeds EUR 50 million (bTV News, 2022). In total, at least 244,000 children annually will benefit[3]. Enrollment in preschool education was also included as a key indicator in the Strategic Framework for the Development of Education, Training and Learning in the Republic of Bulgaria (2021–2030) (Ministry of Education and Science, 2021).

Informed by high quality evidence, achieved through a thoughtful process of agenda setting, evidence collection, awareness raising and ally-building, and sustained through advocacy toward decision makers and the public, this policy places Bulgaria as a European leader, alongside Latvia, in affordable early care and education (European Commission/EACEA/Eurydice, 2019). What could possibly go wrong? These gains may not be as sustainable as they first appear, and they might not be sufficient to meet policy goals.

Cost of the fee removal policy

The World Bank's impact evaluation proved that removing the cost of attendance was the most economically effective way to increase enrollment, attendance and academic outcomes among Roma and Turkish children from disadvantaged communities (Huillery et al., 2017). Data shared with the Ministry of Education and Sciences (MOES) during the advocacy campaign projected that the total annual cost of removing fees for all children would be three times higher than the cost of removing fees just for children living under the poverty line and showed that residents of the capital city are not supportive of the removal of fees. Assuming that the government would not dare roll back social benefits once given to the people provides a false sense of security. The municipality of Targovishte removed kindergarten fees in 2015 (bTV News, 2015), only to have them reinstated in 2016 (Zname, 2016) when a different political party took the local seat of power.

Moreover, since impact was formally linked to enrollment, alternative policies to boost enrollment exist, such as investing in infrastructure expansion, making registration mandatory for 3-year-old children, or operating local intra-institutional action groups aimed at enrolling unenrolled children (first created in 2018). They are the primary government policies to reduce school dropout and non-enrollment

(European Commission/EACEA/Eurydice, 2022; Ministry of Finance of the Republic of Bulgaria, 2022), far cheaper than removing all fees for all children every year and likely to also carry political appeal.

Public perceptions of early learning

Kindergarten is still valued by society more so as a form of parental support than for its impact on child development. In a 2017 nationally representative survey commissioned by TSA, 63.1% of respondents thought that kindergarten fee removal would relieve family budgets, 60.7% thought that it would lead to increased attendance, but significantly fewer respondents thought that it would lead to improved school readiness (45.7%) and socialization skills (35.6%). The government (European Commission/EACEA/Eurydice, 2022) and the political parties (Bulgarian Free Television, 2021) emphasized the financial support for parents rather than the promise of improved outcomes. Viewing kindergarten primarily as an adult-oriented service creates the risk that should the policy be revisited for better targeting, "need" would be defined mostly at the (working) parent level, leaving out the most marginalized. Again, the history of fee removal in Bulgaria points to relevant examples (Vladimirov, 2018).

Improving quality to defend access

TSA's larger policy goal was to improve school readiness[4] nationally by increasing the participation in kindergarten by minority children from disadvantaged communities. The SSR impact evaluations register unsatisfactory advancement of Roma children in financial treatment groups after 9 months of attendance and negative spillover effects on less disadvantaged Roma children after 3 years of attendance, caused when kindergarten groups swell with many new highly disadvantaged children. Ethnic Bulgarian and Turkish children are not affected. These results speak to challenges with the universal quality of kindergarten and point to a need to improve service quality and its measurement, findings echoed by others (Open Society Institute–Sofia Foundation, 2020; World Bank Group, 2022). Providing free access is a critical step toward improving participation in kindergarten. For students from low socioeconomic status and those who do not speak Bulgarian at home, it takes a full 3 years of kindergarten attendance to see significant improvements in later academic outcomes (Gortazar et al., 2014; Mavrodieva, 2019). Greater efforts are needed to raise the quality of learning for each and every child. Further improving child outcomes – and their measurement – could in turn be used as an argument to defend the fee removal policy.

Encouraging the demand for high quality kindergarten services

At the same time, parents appear to lack a critical understanding of what a high-quality kindergarten service is – what they and their

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2   The Preschool and School Education Act (2015), The Local Taxes and Fees Act (1998), The Corporate Income Tax Act (2007) were amended.

3   Author calculations based on National Statistical Institute data. [Online] 2022. Accessed July 13, 2022 from www.nsi.bg.

4   TSA applies a holistic understanding of the term "school readiness" to include not just pre-academic skills but also and mostly life skills such as ability to socialize, self-regulation, curiosity, problem solving, approaches to learning.

children should expect to experience, see, hear, and feel when at the kindergarten. Yosifov et al. (2018) find that over half of parents of children in kindergarten rate the quality as "very good" or "excellent," while at the same time only a third assess discrete components of quality – such as the individualization of activities – as high. A discrepancy between reported satisfaction levels and true satisfaction as reflected in actual behavior of Roma parents has also been reported (World Bank, 2012). Parents appeared to misinterpret the quality of kindergarten services before the adoption of the kindergarten fee removal policy. In this new era of expanded access, will parents even have the motivation to expect higher quality from their local center and government? Research suggests that wealthy parents could exercise their extended options to exit the state system, and this would demotivate them from advocating for the improvement of educational quality, whereas those left behind would care more about the cost and supply shortages than the quality of the service (DiJohn, 2007; King, 2014). Supporting such an assertion is the 2021/2022 uptick in what was already an impressive growth rate in the number of private kindergartens, possibly owing to the new voucher scheme (National Statistical Institute, 2022).

A wider effort is needed to increase the public's recognition of the importance of early education and the importance of quality in early education. Such a strategy would not aim to replace direct approaches toward teachers and policymakers at various levels, but rather complement, enhance, and buttress current efforts by laying a broad foundation of public support for national reforms in early education.

Key strategic initiatives in early education remain on hold, such as the National Strategy for Early Childhood Development (Open Society Institute–Sofia Foundation, 2020) or the introduction of a performance measurement system. Early education is a declared national priority area and yet reforms have focused mostly on access, and even there, challenges persist (World Bank Group, 2022). Investing in the quality of public early education might be easier when an informed body of users demands this type of investment, in addition to accessibility and availability. Nudging demand for quality in early education could spur changes to its supply, given that supply-side policies have not prioritized quality (World Bank Group, 2022). It is hoped that this can be achieved in the context of inelastic demand for kindergarten services, as discussed below.

Reframe the role of early education

Stepping on scientific advances in the understanding of how human preferences form (Tversky and Kahneman, 1981), issue framing has been elevated over time as a critically important strategy for policy advocates wishing to gain the public's support (Dorfman et al., 2007). Using this approach, civil society could reframe the public's perception of early education as first and foremost a child service and a societal service in addition to an individual (adult) service. Shifting public attention from individual to public responsibility has proven an effective approach for several policy change initiatives, such as with tobacco (Dorfman et al., 2007) or climate change (Bolsen and Shapiro, 2017). From the results of the nationally representative survey commissioned by TSA we can infer that adults in Bulgaria have a weak belief that it is the kindergarten's responsibility to prepare children for transition to school, or at minimum that kindergartens are actually fulfilling this objective. Then logically they must believe that this is the parents' obligation, or that it falls to the parent, fitting well with a worldview of individual

responsibility (Dorfman et al., 2007). This cultural ideal is also reflected in the fragmentation of early childhood development services in Bulgaria (World Bank Group, 2022) and in how professionals view parents as the natural coordinators of care for young children (Yosifov et al., 2018).

Early education should be projected as an integral part of the lifelong learning process as this is not guaranteed to happen automatically. The very understanding of early education needs to be challenged to include the acquisition of socio-emotional competences, executive functioning, and approaches to learning. These competences are now codified in a national strategy for lifelong learning, except no effort has been made yet to "translate" them into practical teacher-level instruments (World Bank Group, 2022), let alone into concepts that parents can understand.

To successfully reframe the issue for the public, policy advocates should actively pursue the private sector, which can help shift the perception of early education from holding "value to the employer and the worker" to holding "value to the society, the employer, and the worker." The private sector has shown a fledgling interest in improving the quality of early education (Business Foundation for Education, 2020). Together, businesses and civil society can reimage the value of quality in early education, for example through initiatives such as media campaigns, product campaigns, and corporate environmental, social, and governance initiatives. To influence perceptions of early education, policy activists and researchers can arm the media with locally generated evidence about the impacts of high-quality early education and showcase real-life examples. Partnerships with businesses could also provide an appreciated combination of expertise to the state toward formulation of policies on taxation, investments, and education funding, as was the case in Romania (Ready Nation International, 2017).

Policy advocates should also try to reframe the public's visual associations relating to the quality of early education. Civil society organizations focusing on implementation of activities to support the improvement of quality in early education could have a significant role to play by promoting and replicating success stories and images that closer match actual service quality (creative cozy atmosphere versus clean and tidy spaces).

Strengthen "voice"

Hirschman's seminal 1970 book on how individuals respond to organizational decline posits that when dissatisfied with the public education service, individuals will either "exit" (through change of school or dropping out altogether), or "voice" their frustrations hoping to improve the situation (Hirschman, 1970). Hirschman identified extreme inelasticity of demand, as when services for young children are geographically dispersed or when there are too many children competing for each open place, as a strongly influential factor for "voice." He contended that the ultimate outcome would depend on the responsiveness of the system to either "voice" or "exit," at least in situations where quality is a multidimensional concept, that is, parents have heterogeneous understandings of what quality means. Supporting the assumption that Bulgaria's parents hold quality in education to be a multi-dimensional concept is the fact that the lack of Roma teaching staff is cited as a key reason for non-enrollment by Roma parents (World Bank, 2012) whereas almost three quarters of ethnic Bulgarians are estimated to not be comfortable with their child's teacher being of Roma origin (Simeonova et al., 2005). Systems with state-subsidized private

service provision where funding follows the child or student, such as Bulgaria's, would be viewed as incentivized to respond to "exit" behavior. Despite additional subsidies to kindergartens working with disadvantaged communities and a range of initiatives to promote parental engagement and inclusive education (European Commission/EACEA/Eurydice, 2022; World Bank Group, 2022), secondary segregation persists in both schools (European Commission, 2018) and kindergartens (World Bank Group, 2022), and attendance is historically low in both the capital city (Data for Good, 2022) and among Roma communities (Trust for Social Achievement, 2022).

Parents of children aged 2 to 7 (the possible range for kindergarten) are therefore already facing headwinds when trying to "voice" their dissatisfaction with the quality of early education. Continued migration to better quality life and educational opportunities has left many rural areas with a high percentage of socially and economically marginalized populations, mostly Roma, whose "voice" is frequently altogether missing. Within large cities, private enrollment is expanding (National Statistical Institute, 2022) with the help of the state (Municipality of Sofia city, 2021) and drawing away from the public system the most vocal advocates for quality. Those "squeezed" in the middle have little alternative to their nearest free of charge kindergarten, securing a place in which has in some locations been likened to playing the lottery.

Efforts to strengthen the capacity and expand opportunities to "voice" for parents of both middle-income and low-income backgrounds could include initiatives to inform, such as voter education activities or informing parents of specific elements of quality they could demand from their local provider (such as regularly reviewing and discussing the child's portfolio); or initiatives to engage, such as involving parents in the life and governance of the kindergarten or training community advocates. Expanding "exit" options – such as through the establishment of early education service in villages with even just a handful of children or by using available state funding for private kindergartens to alleviate the shortage of places in large urban ghettos – could also lead to a shift of parental priorities away from "access" and closer to "quality," further bolstering "voice." Admittedly, it is a difficult undertaking to focus the public's attention on quality when access is hampered by a shortage of places in large cities and increasing distances to the nearest kindergarten in rural areas (Junction Bulgaria, 2021), thereby greatly limiting parents' choices.

Nurture the early education system's capacity to respond to "voice"

Within the context of multi-dimensional quality, the way in which quality in education is measured, managed, and communicated to the public has been claimed to affect the incentives for the public education system to respond primarily to one or the other, "voice" or "exit" (Wilson, 2008). In Bulgaria, results from early education are measured mostly via input measures such as enrollment rates, number and qualifications of teachers, and staff to child ratios (World Bank Group, 2022). An attempt to introduce outcome measures – a standardized school readiness test – remains on hold to this day (World Bank Group, 2022). The concept of process quality, which unlike outcomes is free of input selection bias, has only just been introduced *via* the piloting of a national quality framework for early education and care (Ministry of Education and Science of the Republic of Bulgaria, 2022). Going a step further, process standards at the individual teacher level would describe the behaviors that best lead to, for

example, the individualization of learning approaches for each child (including use of teaching methods for second language learners), the maintenance of inviting rather than clean spaces, or the use of child-directed learning (Tankersley et al., 2010).

Measuring and rewarding process quality could allow the early education system to respond to the "voice" of all children and parents more effectively. Communicating measures of process quality to the public could raise the profile of the kindergarten teacher and thus bolster support for continued investment in the sector. Civil society can play an important role in sustaining such efforts, for example by piloting instruments for the measurement of process quality, training teachers in the use of process quality principles, promoting a diverse workforce, facilitating the transformation of kindergartens into self-improving organisms, and educating the public about the concept of process quality. Moreover, civil society can share its valuable advocacy skills with kindergarten principals and other early education government officials to increase the effectiveness of their own "voice" for reform from within the system. Research efforts can be directed to support the selection and evaluation of process quality indicators.

Conclusion

Recent policy advances in Bulgaria raise hopes of expanding access to early education to the most marginalized communities. Civil society can affect the long-term sustainability of access policies, as well as the supply of high quality public early education, by securing a broad foundation of public support for the importance of early education and the importance of quality in early education. This could be achieved by highlighting the value of early education to the child and to society, strengthening the capacity and motivation of parents to voice their priorities, and supporting the introduction and communication to the public of standards to measure process quality.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

EV was responsible for the SSR project implementation and advocacy efforts to remove kindergarten fees, and currently leads a variety of initiatives to improve the quality of kindergarten services at both the teacher and the system level.

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Monitoring, evaluation and accountability evidence use for design, adaptation, and scale-up of an early childhood development program in Rwanda

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Introduction: The first three years of a child's life are the most critical to child development and have an impact on the future achievement of the child. Young children's healthy development depends on nurturing care that ensures health, nutrition, responsive caregiving, safety, and security. Parents & other adult caregivers play a critical role in moderating children's early experiences, which has a lasting impact be it positive or negative on the children's future. Parenting education programs are proven to improve parental skills, capacity, and efficacy in a way that supports improved child development outcomes. Yet, most parents in low-middle-income countries such as Rwanda lack access to information and skills on how to support their children's holistic development. In response, Save The Children implemented the First Steps "Intera za Mbere" holistic parenting education project in Rwanda from 2014 to 2021. This paper reflects on how monitoring, evaluation, accountability, and learning (MEAL) approaches were applied throughout the project cycle and their impact on program improvement and national policy and advocacy. This paper explores how the aspirations for measurement for change, considerations for innovation uptake and frameworks for learning about improvement are reflected in this project.

Methods: The project utilized qualitative and quantitative MEAL across the program cycle. Action research at the start of the project identified promoters and inhibitors of high-quality nurturing care and program delivery modalities. The project utilized a randomized control trial to provide insight into components that work better for parenting education. Evidence from surveys done remotely via phones was used to inform COVID-19 adaptations of the program.

Results: The application of MEAL evidence led to the successful development and improvement of the program. At the policy level, evidence from the project influenced the review of the 2016 National Integrated ECD policy and the development of the national parenting education framework.

Conclusion: The regular use of evidence from MEAL is critical for program improvement, scale-up, and policy influence.

KEYWORDS

early childhood development, parenting, measurement, monitoring, evaluation, program adaptation, scale-up, evidence

1. Introduction

Globally more than 250 million children are not meeting their developmental potential due to a myriad of factors including lack of stimulation, poor health, and nutrition, exposure to violence in their homes, and humanitarian crisis (1). The first 3 years of a child's life are critical for brain development, physical development, and forming social and emotional skills (2). Young children, therefore, need a nurturing environment that comprises early learning, child protection, responsive caring, health, and nutrition quality services, and parents should be equipped to provide quality holistic ECD services to their children (3).

In Rwanda, the nutrition and development status of a child has been improving over the last 6 years but more still needs to be done. When the First Steps Intera za Mbere program started in 2014, the stunting rate in Rwanda was at 38% and this has now reduced to 33% as per the 2020 Rwanda Demographic and Health Survey (RDHS). But, young children in Rwanda are still faced with many challenges including limited stimulation and early learning support at home. In the RDHS 76% of children aged 24 to 59 months were found to be developmentally on track in at least 3 of 4 core domains of child development although only 12% were found to be on track in literacy and mathematics, which are foundation skills for later learning. Children living in urban areas and children from wealthier households were found to be more likely to be on track implying issues around equity. In terms of access to play and learning materials, only 2% of children under 5 were found to have 3 or more picture books at home, and only 36% of children aged 0–59 months had engaged with an adult household member in four or more activities that promote learning and school readiness 3 days prior to the survey (4, 5). This indicates low stimulation and opportunities for learning in the home environment.

In response to these challenges, in 2014, The First Steps "Intera za Mbere" (FS) project was innovated, designed, and implemented in the western province district of Ngororero. In 2018 it was scaled up to 3 more districts, Kirehe, Gasabo, and Ruhango. The project aimed at offering a nationally scalable and holistic approach to parenting education that was integrated within the Rwandan government structures, combining radio programming with community-based peer learning groups, and collaborating with local publishers and entrepreneurs to increase parents' access to emergent literacy materials. The project also had an ambitious policy and advocacy agenda to ensure that the enabling environment for nurturing care was improved and sustained through favorable policy actions. The ambitions for scale and sustainability required merging learning and implementation science approaches to capture what works or does not work, how it works and other factors necessary for innovation uptake as proposed by Danika (6) and Bauer et al. (7) and other implementation scientists exploring the systematic uptake of research findings and other evidence-based practices (EBPs) into larger systems.

2. Context

Prior to 2014, the focus on the National 0–3 Early Childhood Development (ECD) agenda was limited to mainly health and nutrition. The 2011 Early Childhood Development Policy emphasized early learning for children above 3 years, with limited to no recognition

of cognitive development and early learning from birth (8). Advocacy including from Save the Children led to a shift to holistic development for the 0–3 age with a focus on early learning and stimulation. The latest 2016 National Early Childhood Development policy overseen by the Ministry of Gender and Family Promotion (MIGEPROF) recommended interventions that support a child's whole development from 0 to 6, with parenting education as a key pillar. The government has since then accelerated efforts to implement the policy in collaboration with partners.[1] Save the Children has positioned the First Steps intervention as a source of learning and evidence on what works best to implement the parenting education pillar of the policy. The target population for First Steps is expectant parents and parents with children aged 0–36 months.

3. Key programmatic elements

First Steps "Intera za Mbere" is a radio-supported holistic parenting education program targeting male and female caregivers of children aged 0–3 years old. The program aims to improve nurturing care practices, child development, and learning outcomes, and increase emergent literacy promotion in the home. Typically, parents attend 18 structured 60–90-min parent group sessions run by a trained parent facilitator. Seventeen of the 18 sessions include a radio listening session which is preceded and followed by facilitated discussion, reflection, demonstration, and practice of key nurturing care behaviors such as singing, reading, talking, telling stories, and playing with children. Parents are requested to attend the session together with their children which gives them an opportunity to play and practice simple games that support children's development.

A distinct aspect of the radio program is that it addresses male engagement through the role model of a father whose character evolves over the course of the drama, from a skeptic into a loving, nurturing, playful father. A light touch home visit component was also piloted in the project.[2] The project was implemented from 2014 to 2021 by Save the Children and a local Non-Governmental Organization (NGO) implementing partner Umuhuza. In 2022, the project underwent iteration to focus on system strengthening at scale as discussed below. The First Steps project was implemented in 4 districts, however, as part of the scale-up strategies NGO partners such as Help a Child and A Partner in Education (APIE) were given access to the parenting education tools for use in other locations. The radio program was broadcast throughout the whole country during the COVID-19 period when face-to-face gatherings were limited. So, this means that some program elements have scaled nationally.

On the journey to scale, First Steps utilized monitoring, evaluation, accountability, and learning (MEAL) approaches, and human-centered design principles to allow evidence and learning from program implementation and evaluation to shape every stage of the program cycle. Evidence and learning from the program were also used to influence national-level policy, practice, and advocacy. Both qualitative and quantitative methods were used to gather program learning and

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1 MIGEPROF (9) Early Childhood Development (ECD) Policy.

2 A light touch home visit program included 2 structured home visits per family during the course of 17week parenting program.

evidence. Over 6 years, the program went through several distinct phases punctuated by periodic "pause-reflect-action" cycles that allowed the program to continually apply measurement for change principles and aspirations. The distinct phases and key activities are discussed below.

3.1. Action research and human-centered design- 2014

First Steps was launched in Ngororero District of Rwanda in 2014 and the first phase was devoted to action research, engaging community members in identifying promoters and inhibitors of high-quality nurturing care among parents of children aged 0–3. Parents and parent trainers also provided feedback on the appropriate materials for training, length of training, home visits, and other program inputs. Initially, two blended curricula, "Child I Care" from Umuhuza and First Read 0–3 from Save the Children were used to pilot and learn what works best in parenting education in this setting. "Child I Care" emphasized social–emotional development while First Read had an emphasis on early learning and stimulation. The two curricula were blended to form a 13-week-long pilot parenting program. The purpose of this phase was to learn from parents and parent facilitators what worked well or did not work in terms of the delivery of parent sessions, materials needed, and relevance of topics to parents' needs. Volunteer parent facilitators managed by Umuhuza carried out parenting education sessions and home visits weekly and documented their experiences. The facilitators had reflection forms with guiding questions that they had to fill out after every group session and a home visit. In addition, the Save the Children ECD technical lead together with MEAL personnel carried out session observations and led bi-weekly facilitators' group reflection. Two cohorts of pilot parent group sessions were run with 800 families in two sectors of the Ngororero district. In addition, focus group discussions were held with both parents from the pilot sites and parents from other sectors not yet reached with parenting messages to understand the existing nurturing care practices, gaps in nurturing care among both male and female caregivers, as well as preferred modalities of receiving parenting messages. Both parents and facilitators recommended having one harmonized curriculum and they recommended priority topics based on what they understood to be gaps in their parenting knowledge. They also recommended having visual posters for parent group sessions and printed take-home materials. Through community consultations, the design team also noted the high interest in soap opera radio drama for passing social behavior change messages. Parents noted that they enjoyed an existing popular soap opera called Urunana. Parent facilitators provided feedback on home visits and suggested a reduction of required home visits per family to reduce the burden on volunteers. At the national level, a political economy analysis (PEA) and stakeholder listening session done as part of a larger 0–9 Advancing the Right to Read PEA study conducted by Save the Children, also provided insights into enabling factors that were needed for success including an ECD policy revision with emphasis on the thus far neglected 0–3 age range and challenges of 0–3 ECD front line workforce.

Based on this learning and feedback, a holistic parenting education curriculum and training materials including a 17-session radio soap opera program were developed. The radio program served a dual purpose of passing messages to parents while also reducing message dilution that normally comes due to cascade training

modalities such as what was being used in the program. In early 2015 the new First Steps "Intera za Mbere" curriculum and materials were tested, refined, and validated. Feedback from the field in Ngororero was combined with feedback from national level stakeholder consultation to refine the program tools for the proof-of-concept phase. Save the Children also began intensive policy and advocacy on investment in parenting education and support for parents of children birth to 6 years. Advocacy and policy materials including a strategy and a parenting education advocacy brief were developed and utilized at all levels of change from local to national level.[3] This phase was marked by all Measurement for Change (M4C)[4] aspirations especially being people-centered and inclusive.

3.2. Proof of concept phase, 2015−2016

From 2015 to 2016, the program entered a proof-of-concept phase focused on determining the most feasible, cost-effective, and scalable approach to delivering parenting education. A Randomized Control Trial (RCT) was conducted with two modalities of interventions and a control group; *Light intervention* characterized by: 3.5-day training for a local volunteer, a basic package of materials,[5] and parenting education sessions supported by radio; *Full intervention* characterized by all light touch inputs, plus the provision of an enhanced package of materials[6] and additional training for the volunteer on how to use them; plus a salaried area facilitator supporting the local volunteers in guiding group sessions and conducting home visits; *Control group* receiving no support during the active implementation period. However, the control group received the light intervention package after the research period concluded. The RCT baseline confirmed the urgent need for investments in parenting education and early learning interventions from birth as children showed a declining ability to meet age-appropriate developmental benchmarks as measured by the Ages and Stages Questionnaire (ASQ), especially for communication and problem-solving which are predictive of later academic success. The end-line results revealed that children in the intervention group outperformed their peers in the control area. The evaluation also found that the frequency and quality of parental play and learning activities were correlated with children's developmental outcomes.[7] In addition, to the RCT, Save the Children continued to collect data on the implementation to understand what was working or not working in program delivery. Learning from this phase was used to adjust the

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3 https://rwanda.savethechildren.net/sites/rwanda.savethechildren.net/files/library/Parenting%20Education_Literacy_Position%20Paper_2014-07-18_0.pdf

4 The Aspirations for measurement for change (M4C) set forth by Krapels et al. (8) include recommendation on building monitoring, evaluation and learning systems that are Dynamic; Inclusive; Informative; Interactive; and People-centered.

5 Basic package includes: parenting curriculum guide, parenting session posters, 15−20 radio sessions.

6 Enhanced package includes: parenting curriculum guide, parenting session posters, 15−20 radio sessions+ take home cards for parents, access to a cell level book bank.

7 Abimpaye et al. (9) improving Parenting Practices and development for young children in Rwanda: Results from a Randomized Control Trial, Int J Behav Dev. Doi: 10.1177%2F0165025419861173.

delivery model including the shift from utilizing trained parents as volunteer parent facilitators to utilizing the newly formed government cadre of social worker volunteers called Inshuti z'Umuryango (IZUs) / Friends of the family commonly known as IZUs[8]. Adaptations were also made to the peer coaching and mentorship model and required home visits per family were reduced to two per family in a 17-week period to match facilitator workload demands. A practical session on cooking demonstration was also added as per demand from both parents and facilitators. The curriculum was also updated further to add more age and culturally-appropriate games for children aged 0–3 years and increase the understanding of community volunteers on 0–3 playing activities to include during the face-to-face parenting session. Beyond Rwanda, the learning from the project was shared within the Save the Children movement and contributed to the development & refinement of Save the Children's 0–3 Building Brains Common Approach.[9]

3.3. Transition to scale (TtS), 2017−2019

In 2018, a follow-up RCT measured the medium-term impact of the intervention on children and parental outcomes 24 months after the intervention. Again, parents and children who benefited from the intervention continued to outperform their peers from the control group suggesting the midterm to long-term impact of the intervention on parental practices and children's developmental outcomes.[10] Implementation research data was collected to inform national scaling-up plans. A component of the follow-up study was to understand the benefit of sharing evaluation results with parents via accessible video media. Through this follow-up study, the team learned about the value of the radio program as parents continued to rank radio listening as one of the most important elements of the intervention. The team also learned about the benefits of sharing results with the parents in increasing parental confidence and efficacy. When parents heard that their simple actions such as singing and talking were leading to improved outcomes for children, they did those actions even more. However, the results from this study also revealed that caregivers were not making strong gains in applying positive discipline strategies in comparison to the application of strategies that support early learning, nutrition, and health. Therefore, the team made a decision to once more update the curriculum to mainstream positive discipline into all 17 structured sessions in addition to maintaining the topic as a stand-alone. Practical and age-appropriate positive parenting messages and strategies were shared at every parent group meeting, as well as gender messages to emphasize the role of both parents in child development. The detailed results from the follow-up RCT are shared in another paper (12).

First Steps entered the transition to scale in mid-2019. The 24 months long TtS phase intended to test if the program could

be implemented in new geographical areas (including both rural and urban settings) with similar gains and to collect implementation science data to inform national scale-up plans. The program was implemented in Ruhango, Kirehe, and Gasabo Districts in October 2019 with minor modifications to the treatment conditions of the previous phase and following an RCT design. The parenting sessions, home visits, and parent support activities were carried out by IZUs, in line with learning from previous phases. Working with this existing government structure was one of the sustainability strategies of the program. During this period, as part of scaling strategies, via a signed Memorandum of Understanding (MoU), Save the Children also shared the technical tools with NGO partners Help a Child and A Partner in Education to implement within their own programs. These partners met annually with Save the Children and Umuhuza to reflect and share learning from implementation and contribute to decisions on the program improvement. This phase especially exemplified the M4C aspiration of being dynamic and informative.

3.4. COVID-19 adaptation and national scale up, 2020−2021

Interruptions due to COVID-19 led to adaptations and changes to the design of the program to allow delivery amid COVID-19 meeting restrictions. COVID-19 meant that it was no longer possible for the community volunteers to convene caregivers for weekly meetings. Prior to program adaptation a COVID-19 baseline survey was conducted to understand the parenting needs, parent attitudes, and practices after the first national lockdown. The survey especially aimed to capture any impact of COVID-19 on the home environment and parents` access to different remote delivery technology approaches. Phone-based interviews and, in some cases, face-to-face consultations were conducted with IZUs to gather their ideas on how to adapt the program to the new reality. Based on the results from this remote rapid evaluation the radio content was expanded to include a stronger emphasis on mental health and self-care, father engagement, gender, inclusion, and COVID-19 prevention and health. Radio became the primary delivery modality replacing face-to-face group meetings. The pandemic also made support to parents an even greater need than before which prompted the decision to make the radio component of the program available to all parents in Rwanda. Thus, the Radio component went to scale reaching all villages in Rwanda from October 2020. In the 3 districts of Gasabo, Ruhango, and Kirehe parents also received phone-based counseling and home visits when movement restrictions were eased. Coaching and mentoring of IZUs was also done remotely via phone. In addition to that, MoU technical partners like Help A Child encouraged and supported their beneficiaries to access and utilize the radio parenting sessions and COVID-19 parenting tips during the lockdown period. Key measurement for change activities, loops and decisions are summarized in Figures 1, 2.

3.5. Next steps for sustaining the intervention at scale, 2022 and beyond

Since the launch of the revised 2016 National Early Childhood Development Policy, there has been major efforts to create an enabling environment for nurturing care including the creation of the National

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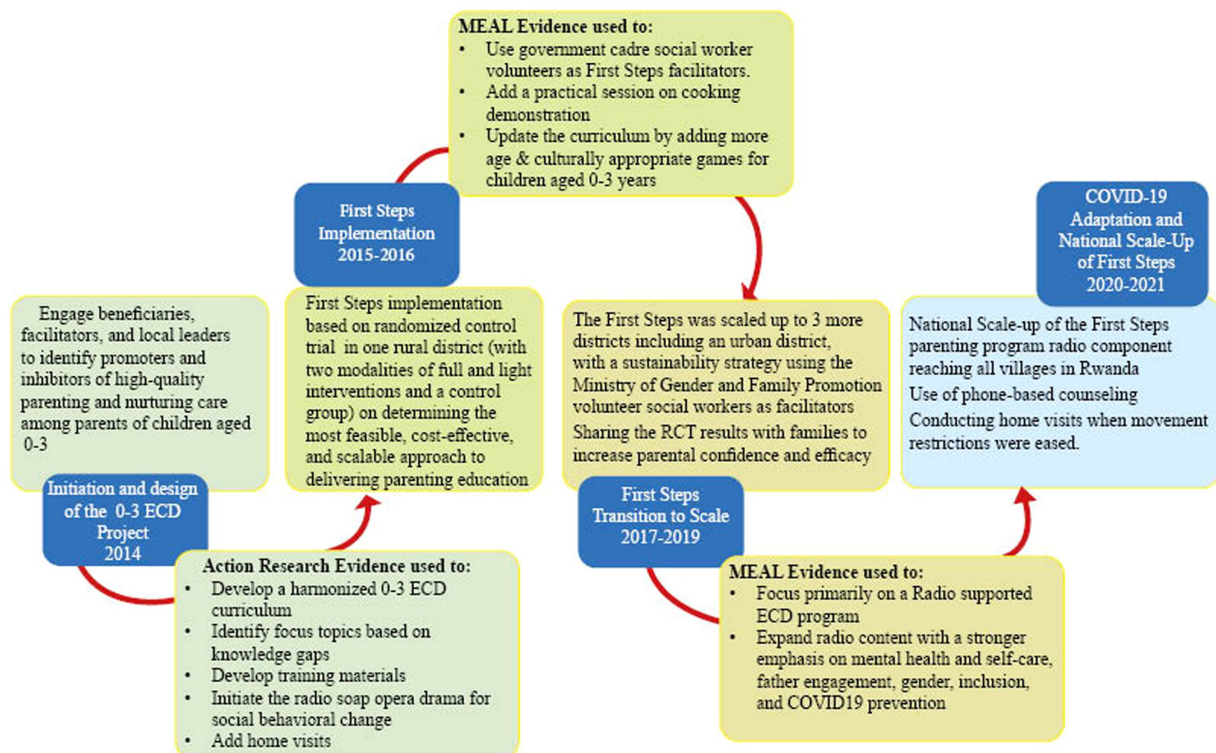
FIGURE 1
First steps "Intera za Mbere" measurement for change loops and decisions.
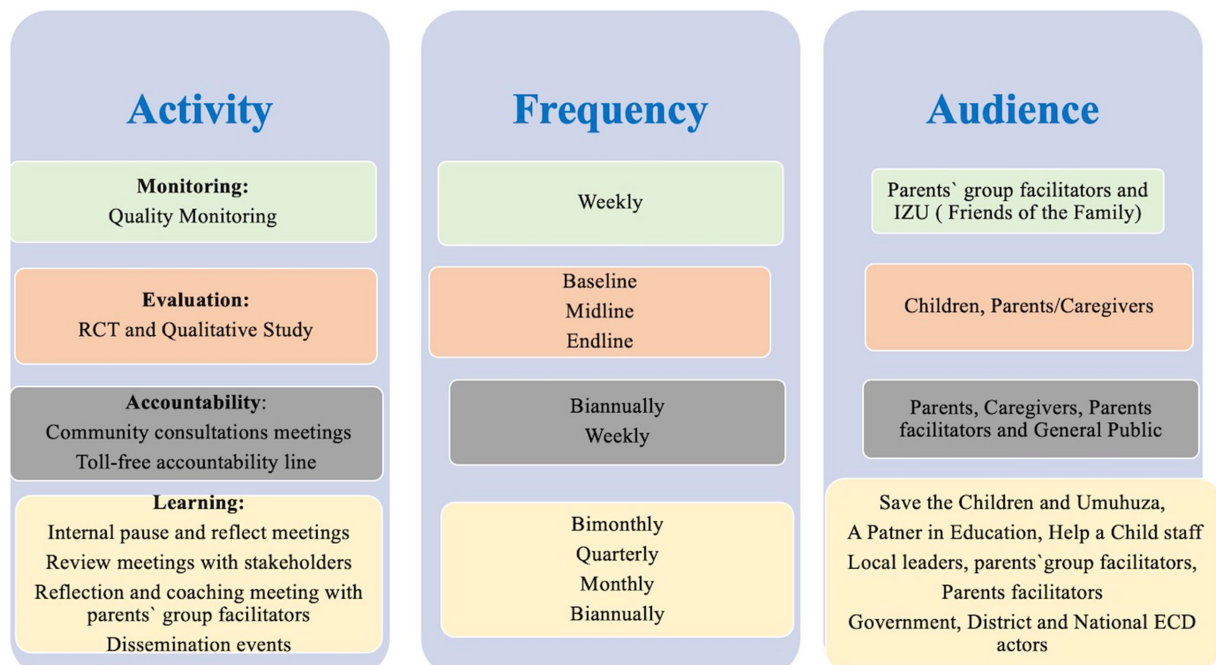
FIGURE 2
Key first steps "Intera za Mbere" monitoring, evaluation, accountability and learning (MEAL) activities.

Child Development Agency (NCDA) to oversee policy implementation and multisectoral coordination, and the expansion of IZUs terms of reference to include ECD. GoR and its partners have jointly developed the national parenting education framework. However, there is still work to be done to understand what works well in terms of building the capacity, skills, and efficacy of front-line workers such as IZUs and as

well as scaling and sustaining parenting education and support for female and male caregivers/parents, as a key step to operationalizing the parenting education framework. There is a need to address gaps around ECD frontline work capacity and incentives. There is also a need to enhance the involvement of community leaders in the implementation of ECD activities at the community level. Evidence and learning from projects such as First Steps "Intera za Mbere" can bridge the gap in knowledge on how to maintain quality and fidelity of implementation at scale through existing government mechanisms.

4. Discussion on practical implications, lessons learned for future application

4.1. Embedding measurement for change principles across the project cycle

Embedding measurement for change principles and designing the project around an adaptive learning agenda allowed First Steps to have MEAL approaches owned and led by all project staff and not just the "MEAL experts." MEAL was positioned as an integral part of the project and the responsibility of everyone including project managers, beneficiaries, partners, and all other stakeholders for a continuous quality, context-adapted, and improved implementation. We learned that for a productive and quality execution, all stakeholders need to come together through both planned and unplanned opportunities to express their views and influence decision-making across the program cycle by discussing, deciding, and working together during a needs analysis, design, implementation, monitoring, evaluation, and advocacy. Allowing for diverse voices made the program agile and responsive to the needs of stakeholders during the different changes in the implementation environment. This outlook is a necessity for similar projects wanting to make and sustain changes at scale.

4.2. Honoring and centering community voices

First Steps team placed an emphasis on the community voices to shape decisions and allowed the voices of parents, parent facilitators and other community members to shape the design and continuous improvement and this is one of the reasons behind the success of the approach. We learned that accountability including collecting and responding to feedback from users/beneficiaries will always be essential at all stages of the project cycle to ensure that the project implementation and design is improved and the intervention considers and accommodates the needs of its end users including their literacy levels, culture, abilities, preferences etc.

4.3. True and equal partnership

One of the key lessons from First Steps is the importance of working in partnership and allowing equal participation and voices of all partners. Save the Children's implementing partner Umuhuza was involved in all decisions including on the technical content and participated in reflection and learning meetings to shape the future of

the intervention. MoU technical partners such as Help a Child and A Partner in Education were also included in annual "pause, reflect, action" cycles. Quarterly reflection with the government at both national and local levels also allowed the project to respond to feedback and align with changes at policy level. We learned that Partnership is a key ingredient of a good measurement for change system.

4.4. Staff psychological safety and measurement for change

Our experience in embedding measurement for change principles in a project reveals that staff psychological safety is key to the fulfilling measurement for change aspirations. Staff need to be confident and free in sharing and reflecting on what is working, what is not working, what needs to change and what needs to be added to the intervention. Staff also need to be confident that this open sharing will not have negative repercussions for them, buy into the idea of measurement for change and develop a learning culture. In our case, this was encouraged through what was called the Sharing, Quality, Interactions and Discussions (SQUID), an internal Save the Children and Umuhuza mechanism for learning, reflection, and ideation. At its peak, between 2014 and 2018, staff met monthly for a SQUID meeting where learning, reflection, ideation, dreaming, reflection, and self-critique was not only encouraged but celebrated in a psychologically safe environment.

4.5. Combining qualitative and quantitative methodologies

A key learning from our experience is that it is important to combine both qualitative and quantitative data collection methods to inform decision-making. There is a lot of implementation science data, that can only be collected via qualitative methods, yet it is critical for capturing mechanisms of change to explain how and what is working in an intervention. Similar interventions need to embed this in design including intentionally planning stakeholder listening and reflection sessions.

4.6. Linking MEAL and advocacy

Our experience also taught us that it is critical to link MEAL and advocacy to achieve sustainable change. The evidence from MEAL processes should be used to continuously shape the advocacy messages over time. Evidence including from implementation is critical for providing evidence-based solutions to policy implementation gaps and in providing tools and learning on what works to inform policymakers and partner actions.

5. Acknowledgment of any conceptual or methodological constraints

Radio programming was one of the key elements of our program however, it was difficult to fully control contamination between intervention and control areas. For this, initially, the program was

broadcast at a specific time (days and hours) which was known only to the families in the intervention group. In addition, we used the least listened-to radio station among 17 covering Ngororero district, based on our baseline assessment which successfully decreased contamination. 15% of participants in the control arm reported having listened to the radio and this spillover was controlled in the analysis. During the TtS phase in Ruhango, Gasabo and Kirehe the approach used was the same and a few families in a control group listened to one or two radio soap operas but not regularly enough to affect the results. The endline assessment showed that the intervention group had greater gains in parental practices and child outcomes.

Monitoring data also showed that some challenges were encountered in the first few weeks of implementation in 2015 but these were quickly addressed through course correction activities. For example, a few weeks after the start of the 2015 RCT, full and light interventions had a small difference due to logistical constraints in accessing books and other inputs. The importance of good logistical planning was noted for future programming and also this limitation was noted in the 2016 RCT end-line study report (5).[11]

In regards to advocacy, it is always important to recognize that advocacy is done in partnership with others so although Save the Children played an influential role in shaping policy around 0–3 ECD, it was in collaboration with other partners including the members of the Rwanda Education NGOs Coordination Platform (RENCP) ECD Working group, Imbuto Foundation, and UNICEF.

Data availability statement

De-identified data, reports and tools supporting the conclusions of this article will be made available by the authors upon request.

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[11] https://resourcecentre.savethechildren.net/document/saving-brains-first-steps-0-3-program-rwanda-endline-report/

Ethics statement

The studies involving human participants were reviewed and approved by the Rwanda National Ethics Committee (RNEC). https://www.rnecrwanda.org/. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

CD and MA contributed to the conceptualization, design of qualitative and quantitative studies, writing, and visualization. NK and MU contributed to the review of the drafts. All authors contributed to manuscript revision, read, and approved the submitted version.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Realising distributed leadership through measurement for change

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Through a systematic reflection on the journey that transformed traditional state-run baby homes in Tajikistan from closed institutions into community-oriented Family and Child Support Centres (FCSC) we reveal key moments of change. This review describes how community consultation with local participants in a development project shifted responsibility and accountability from international to local ownership and how distributed leadership contributes to the decolonisation of social services. Based on these interviews we ask, 'How do the innovations of a social development project become a fixed part of normal local social, cultural and political life; and, how do we know when a new normal is self-sustaining at a local level?' This analysis builds on a network-mapping tool previously described in this journal. Our interviews show that each participant has taken a non-linear journey, building on the networks previously described, under the influence of activities and discussions that emerged throughout the project. We consider how a monitoring, evaluation, and learning process should be responsive over time to these influences, rather than be set at the start of the project. Using the themes that emerge from participants' journeys, we apply a 'measurement for change' (M4C) approach that integrates Monitoring, Evaluation and Learning (MEL) into decision-making. The journey framework applied represents a systematic application of the M4C approach that gives us insight into where local ownership is responsible for the sustainable management of the intervention, and where continued partnership will further strengthen impact and accountability. The exercise has provided evidence of progress towards decolonisation and of the centring of local priorities in MEL and implementation processes.

KEYWORDS

responsibility and accountability framework, scaling, paradigm change, decolonisation, measurement for change, monitoring evaluation learning, deinstitutionalisation, vulnerable children

Introduction: starting point of the journey

The journey encompasses two dimensions of decolonisation. First, that of cultural and organisational change that reflects local values and moving away from the institutional practises and policies of a former coloniser. Second, the reconstruction of decision making around local accountability and responsibility, moving away from the domination of colonial ideologies determined by Western thought and approaches. The first dimension addresses the legacy of institutional state-centred care from the former Soviet Union. The second involves taking down the ideological and financial scaffolding framed by an International NGO. The challenge of decolonisation we address is the understanding of effective turning points in the transformation from external to local control.

In this paper, we describe the journey of change in Tajikistan from a Soviet model of institutional childcare to a family support model. The journey was rooted in best international professional practises, facilitated by a collaborative programme, Putting Families First (PFF). Using the conceptualisation of a journey we explore how a system involving families, professionals and government becomes locally owned and how information gathering places the local perspective at the centre of the process of change. We document evidence of the transition and describe actions that will continue the journey of scaling effective and sustainable family based support.

In Tajikistan, recently independent from Soviet governance, it remains common for children to grow up in extended families, where fathers take most decisions and fathers' mothers (mothers-in-law) retain a strong influence over daughters-in-law and grandchildren. Family centred support is therefore a more traditional model than that imposed in the Soviet era, when children in need were cared for in institutions, known as Baby Homes. As a low-middle income economy many adults, particularly men, emigrate for Russia to seek employment, and absent parents can leave families struggling to meet the needs of their children. Support systems have provided limited resources directed at child protection and family support, either from the state or other entities. The process of transition from an institutional to a family support model here described is a continuing process.

Under a centralised institutional system of child support, accountability and responsibility for care is taken from the family and given to a very narrow group of actors. Centralised decisions about children are remote from the family unit and filtered through multiple administrative levels resulting in a slow processes of change led by fixed requirements of the service, not the needs of the child. The initial theory of change for PFF, developed as a collaboration between INGOs, funding partners and local service providers, was directed at broadening the accountability and responsibility framework and for decisions to be more child and family-centred. It recognised that changing from centralised support to family centred care requires change throughout the system, which Meissner refers to as 'Alignment' (1). The goal was, is, to return the central role of childcare to the family supported by services that create shared accountability and responsibility. Gaining national and local government support for this transition, and parental trust in new support structures was crucial and a primary focus of activity in the process of transformation.

We review the changing structure of the decision-making process using the approach of Measurement for Change, M4C (2, 3). M4C highlights, through five overlapping and interconnected aspirations, key components of information systems that build effective decision-making, by making data accessible to, and useful for, all participants in the network of practise and support. We also reflect on the contribution the PFF journey makes to the wider understanding of decolonisation and the central role that data play in establishing local ownership and local relevance. Progression from one stepping-stone to the next on the journey has been marked by moments of realisation, the 'А бача! (*A bacha*!)', a Tajik expression of surprise and delight

when an idea or concept emerges and makes sense in context. In this paper, we discuss the pathways and the *A bacha*, through which the rights and needs of children are met locally. Like the Silk Road, these pathways are networked, multi-faceted and change over time (4).

Monitoring and evaluation using M4C

Methodological framework

Integrated into the journey towards sustainable and effective delivery is the transformation of decision making from a top down hierarchical process to one that reflects distributed responsibilities through shared accountability. The foundations of this approach are closely aligned to Parker-Follet's conception of integration and collaborative, shared leadership (5). These conceptualisations have continuously emerged and re-emerged in organisational, management and leadership theory since first being published in the 1920s (6–8). In the process of decolonisation M4C embeds the principles of Diversity, Equity and Inclusion[1] into the collection and use of information.

Information plays the key role of drawing the network of participants into the conversation on design and implementation. Diversity means the drawing on multiple sources; Inclusion, the recognition of multiple perspectives, and Equity, the attribution of comparable weight to different values. The opportunity to contribute and participate in information based decision making stimulates the transformation. At the heart of this transformation in PFF lay building the capacity of the implementing partners to monitor, evaluate, and learn. Aligned to the M4C aspirations, an MEL system that applies the principles of shared listening and learning using participatory methods was key to achieving this objective. Experience was created in partners of information collection and utilisation methods that are consistent, rigorous, systemic, feasible, and supply useful information in context (4).

Objectives

The focus of this paper is the process of reflective practise applied post-external funding to uncover the key components of the programme that held value over time. We were interested in clarifying what is happening now, and how this relates to the turning points. This stage of reflection builds on the experience of information gathering from earlier stages of the journey, an example of which involved participants in mapping the ecosystem of support for childcare. The details of this exercise are shared in an earlier publication (4). The exercise identified systematic consultation as a valued process as well as three key areas of action: (1) Regular consultation. Discussion sessions to share experiences and learning between the families and support services, and across families, to build trust and networks of support; (2) Targeting fathers. Bringing fathers more intentionally and directly into the Family Centre services to strengthen the childcare

1 https://thedecisionlab.com/referenceguide/organizational-behavior/diversity-equity-and-inclusion-dei downloaded 25.5.23

system; (3) Directed support for mothers with restricted support networks. The triangulation of data from mapping, systematic Observations of Mother Child Interaction (9), and case management notes, guided support staff to stimulate positive bonds between the more isolated mothers and their children.

Process and tools

We here describe uncovering the experience of the readiness of component activities to scale, the capacity of the information system to improve the delivery of quality nurturing care (10), and the shift towards local responsibility and accountability. We report on an interview-based structured reflection process applied in a series of individual in-depth interviews.

The interview process itself was developed in stages. The parameters of interest were clarified by the authors (JW, NM and PH), who also listed potential questions relevant to a conversation around opportunities, responsibility and accountability. These were refined through an initial interview to focus on stimulating individual reflections without being overly prescriptive around the themes and topics that might emerge. The questions/prompts asked were:

From your point of view, how is the project ready for scaling up?

How can you determine that the project is ready for scaling?

What lessons have you learned from the funded project?

How important is partnership in the development and effectiveness of the project?

What changes have occurred as a result of the funded project?

What tools would you recommend using in a new project?

In which areas of life do you think Children With Disability are not fully included or given opportunities?

What is the area where you ultimately hope to see change?

Permission to carry out the cycle of evaluation came from the Ministry of HSPP (in full) as part of their ethical overview. Interviewees provided individual consent to participate, having been informed of the purpose and process of the reflection. Personal identifiers were kept separate from interview scripts.

Study sample and sampling

Interviews were carried out by author NM, who also took responsibility for identifying the respondents and recording the data. These were carried out with service providers, as, in light of discontinuity in funding, and with key decision-making moments falling outside the funding cycle, we were unable to include reflections from across the whole network of support in one step. The perspectives of Hayot dar Oila and Sarchashma, the two NGOs who manage the development and delivery of the family based services, were each represented by four respondents. These eight interviews included three managers (NR, ZN2 and UE) and five service providers (ZN1, FB, DM, SS and ZP). Two additional respondents represented the perspective of the Baby Homes, now re-fashioned as FCSCs. In Dushanbe the respondent was a social worker (FB), and in Khujand the Director (SS), both had been with the project since its inception in 2006. Respondents were selected to represent the breadth of experience of those who had been on the journey during the development and implementation of the PFF programme.

Analysis

The information was collected, reviewed and fed-back in the original in Russian and Tajik. English translation of the material was only completed to support discussion amongst the authors in the development of a summary framework, and to share key examples with the readers of this paper. The subsequent interviews were harvested for the *A bacha*, the reflections that bring learning of the impact on participants and the system of support. NM carried out the initial review of responses. The initial grouping of responses was discussed with JW. The thematic organisation of examples was then reviewed by PH, and any suggested changes discussed with the other authors prior to production of a final summary list.

Once individual themes were extracted a journey metaphor provided a framework to display and discuss the characteristics of change that emerged through the conversations with respondents and between the authors. The methodology itself developed out of team reflections on individual children's life journeys, in which key events and experiences can be linked to changes in the direction of a child's development. Here, we have adapted this idea to track observable changes in the system of support. The journey of PFF is described through relating shifts in accountability and responsibility to emerging influences, related events, and their consequences, pursuant to each project milestone. The intention is to reveal how decision-making, ownership and data sharing has changed over the course of the life span of the intervention.

Results: the learning

Reflections and the *A bacha*

The reflections shared in Supplementary Figure 1 are drawn from 10 interviews carried out in 2022. All respondents were female.

The reflections illustrated:

Changes in the system of support: in resources available, access to and utilisation of services.

Changes in responsibilities/relationships: growth in self-awareness, confidence, trust, job satisfaction and professionalism.

Changes in accountability: in the use of information to monitor, evaluate and learn.

Scaling the system: current gaps and recommendations to build future steps.

Interviewees told us that, through this project, they came to understand that institutional care is harmful for children and that a model of care that emphasises both social and medical support is effective. Their motivation for change grew from a combination of knowledge and understanding of early child development, the experience of changes in practise and the building of trust within the network of support. All interviewees commented that they now worked more closely with other professionals, indicating a move towards group responsibility for child and family care. Equally, they observed a greater inclusion of parents in therapeutic care and a transfer of responsibility to parents for meeting the daily needs of the children.

The evidence base and the collecting and using of data were central to the process of building trust. The tools they used for measuring change and evaluating needs gave them the information

they needed to target and improve their services. We also heard that information from monitoring and evaluation was used to explain to senior decision-makers the value of the project innovations. Initially strongly influenced by the requirements of external funders to report on progress and impact, the implementation team developed a growing awareness of the value of information in guiding forward planning to meet individual needs as well as to influence wider policy and practise.

The journey, summary narrative

The journey is set out in Table 1 where time-related markers are associated with influences, events and a description of the consequences of each event alongside the progressive handover of responsibility and accountability.

The journey towards community supported child care in Tajikistan began in 2006 when the Dushanbe City Health Department asked an INGO, HealthProm, to identify alternatives to supporting children in need in baby homes. The PFF collaborative programme facilitated the transformation of child support from a Soviet-legacy institutional model into a family care model that reflects traditional Tajik values. As can be seen from Table 1, the Journey has covered an extended period, not consistently supported by external funding. It started with the essential foundations of partnership building across government and non-government agencies, introduction of innovative social work and therapeutic professional practises.

Until 2007, disabled people received mainly a medical model of care. Such services as occupational therapy and physical therapy began to be introduced for the first time in the post-Soviet space through this project. On the site of the first baby home, the first early intervention centre was opened with the support of HealthProm. In 2011, with funding from the European Union and United Kingdom Aid, technical assistance was provided to expand skills and develop policy and practise in social protection. The project began to introduce tools to assess changes in the development of children. In 2017, this process became more structured under the funding of Grand Challenges Canada, with the introduction an MEL system guided by M4C.

Self-awareness, confidence, trust, job satisfaction and professionalism all built slowly over time. Thirteen physical therapists and 15 occupational therapists were trained under PFF to move beyond the provision of massage and electrical therapy. At the beginning, it was difficult for innovations to be accepted. There was little trust in the relations between therapists who provided new improved services and the doctors in medical services. However, the positive results arising from PFF have changed the attitude of doctors. Doctors began to refer their patients, and the skills of these specialists have become recognised by the community. In the first years of the early intervention centres, parents complained that they had brought their child not for play but for treatment. Later the realisation grew that play is a key element in the learning and development of children. In subsequent years, when the community saw positive results from the intervention, many more children came. Many families were referred by polyclinics and many came by themselves, as they heard from other parents about the positive results of the interventions. During the course of the journey of change a community model of support has become embedded in national policy and local law. Community based services are now accessible to those families that

reside within easy travelling distance of the four FCSCs, operating from what used to be the Baby Homes. Whilst the funded programme that actively contributed to the establishment of the FCSCs has ended, the centres continue to operate under Local Government Authority management and families remain engaged within the new system of support.

At the start of project work in 2006 key responsibility for design and resources were remotely located with the INGO. The government of Tajikistan, in the process of reclaiming a national identity after some 80 years of Soviet influence, was a key partner, motivated by a general wish to comply with the UN Convention on the Rights of the Child and achieve the Sustainable Development Goals. Over the lifetime of the project work, and following a series of *A bacha* moments that arose out of evidence, increased acceptance and engagement has followed. Responsibility for project management and delivery became progressively more local. The Local government Authorities where the former Baby Homes were located took ownership of the new identity of the FCSCs by passing by-laws that ended the institutionalisation of young children and legitimised a community care model of family and child support. Responsibility for implementing and sustaining best professional practises has passed progressively from the INGO to local NGOs. Local NGOs assumed responsibility at an early stage of the project for advocating for change, sharing their skills and knowledge with other professionals, and ultimately assumed a MEL role to ensure sustained quality in the Local Authority run FCSCs. They remain with the responsibility of developing local skills and knowledge for the care of vulnerable children in their families.

Accountability, the evidence that supports effective delivery also shifted from a focus on information collected to address the values of international actors and towards local audiences. The locus of control has moved closer to families, the ultimate beneficiaries. The major shift in accountability came during 2019 when the non-state sector, the INGO and local NGOs, passed control of the FCSC to Local Government Authorities. New by-laws meant that Local Governments now managed the family support services and assumed accountability to the local population for the quality of care provided through the democratic systems of local governance.

In 2020, the vision of distributed leadership was achieved to the extent that local government assumed authority for service management, local NGOs for quality assurance, national government for service specification and parents for the care of their children.

Discussion/reflection

The transformation of Tajikistan's closed baby homes into family centres has provided innovative multidisciplinary community-based care, depending on trust between parents and services. We became aware of, and built on, the close connection between trust and evidence, which is echoed in the Russian proverb, 'доверяй, но проверяй' 'trust but verify'. From the start, the PFF project has had a paradoxical relationship to decolonisation. Whilst raising questions about the value of state parenting and reviving a traditional focus on the family, it has also used external (Western) approaches and resources to scaffold structural change. The decolonisation of institutional care has had two phases. That of replacing closed institutions with open community-oriented family support has been

TABLE 1 The journey.

Years from the start	2006	2008	2009	2011	2012	2013	2016	2019	2020	2022
Milestones reached	Foundations for change adopted	Partnerships and networks forged	Culture change shared goal	Increased advocacy for change	Gap in international funding	Engagement with innovation consolidated	New funds secured	Focus on evidence building	Internal funding	System sustained
Emerging influences	Inter-agency trust	Social and integrated care	Social inclusion	Child development knowledge	Local autonomy	Multi-sectoral trust	Measurement for change	Policy and legislation enacted	FCSC model	Self-belief
Related events	Approval by City Health Department	Implementation processed initiated	Local provision for children with disabilities	Service innovations prioritised	Partnership models adopted	Family centres prioritised in all baby homes	Family support model dominates	FCSCs replace baby homes in law	Local laws passed	NGOs support best practise
Consequences	Partnership of Dushanbe City Health Department and INGO	Engagement in professional development	Inclusion of children with disabilities	Local family centres opened	Growth in demand for community support	Institutionalisation decreases	M&E more intentional	Social model becomes mainstream	Community care local government norm	Focus on long term sustainability
Responsibility	Government, INGO	Government, INGO, NGOs	Local government and parents consulted	Baby homes broaden responsibilities	Service delivery staff	Multi-agency partnerships	Shared leadership includes parents	Parents' role expands	Local government directs family support	Distributed leadership
Accountability	INGO led data informed fund raising	INGO NGOs reporting to funders and government	Exploration of impact on children	Service providers report to parents	Internal reporting systems in NGOs	Multi-agency evaluation of service provision	NGOs use M4C approach to MEL	System for data sharing in place	Local government legally accountable	Functions at multiple levels

largely completed. Removing the scaffolding of the PFF internationally funded action continues to shift the responsibility and accountability for care towards those more directly connected to vulnerable children, the families, local authorities and national policy makers. The theme of trust permeates the overall journey from initial building of partnerships and forging new networks, to creating a culture of change where participants are willing to entertain new concepts and practises.

The journey framework illustrates how trust developed over the long term, and the narratives illustrate the central role trust plays in building the relationships necessary for change to happen. Trust created conditions of openness to new ideas, loosened the ties with established patterns of care and enabled the development of responses to changing circumstances. In this journey, the role of an INGO is to work consistently to build trust and self-confidence between state and non-state partners, allowing for the possibility of innovation to be introduced. The INGO had also to trust the relationships built to shift the framework of responsibility and accountability to more local control.

In spite of introducing uncertainty and discontinuity, the cyclical transition between periods of international funding and unfunded phases, has provided space and released local actors to cement, integrate and localise their ideas and practises. We observed a pattern where innovations happen occasionally and periodically, rather than smoothly over time. Changes to the status quo did not take place in direct response to new experiences and opportunities. Rather, a critical mass of evidence needed to build up to create the *A bacha* moments that punctuate the journey, marking the ratcheting-up of project innovations towards system change and sustainability. Examples of alignment of the system into new best practises include the realisation that social family support, rather than clinical vitamin injections lead to improvements in child development, as well as the passing of a by-law ending young child institutionalisation by the first local government authority. Professional attitudes changed in response to pressure from parents, requiring also the influence of widespread training, coaching and the lived experience. Policy change occurred when local NGO leaders gathered and then disseminated evidence of the impact of the innovation. We observed that a new status quo or paradigm emerged when pressure for change built, and people let go of familiar ideas to embrace personal change. These examples reflect both Thomas Khun's model of paradigm change (11) and Karl Popper's notion that change happens when people change (12). An extreme example of the Popper notion was when family support services only developed in one Baby Home after there was a change of Director. As suggested by M4C, data played a central role in driving conceptual changes in the paradigm. Evidence provided micro-steers to those who gathered the data, and for those with whom it was shared. The journey is open-ended because the evidence is still building, and changes achieved so far will, in time, be overturned by new knowledge, and by new generations of practitioners adapting to specific events and changing local circumstances (12).

The M4C approach contributed to the decolonisation process by asking the question, 'To whom does the data belong and for whose benefit is the data collected?' Data are valuable more than for its quantification or qualification of actions and events. It empowers participants who draw on it for everyday use. Whilst the project has used data to demonstrate that externally set project targets have been met, and to contribute to and demonstrate wider objectives, such as the Sustainable Development Goals, we also recognise that one-time

evaluations have consistently failed to generate sufficient information to support the transformation into sustainable systems (13). The data we report on in this paper demonstrates that for data to be useful, and used, it must be based upon the needs and circumstances of all participants, and feed back into their lives. The dynamic use of data interacted with the project as a whole to direct frequent 'micro-steers', and feedback loops. As an example, conversations around networks (4) revealed the absence of fathers from day to day care of children, triggered PFF to strengthen the parenting programme for fathers.

In the process of decolonisation, evaluating impact and creating sustainability and feasibility at scale requires the MEL system to reflect the priorities of participants central to the intervention, perhaps, more so than the needs and values of those external to the process of change. To create change requires MEL also to be innovative (2). These have also been our experiences. The implementation team, largely applied practitioners, began with limited experience of managing and utilising integrated monitoring and evaluation systems. Professionals and decision-makers were wary of the potential for measurement to be used to judge the quality of their work, and feared losing face in the sight of more senior managers. We also experienced resistance from the government to developing a monitoring and evaluation system, whose primary role might be to publish impact internationally. These attitudes reflect a not uncommon blame culture, rather than a learning approach. As the project progressed the value of the information gathered grew alongside an increasing appreciation of rigorous and systematic data systems. The implementation team built awareness of the interconnection between developing the skills to track and measure change and the value of the information collected to improve communication and decision-making. A transition from data being used to deliver instructions to data informing collaborative learning was achieved. We have also observed that an extended time frame was required to build the capacity to generate detailed longitudinal data on programme impact.

Recommendations made by the local practitioners for future steps addressed further building of skills and the sharing of those skills with other professionals. It also stressed the need for continued close collaboration with government agencies. Government involvement in the planning and design of new programmes was seen as key to establishing sustainability and scale. They also stressed the multi-departmental nature of the network of support required, inclusive of the ministries of health, welfare, and education. In this conceptualisation, there remains a role for all partners to build and share skills. Commitment to distributed leadership and rigorous implementation, to trust and verify, will continue to strengthen the quality and impact of the innovation as it scales.

Conclusion and main learning points

The conceptualisation of the journey of transformation identified the cyclical route of awareness, experience and learning through which the turning points emerged. Awareness of the implementing partners of the valuable contribution to effective decision making of regular, systematic Monitoring and Evaluation transformed the engagement with quality practise. Experience in applying different data collection tools and methods transformed the capacity of the team to drive their own professional capacity building. A critical mass of information collated stimulated the learning that led to

implementation redesign, and to policy formulation. In each of these turning points a shared process expanded awareness, experience and learning across the network, driving still further forward the journey towards sustainability.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ministry of Health and Social Protection of the Population, Tajikistan. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JW, NM, and PH contributed equally to the development of the process presented in this paper. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The handling editor ZS is currently organising a research topic with the author PH.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1155692/full#supplementary-material

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Using lessons learnt from key stakeholders to increase support for scaling the Reach Up Early Childhood Parenting program

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Introduction: Sustainable implementation of early childhood programs requires resources, materials and methods that are adaptable, scalable and feasible for delivery through multiple sectors. Additional or modified program resources may be required to meet emerging needs, as programs go to scale. An active and effective monitoring, evaluation and learning (MEL) process may enable programs to be responsive to demands. The Reach Up: Early Childhood Parenting program, is designed primarily for disadvantaged children under 4 years of age in low- and middle-income countries (LMICs) to promote their development through playful caregiver interactions. The curriculum, training manuals and other materials and resources support implementers in the adaptation of the intervention, implementation, workforce training, monitoring and evaluation. This paper reports on how data collected from key informants drove modifications to program processes, materials and resources.

Methods: We conducted in-depth interviews with 14 key informants (including program managers, lead trainers, academics, consultants and workforce personnel) on their experiences with Reach Up across 15 LMICs where the program has been implemented. We also reviewed written records generated from (i) structured small group discussions at a Knowledge Exchange meeting of 31 Reach Up partners and (ii) notes from working groups formed at the meeting and tasked to continue working post-meeting to find solutions to support ongoing implementation. The transcripts from the in-depth interviews and the meeting records were analysed using thematic analysis with a mixture of pre-defined categories and data-driven sub-themes.

Results: The main findings indicated that there was a need to: (i) develop advocacy and communication resources and materials to aid prospective implementers and other stakeholders, to make decisions for implementation, (ii) revise and/or add to the content and format of the curriculum and add content in the training and other supporting manuals and (iii) enhance the training process.

Conclusion: The feedback from the key global partners informed the development of new knowledge materials, resources and processes and modifications to existing program materials and resources. These will help to support advocacy, ongoing implementations, and the process of transitioning the Reach Up early childhood intervention to scale.

KEYWORDS

Reach Up program, scale-up, global community, program resources and materials, key informants, implementation research

Introduction

The *Lancet* early childhood development series in 2016, the launch of the WHO, UNICEF and World Bank *Nurturing Care Framework* in 2018, the special issues of *Annals of the New York Academy* in 2018 and the *Archives of Diseases in Childhood* series in 2019, highlighted the significance of addressing early childhood development (ECD), especially for children in low- and middle-income countries (LMICs). Increasing numbers of LMIC have national ECD polices (1) with increased demand for scalable and sustainable ECD interventions.

To achieve lasting impact on early childhood development and caregiver skills and practices, interventions require a comprehensive package of resources and materials that are adaptable, scalable, promote sustainability, and feasible for implementation through multiple sectors. An active and effective monitoring, evaluation and learning (MEL) system can be important in understanding effective scaling. As Krapels et al., noted, this is needed to (i) facilitate strengthening of programs and inform the development of more effective designs, implementation and scale up and (ii) share information and knowledge gained from MEL processes with others working in the ECD and other behaviour change sectors (2).

The Measurement for Change (M4C) approach provides a framework that can be used to measure progress and respond to developing needs as necessary, to ensure continued effective adaptation and implementation and facilitate scaling of ECD interventions. The five interconnected objectives that currently inform the use of data collected for M4C are that it should be (i) dynamic (flexible to change and use iterative learning cycles), (ii) inclusive (engaging all stakeholders – children, families, community members, policy makers), (iii) informative (making decisions based on the data gathered from various sources), (iv) interactive (continually interacting with systems, processes and stakeholders and implementing changes based on these interactions) and (v) people-centred (be able to respond to the diverse needs of all stakeholders) (2) The framework, with focus on objective (ii) was used as the guiding approach for this study.

Studies on scale up of ECD programs have focused on examining of geographical coverage and reach, implementation characteristics such as dosage, frequency and mode of delivery, monitoring (supervision, fidelity), evaluation of intervention outcomes, financing and the workforce (3). In addition to monitoring implementation characteristics such as coverage, mode of delivery and impact, other elements of an intervention, such as the program material and resources and capacity to implement, may also affect its success. Research on this aspect of scaling ECD programs through evaluating and improving the processes, resources and materials to support achievement of scaling at other levels, is less common.

In this paper, we document lessons learnt from engagement with the Reach Up: Early Childhood Parenting program (commonly referred to as "Reach Up") implementation partners in multiple countries. We also discuss how this informed enhancements to the Reach Up package to support the needs of program managers and delivery staff as they expand to reach more families.

First, we present a brief overview of the Reach Up program. We then discuss Phase I, the evolution from the Jamaica Home Visit intervention (JHV) to Reach Up. Phase II (the formation of the global Reach Up community) and Phase III (using learnings from the global partners to make systematic changes to further scale the Reach Up package) are discussed in the Results section.

The Reach Up Early Childhood Parenting program

The Reach Up: Early Childhood Parenting program is based on the Jamaica Home Visiting (JHV) model developed in the 1970s (4–6). It was designed primarily for disadvantaged children under 4 years of age in low- and middle-income countries. In addition to helping parents promote their children's development, the program aims to build the mother's self-esteem and enjoyment of parenting (6). The format of delivery of the intervention is through a series of weekly or fortnightly home visits or small group sessions, using a structured curriculum. The activities are tailored to the child's ability and each play session includes the introduction of concepts (using homemade toys, songs and games) and language activities. The intervention is designed to be suitable for delivery by non-professionals, with a minimum of complete primary level education, such as community health workers and community members (e.g., *Madre Guias* – "mother guides" in Guatemala and Colombia). The initial Reach Up package comprised weekly and fortnightly curricula for ages 6–36 months, an Adaptation and Planning Manual for program implementers, a Toy manual, a Training manual with films to be used during training workshops and a Supervisor Manual. The intervention has been adapted and used in 17 countries: Bangladesh, Bolivia, Brazil, China, Colombia, Guatemala, India, Jamaica, Kenya, Liberia, Madagascar, Peru, Turkey, Zimbabwe and Jordan, Lebanon and Syria (for Syrian refugee families). At scale, in Peru, the national home visiting program, *Cuna Más*, was built on Reach Up, through the adapted Colombian model (7). The intervention has also been expanded to 11 counties in the western and central regions of China (8). The intervention has been adapted and implemented in diverse contexts and settings, such as in poor, rural and urban communities and humanitarian, conflict and displacement settings such as the implementations led by the International Rescue Committee (IRC) in the Middle East.

Adaptations done for context prior to implementation include the inclusion of local games and songs, adaptation of pictures and toys to reflect local people and activities, and addition of content to the curriculum (e.g., health, nutrition and hygiene messages) and training manual (e.g., stress management). Adaptation of implementation processes to fit country infrastructure, personnel and resources include mode of delivery (e.g., weekly to fortnightly visits), personnel (categories of workers used – healthcare workers, community leaders, pre-school teachers), engagement strategies (recruitment of participants, retention of workforce) and training.

Evidence shows that Reach Up can be feasibly delivered through health services or social services reaching families with young children in several countries (9–14). The intervention has been adapted for delivery through small group sessions in India (15), Bangladesh (14, 16) and Colombia (12). The impact of the intervention has been measured through randomized control trials which have shown benefits to child development and parenting outcomes (4, 9, 14–21). Substantial long-term benefits to cognition, education, mental health and income up to age 30 years have also been demonstrated (22, 23).

Evaluations of implementation processes have been conducted in Jamaica (24), Bangladesh (14, 25), Colombia (26) Brazil and Zimbabwe (27) and the Middle East (28). These have included evaluations of the adaptation and implementation processes, focussing on the acceptability, appropriateness, feasibility and effectiveness from the perspectives of caregivers (mothers) and implementation staff.

Scaling up the Reach Up intervention package

Scaling of the processes, resources and materials that make up the Reach Up intervention has occurred across three phases:

- Phase I, the evolution from the Jamaica Home Visit intervention (JHV) to Reach Up, a comprehensive package of curricula, manuals and resource materials in 2014.
- Phase II, implementation and evaluation in several countries leading to a knowledge exchange meeting and the formation of the global community in 2019
- Phase III, interconnected with Phase II, using learnings from global partners to make systematic changes to further scale the Reach Up package in 2021.

Phase I: from Jamaica home visit to Reach Up (1973–2014)

Up to 2014 the JHV program was adapted for use in Bangladesh, Colombia (the first attempt to scale the intervention by linking to the conditional cash transfer program *Familias en Acción*) and Peru (adapted and implemented at scale through the *Cuna Más* program) (5). Randomized control trials conducted in Bangladesh (5–7, 29, 30) and Colombia (10), in addition to those in Jamaica (4, 9, 17) provided robust evidence that the program had benefits to children's development.

Development of the Reach Up package

In a context of growing demand for scalable ECD programs and an increase in interest in the implementation of the JHV, the developers identified challenges with the expansion related to limited technical capacity of organizations as well as capacity of the Jamaica intervention team to provide support. One of the solutions identified was to develop a comprehensive training package that could be used by implementation partners.

With the support of a grant in 2014 from Grand Challenges Canada, a web-based package was developed. The curriculum layout was reorganized for easier use with drawings of toys and suggested text to introduce and explain activities included. A few new picture books, toys and activities were added to the curriculum to replace some toys and create more variety. The toy manual was revised with colourful drawings depicting step by step instructions. All pictures (used in books and puzzles) were redrawn with the use of vibrant colours to make them more attractive to young children. Three additional manuals to support implementation and training were developed (Adaptation and Planning manual, Training manual and Supervisor training manual). To facilitate the training, 23 short films (approximately 2–3 min each), were produced to show the methods used during visits and demonstrated specific materials and activities. Three 15-min films produced show the key steps in a home visit. All films are available in Bengali, English, French and Spanish.

A meta-analysis of impact evaluations of the JHV and Reach Up in several low- and middle-income countries, showed that the intervention improved child development across diverse settings (31).

Methods

We focussed on the *inclusive* aspiration of the Measurement for Change (M4C) framework as the intent of this paper is to highlight how learnings from Reach Up partners, who are critical stakeholders, contributed to the scaling of the Reach Up program resources.

The data we present in this paper were collected in Phase II of the Reach Up scale-up process. We used two approaches (i) interviews with key informants on their experiences with Reach Up in the different countries where the program has been implemented and (ii) review of written records generated from meetings with members of the global Reach Up community.

In November 2019, with funding from the LEGO Foundation, we convened a 3-day Knowledge Exchange Meeting to bring together 31 partners to discuss the findings from the intervention, including reflections on the challenges, successes and lessons learned from the implementation of Reach Up. The attendees at the Knowledge Exchange Meeting were program implementers familiar with the processes involved in the decision-making, adaptation and implementation of country-specific interventions, the core team of Reach Up developers, and representatives from the LEGO Foundation, The World Bank and the Inter-American Development Bank who had been involved in supporting the implementation of Reach Up. We also asked country program leads to recommend team members who would be able to contribute to the discussions on country-specific adaptations and implementations.

Before the meeting, three researchers (JC-H, JS, and MK) obtained information from a purposive, non-random sample of 14 key informants over the period August to October 2019. Informants were chosen as they were experienced with the intervention and/or had first-hand knowledge of the processes involved in the decision-making, adaptation, and implementation of country-specific interventions. Reach Up developers identified persons from the existing network of partners who were experienced Reach Up trainers, country program leads who had conducted planning and adaptation of the intervention, or researchers who undertook evaluations of the intervention. We also asked program leads to recommend team members involved in frontline delivery, so that we could capture their "on the ground" experiences. The sample was deliberately restricted as the intention was to interview one key person involved in the planning and implementation of the respective programs, and to invite one or two additional key people to the Knowledge Exchange Meeting. One informant provided information for two separate country programs and two informants provided information for one country, but on different modes of delivery (groups and home visits). All persons who were approached agreed to be interviewed.

Thirteen interviews were conducted in English and one in Spanish, each lasting approximately 1 h. Due to geographical distance, the interviews were held *via* Zoom®. A structured guide consisting of 28 questions was used during the process. The guide was divided into three main sections: Program Design (Adaptations and Program Materials), Implementation (Lessons Learned and Promoting Play) and Overall Reflections. Table 1 presents the questions related to the program design which is the focus of this paper. The participants were not provided with a copy of the interview guide prior or during the actual interview.

The interviews were recorded, and the interviewers also kept written notes throughout the interview. Transcriptions of the recordings were compared with the written notes, compiled, and saved as Microsoft Word documents. The 15 transcripts from the 14

TABLE 1 Interview questions specifically on program design.

Adaptation

In the survey you shared that you adapted the (indicate which – curriculum, training materials, supervision materials, play materials, etc. for families). Can you please share with me how you determined that these adaptations were necessary?

Can you please tell me how the adaptations were made, including who was involved in the process (consultants, government officials, trainers, front line workers)?

Did you have an opportunity to test/pilot the adaptations of the materials before full implementation? (If yes, continue). What aspects were you able to test/pilot before the start of the intervention?

Programme materials

What do you think about the Reach Up Curriculum? (e.g., objectives, layout). Do you think anything else needs to be included? Any sections that need to be improved/expanded?

What do you think about the Reach Up Toy Making manual? (e.g., instructions, illustrations, measurements) Do you think it needs to be improved/expanded? Can you describe any significant challenges you may have had in getting the toys, blocks, books and puzzles made?

What do you think about the Reach Up Adaptation manual? (e.g., instructions for adaptation, advice on information to be collected, etc.) Do you think anything else needs to be included? Any sections that need to be improved/expanded?

What do you think about the Reach Up Training process and the Training Manual? (e.g., organisation of sessions, content, layout). Do you think anything else needs to be included? Any sections that need to be improved/expanded?

What do you think about the Reach Up Supervisor Guidelines? (e.g., content, descriptions)? Do you think anything else needs to be included? Any sections that need to be improved/ expanded?

interviews (one informant was interviewed for two separate countries) were numbered R1 through R15. Approval to carry out interviews was received from the Ethics Committee of the University of the West Indies in August 2019 (approval number ECP 3, 19/20). Written consent forms were emailed to the participants for their signature.

We also reviewed written records generated through two major sources (1) the Knowledge Exchange Meeting held in November 2019 where discussions and recommendations were documented and (2) the minutes of meetings from working groups formed at the meeting and tasked to continue working post-meeting to find solutions to support ongoing implementation. Working groups were formed to focus on three key areas – Adaptation, Capacity Building and Monitoring and Evaluation.

Data analysis

Interviews with key informants

The data from the interviews with the key informants were analysed using a qualitative content analysis framework. Specifically, we used thematic analysis, following Braun and Clarke's (32) recommended five phases for identifying, analysing and reporting patterns within data – (i) familiarization with data, (ii) generating initial codes, (iii) searching for and generating themes, (iv) reviewing themes and (v) defining and naming themes. We applied a mixture of deductive coding (pre-defined categories) and inductive coding (data-driven sub-themes). We first identified nine pre-defined themes based on the main section headings and corresponding questions on the structured interview guide – Adaptation, Integration, Manuals,

Curricula, Training Process, Implementation, Workforce, Monitoring and Evaluation and Promoting Play. In this paper, we present the analysis from four of the pre-defined themes related to the Reach Up processes, material and resources – Adaptation, Training process, Manuals, and Curricula.

Two researchers (JC-H and JS), working independently, manually coded nine and six transcripts, respectively. The researchers were currently working with the Reach Up program and therefore understood the context of the review. At this stage, each researcher coded their respective transcripts using the initial codes they identified.

Following the individual coding of the transcripts, the researchers reviewed, and met to discuss each other's extracted supporting quotes. Any discrepancies were resolved through discussions and consensus and consultation with an arbitrator (SW). Based on the initial coding, we identified 39 sub-themes to which data could be coded, and formulated definitions for each (Table 2). The coded texts were then combined under each category and sub-theme and saved as the final output of the coding process.

Review of meeting records

One researcher (JC-H) reviewed the compiled notes from the Knowledge Exchange Meeting and minutes of three of the working group meetings (Adaptation, Capacity Building and Monitoring and Evaluation) to identify discussions surrounding the resources and materials and extract relevant statements, decisions and future actions.

Similar to the coding process for the interviews, the nine pre-defined themes were used in the process. The notes from the Knowledge Exchange Meeting, and the Adaptation, Capacity Building and Monitoring and Evaluation working groups were read and sentences and/or paragraphs were highlighted and labelled with the most appropriate theme according to the codebook.

Results

Three male and eleven female key informants were interviewed from NGOs, and academic and funding institutions, from various regions across the world (Table 3).

Findings for Phases II and III of the Reach Up material and resources scale up are presented in this section. For Phase II, we present (i) the background to the formation of the global community and (ii) the systems used to share lessons and make resources accessible to implementation partners. For Phase III, we (i) highlight the learnings from the interviews with the key Reach Up partners and the review of the records of the Knowledge Exchange and working groups' meetings, and (ii) describe the adaptations made to some of the Reach Up materials and the addition of new knowledge goods and resources.

Phase II: formation of global Reach Up community

The formation of the global Reach Up community began with the participants who attended the Knowledge Exchange Meeting in November 2019. The group included Reach Up developers, implementation program leads, government representatives, lead trainers and academic researchers from Bangladesh, Bolivia, Brazil, China, Colombia, Guatemala, India, Jamaica, Jordan, Madagascar, Peru, Turkey and Zimbabwe. The 3 days of activities included

presentations on experiences with home visiting (four countries) and group modalities (three countries), sharing of results from a pre-meeting survey and a summary of the indepth interviews, in-session working groups (more detailed discussion focussed on adaptation and preparing to implement, workforce capacity, implementation, and learning), gallery walks (comprising notes from working group discussions mounted on flip charts for participants to review and add comments), and other networking activities.

Knowledge sharing

Since the formation of the global community, we have established systems for sharing learnings with, and making resources available and accessible to, Reach Up partners. Networking and communication among the partners have been strengthened through:

- The knowledge goods produced and the new and amended materials were shared with Reach Up partners at a webinar in November 2021.
- A Bi-annual Newsletter to share information about implementation in the different countries, provide updates on workshops and meetings and links to reports, journal articles, evaluations, information from funding agencies, etc.
- A group was formed on the instant messaging platform, WhatsApp®, which included country representatives, implementers, funders and Reach Up team members in Jamaica. The platform has become a place for active exchange of ideas and where members can seek possible solutions for implementation challenges.
- The file hosting service Dropbox® is used to store and organize program documents and resources as they become available. These are made available under the Creative Commons License Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0), to registered Reach Up partners and organizations and are implementing or planning to implement the program. Registered partners and organizations sign a Memorandum of Understanding on the use and citation of the materials, training by experienced trainers, and sharing of new materials.

Phase III: learnings from key Reach Up partners

The results from the coding of the four categories related to the Reach Up material and resources – Adaptation, Training process, Manuals and Curricula – are presented in this section. Table 4 summarises the key findings from the interviews with the key informants and the discussions at the Knowledge Exchange Meeting and Working Groups, while Table 5 presents some of the perspectives and recommendations from the key informants.

Implementation challenges and suggested solutions

A few key informants identified challenges with integrating the program within an existing system. Cost and increased staff

TABLE 2 Pre-defined categories and data driven sub-themes identified.

Pre-defined categories	Data driven sub-themes
Adaptation	• Culture • Stakeholder engagement • Delivery mode • Piloting of materials
Integration	• Types of integrated services • Barriers to integration • Benefits to integration
Manuals	• Layout of the manuals • Content of the material
Curricula	• Format/structure of the curriculum • Content of the curriculum • Development of new content and/or curricula
Training process	• Quality of lead trainers (train-the-trainers) • Duration (length of time) • Mode of delivery
Implementation	• Stakeholder engagement • Relationships with families • Communication • Working relationship • Cultural norms • Impact on families • Material costs • Material procurement • Geography and climate • Scaling
Workforce	• Compensation • Supervision • Turnover • Workload • Gender • Profile • Benefits (of the program) to workforce
Monitoring & evaluation (Supervision)	• Structure of supervision • Supervision of workforce • Importance of supervision and mentorship • Training of supervisors
Promoting play	• Promoting play through training workshops and material/resources • Promoting play during visits • Importance/impact of play

workload were mentioned, but the bureaucratic systems at State-run institutions was the main challenge experienced with integration. Suggestions made by the key informants to engage

TABLE 3 Summary of key informants.

Participant	Sub-region	Institution/affiliations	Position/involvement in the program
R1	South Asia	Research Institute	Researcher; trainer
R2	South Asia	Research and NGO	Researcher
R3	South America	Academic Institute	Researcher; trainer
R4	South America	Government	Consultant
R5	South America	Government	Consultant; trainer
R6	South America	Government	Consultant; trainer
R7	South America	Academic Institute and Government	Researcher; trainer
R8	Southern Africa	NGO	Program lead
R9	Central America	NGO	Supervisor
R10	East Asia	Research Institute	Program lead
R11	Middle East	NGO	Home visitor
R12	Middle East	NGO	Supervisor; trainer
R13	Southern Europe	Academic and Funding Institution	Researcher; trainer
R14	Caribbean	Government	Program lead
R15	Southern Africa	Academic Institute and Government	Researcher

TABLE 4 Key findings from interviews and meeting discussions.

Source	What was learnt
Key informant interviews	• Involving decision makers at the government level is a critical component for the effective implementation and eventual scaling of the intervention. And as part of this engagement process, the key informants emphasized that advocacy and communication resources and material must be available. • There was a need to make revisions and/or modifications to the curriculum (e.g., develop additional sections with activities) and messages for other age groups (e.g., 0–5 months and 37–48 months). ■ There was also demand for additional content in the supervisor and training material (e.g., additional guidelines for trainers). ■ The training process could be improved with adjustments to the duration and mode of delivery. For example, decrease in the number of training days and the use of technology to deliver virtual training sessions.
Records from the Knowledge Exchange Meeting and working groups	Key priorities/deliverables necessary: ■ Develop key arguments for the intervention based on theoretical framework ■ Preparation of advocacy and communications material that can facilitate global conversations with funders, governments, researchers etc. ■ Develop guidelines and minimum standards for the adaptation of Reach Up. ■ Provide guidelines on integrating Reach Up within existing services such as health and education. ■ Provide guidelines for engaging government and community stakeholders ■ Adjust/strengthen the training and supervisor manuals in areas such as mentoring and coaching, conducting meetings and building positive relationships. ■ Develop model terms of reference document for each staff category ■ Identify tools to assess the skills, characteristics and competencies of the workforce ■ Proposed list of monetary and non-monetary incentives for the workforce ■ Explore solutions for the use of technology – in training, monitoring and supervision

policy makers and minimize bureaucratic challenges are mentioned in Table 6.

Adaptation challenges included accessing/finding materials to make the toys, acceptability/suitability of toys and in some instances, costs associated with procuring the required material. The main workforce challenge was staff turnover experienced curing program delivery. Inadequate compensation and heavy workload were the two main factors contributing to staff turnover. Unfortunately, not many solutions were offered, as this issue was often out of the control of the key informants.

Some key informants also noted that the workforce was affected by distance/location of families and the weather. In two countries, challenges related to the safety of the home visitors were of concern:

TABLE 5 Examples of some of the perspectives and recommendations for adaptation, curricula, manuals, and training process.

Perspectives/ recommendations	Examples of comments
Stakeholder engagement is key	• *Put together a persuasion strategy to have them [government] buy-in at the end of the day, into the intervention. And perhaps a presentation that would showing benefits, perhaps, then we would have convinced them to implement it at scale… (R3)* • *It's been a challenge to get the "X" city government to conceptually understand the objectives of the methodology…. it would be helpful if some background on the methodology was described clearly. (R4)* • *There needs to be prep work on how to present the program to get buy-in. This includes videos, materials. Focus on the outcomes and then show the curriculum. The government needs to understand the essence of Reach Up and buy in on the methodology. (R5).* • *[Adaptation manual] should include a community mobilization guide to understand the steps to entering into a partnership with government and community members. (R9)* • *Engaging with the government and community stakeholders from the beginning is the key to buy-in and sustainability. This includes … a communication mobilization guide to understand the steps to entering into a partnership with government and community members. (R9)*
Changes/additions to the curricula	• *Need longer introduction, defining objectives, etc. scientific support, information on development. (R3)* • *It would be very helpful to have more information about the rationale behind the curriculum and the sequence of activities to show the developmental skills. (R6)* • *I think it will be amazing if we can work with families with children at one month. Need curriculum for [sic] one month. (R12)*
Additional content in supporting manuals	• *[Training manual] It would be great to see sessions on problem-solving – what to do in real life situations where children are not cooperating or engaged in activities. (R4)* • *[Training manual] There should be a module on facilitation skills, including how to be dynamic and to motivate the mothers/ caregivers. (R9)* • *There should be a section of the training [manual] for supervisors/training of trainers to prepare to cascade the training. (R9)* • *The training manual should include an overall understanding of ECD, including an overview of child development milestones. (R10)* • *[Supervisor Guidelines] Need to include some assessment forms. For example, use some aspects of the early development assessment tool and include skills that the home visitors need to have, like some teaching, communication and feedback skills. (R11)* • *[Supervisor Guidelines] The layout of the manual that the supervisor has to use need adaptation to facilitate ease of use in the field. (R11)* • *[Integration of activities] into the daily routine, I think that will be very helpful. Given that some families have older children, some activities that can easily incorporate other children can be specified more directly to mothers. (R13)* • *Supervisor guidelines need tweaking for the context…look at all the variables that the supervisor must observe and the tool should be user friendly and capture the most essential factors. (R14)*
Enhancements to the training process	• *In order to improve the training process, the training should be reduced from 10 days since that amount of time is not feasible within a big, integrated program…Before or in between training sessions in person, virtual videos…thus reducing the days of training. (R5)* • *It is not viable to have a 10 day training, especially in the case of an integrated program. It is important to think about how to reduce the number of [training] days, making some sessions virtual beforehand or in between sessions; Think about technology, how to use online sessions. (R6)* • *I think the training can be done in seven to eight days and not ten. (R11)*

> *It's a very geographically dispersed setting with the hugest accessibility problem and some security problems. (R15)*
>
> *Difficult working conditions as we had violence and safety concerns in the neighborhoods. (R7)*

Other challenges and suggested solutions by the key informants include supervision, working relationships, cultural norms and relationships with families (Table 6).

Adaptations/additions and changes to scale the Reach Up package

After the in-depth interviews, further discussions at the Knowledge Exchange Meeting and feedback from the working groups, the following changes to the Reach Up package and resources to support scaling, were made. These were done with input from members of the global community. Tables 7, 8 provide a fuller description of the new knowledge goods produced and the

TABLE 6 Examples of some challenges and solutions during adaptation and implementation.

Sub-theme	Examples of comments	
	Challenges encountered	**Solutions implemented**
Stakeholder engagement	*Getting access to the local health department was difficult. (R2)* *Challenges are balancing with other content needs and bureaucracy. (R5)* *The challenge was that [XX] was implementing many programs at the same time for the same families without coordination. (R4)* *Authorities did not want the program because it was not bringing materials/infrastructure. (R9)* *During that time in [XX] the ministries, the directors of the ministries were changing a lot, there was not much stability. (R13)*	*Having a local person to support adaptation and liaise with the government to manage voices was helpful. (R6)* *Held workshop with government technical staff to present the curriculum. (R5)* *Community fairs helped them to see the importance of play in children's growth and development. (R9)* *We used a community mobilization strategy with the Ministry, community leadership for continuous engagement. We saw that the supervisors had too much to do in coaching the home visitors, so we hired supervisors just to engage with government and community stakeholders and to keep them abreast of the project activities. (R9)*
Material Procurement	*Sometimes difficult to find empty water bottles. (R12)* *Getting cardboard given the ban on plastics has made it difficult. (R14)* *Parents thought toys were outdated. (R10)*	*Have recycling containers to collect empty water bottles and provide these for the volunteers to start work with. (R12)* *We have had to use lamination and foam boards. (R14)* *Some toys were replaced with store-bought toys. (R10)*
Supervision	*At the beginning, they had challenges in applying the methodology. (R10)*	*This was resolved through weekly meetings with supervisors, which focused on discussing challenges and building strategies to resolve those challenges. (R10)*
Working relationship	*One major success was the relationship between supervisors and home visitors. (R4)*	*The focus on modelling, reflection, and problem solving helped them to feel supported. They texted their supervisors regularly to problem solve and the supervisors did the same with the coordinator. (R4)*
Cultural norms	*Because of culture they are uncomfortable for anyone to allow male visitors to conduct activities. Most said we need females. (R12)*	*If we have males we prefer to have a female accompany him. (R12)*
Relationship with families	*Even the availability of the mothers, the timing when the mothers were available. (R15)* *A main challenge was getting the mothers to participate because of existing cultural norms-husbands/fathers did not want home visitors to enter the home or the mothers to travel to attend group sessions. (R3)*	*Sometimes the community nutrition worker had to work either in the evenings or very early mornings. (R15)* *Fathers also became very active in toymaking. (R3)*
Workload	*Supervisors complained of heavy workloads since they had to observe every home visitor at least once in a month. (R10)*	*To reduce workload, the program developed an app for their monitoring tools. This helped a lot. (R10)*
Turnover	*High staff turnover because home visitors are volunteers and do not have any benefits. (R12)* *There was some attrition of home visitors which was a significant challenge. (R13)*	*Pay transportation and meals during work. (R12)* *Train more staff than is needed in case you need replacement staff. (R13)*

new and amended resources, respectively. In summary these comprise,

i. A communication package, developed for advocacy and communication with stakeholders with a modifiable presentation, short film, brochure and policy brief

ii. Production of new documents and resources including guidelines on integration into existing government systems and workforce related documents with suggested terms of reference, competencies and incentives

iii. A document on the theoretical background and content of the curriculum was developed and the curriculum extended with content for 0–5 months and 37–48 months (weekly and fortnightly).

iv. Expansion/revision of training materials including adding a section to enhance the promotion of playful interactions referencing the LEGO Foundation's characteristics of play and

the importance of play for early childhood development (33) and improving sections on working with extended family members.

v. The manual for training of supervisors was revised and expanded to include more content on supervisory techniques and methods, with interactive scenarios for mentoring and feedback.

vi. A Supervisor Handbook was developed to provide guidelines and resources. It covers topics/areas such as supervisory techniques and methods, responsibilities and conducting meetings and field visits.

vii. Virtual delivery of the train the trainer workshop was hastened by the restrictions on travel and social distancing due to COVID-19. In-person training workshops were suspended, and we pivoted to online delivery in 2021, delivering training content using a mix of synchronous sessions on the Zoom® platform and asynchronous sessions mounted on the Moodle®

TABLE 7 New knowledge goods developed to aid in scaling the Reach Up package.

Advocacy and communication products/resources	
Theoretical background	Focus on the rationale for the Jamaica Home Visit/Reach up design and methods (theoretical background and content of the curriculum).
Theory of change	Provides an overview of the intervention delivery with the inputs needed (including human resources and materials) and the connections between each segment of the intervention. As the program is adapted in each context, the suitable staff needed to deliver the intervention need to be trained and the families identified for intervention. The long-term outcomes include benefits to families and staff as well as capacity building for the organizations who implement the program. The ultimate impact includes benefits to families and children with the developmental potential of these children realized.
Power Point presentation and slide bank	A structured presentation that can be used to support global conversations with main target audience (governments, funders, NGOs) who may be interested in implementing Reach Up. It includes an overview of the program with key principles, evidence, materials. It can be adapted depending on audience with sections more focused towards policymakers and others on implementation. There are additional slides organized by topic (e.g., adapting for context, Reach Up evidence) that can be used as templates for slides in other presentations
Marketing video	A narrated 5-min film on Reach Up highlighting the genesis of the intervention, footage from the training videos, footage of home visits in various countries, evidence from studies conducted, still images from the inception of the JHV on which Reach Up is modeled, information on the package/resources, contact information, etc.
Reach Up brochure and policy sheet (revised versions)	These documents provide a brief overview of Reach Up and summarize the key features of the intervention and how they are related to child development and highlights the benefits of implementing the intervention
Adaptation and planning resources	
Making decisions on integration	Core principles and guidelines for making decisions on integrating the intervention with an existing program such as health and nutrition services, if feasible, as well as guidelines on staffing, supervision, funding, scalability, etc.
Engaging stakeholders	Guidelines on approaches (meetings, sensitization sessions, etc.) to use when seeking support from stakeholders (government and community members) and a checklist of areas/topics to focus on during engagement sessions
What makes Reach Up, Reach Up	Highlights the key components of Reach Up and the essential elements of the intervention which should be part of implementation of Reach Up.
Capacity building resources	
Incentives for workforce	A list of proposed incentives – monetary (e.g., comparable wages/salary, stipend for travel to training/conduct visits/ communication), and non-monetary (e.g., exposure to other ECD programs and provision of resources and tools – toys, smart phones/tablets, flyers/bulletins, etc.)
Workforce terms of references	Recommended profile for home visitors and facilitators. Includes education, experience and skills, roles and responsibilities, reporting relationships and demands of the job.
Assessment of skills and competencies	Provides an overview of the expected competences to be achieved from the training, with additional reference to the Early Childhood Workforce Initiative Home Visiting Needs Assessment Tool.

Learning Management System. We partnered with The University of the West Indies Centre for Excellence in Teaching and Learning to develop the Moodle platform, prepared PowerPoint presentations from the contents of the Reach Up Training Manual and 13 short videos of activities (role plays and materials demonstrations) were produced for use in the virtual training workshop. The synchronous sessions were recorded and uploaded to the Moodle platform daily. The first workshop using virtual delivery was held in June/July 2021 over 10 days, and the second in November/December 2021 reduced to 9 days.

Discussion

In this paper, we report on how learnings from key stakeholders contributed to the enhancement of Reach Up materials and resources to support effective adaptation and implementation and facilitate scaling the program across new and within existing countries/regions. Information was collected from Reach Up global community stakeholders (consultants, funders, researchers, home visitors and supervisors) who had first-hand knowledge of the processes involved in the decision-making, adaptation, and/or implementation of the intervention.

The Nurturing Care Framework Handbook recommends the formation of communities of practice to facilitate innovation and scale up of ECD interventions (34). The global Reach Up community (officially formed in 2019) is one such network of implementers, program managers and researchers who have led on the initiation, adaptation, implementation, monitoring and evaluation of the intervention in various settings and countries. Similar to others (14, 27, 35, 36) we found that an important part of the adaptation process is the incorporation of feedback from implementers and delivery agents to inform modifications to existing, program material and resources and the development of new resources that can facilitate scale-up.

TABLE 8 New and amended program resources and materials.

Resource/manual	Adaptation/additions made to resource/manual
Toy Manual	Additions/revisions to the Toy Manual included: • Reorganized by age group and type of toy • Improved instructions – include numbered lists of steps to make toys and measurements of materials needed to make the toys • Deletion of some toys from the list that were made from materials that are often difficult to source.

Training Manual	The main additions/revisions to the Training Manual were:
	
	• The "Importance of Play," referencing LEGO's playful parenting framework, was added to the introductory section of the manual, to support the rationale for the program. Training session 1 "Introduction to the Programme" also included information and activities on the importance of play and the characteristics of play.
	• Improved sections/statements on working with extended family members, practice activities that include other family members and on how to treat other family members
	• Revised and/or added questions to be asked after viewing training videos, e.g., new questions "What developmental domains does this activity help?" and "What concept words were used?"
	• Added lists of materials by names, descriptions, drawings and age as they appear in the curriculum.
	• Added a new set of practice activities (using blocks and cardboard farm animals) to support the extension of the curriculum for children 36–48 months.
	• A new flip chart with instructions on how to build a positive relationship with the mother/caregiver was included (e.g., sit at the same level, ask their opinions, praise and explain what you want to teach the child and how to do it).
	• Included as Appendices, for ease of reference:
	    o Workshop evaluation forms
	    o List of role plays by session
	    o List of videos by session
	    o List of supplemental practice activities

Supervisor Training Manual	The main additions/revisions to the Supervisor Training Manual were:
	
	• Additional guidelines for the trainer:
	    o How to use the manual
	    o How to conduct demonstrations and practice activities
	    o How to prepare for the training workshops
	• Additional information for training Session 2: Supervisory techniques and methods:
	    o Supportive supervision,
	    o Building positive relationships
	    o Coaching and giving feedback
	    o Conducting meetings and field visits
	• Additional information for training Session 3: Responsibilities of a good supervisor
	    o Handling community relations
	    o Organizing facilitators' meetings
	    o A list of the flip charts required for the training was included as an Appendix for ease of reference.

Supervisor Handbook	A Supervisor Handbook was developed for supervisors who are not train-the-trainers, but who may need guidelines and resources. It covers the following topics/areas:
	
	• Supervisory techniques
	    o Supportive supervision
	    o Building positive relationships
	    o Coaching and giving feedback
	• Conducting meetings and field visits
	    o Individual and Group meetings
	    o Field visits/observations
	• Responsibilities of a good supervisor
	The handbook also includes a list of resources needed for the program and local services that vulnerable families may need and an Observation checklist with clear definitions for each factor

Curriculum • 0–5 months • 37–48 months	The curriculum was extended to include objectives, activities and resources to be used for visits with children ages 0–5 months and 37–48 months.

The expansion of the Reach Up program has been driven by networking, partnerships and collaborations over many years. Some of our partners are champions and leaders of Reach Up through their advocacy and interaction with decision makers (including government policy makers), contributing to adaptations in new countries and/or to extending coverage in countries where the program has already been implemented. Networking at the global community meeting in November 2019 also led to new collaborations and projects between implementers. For example, the International Rescue Committee (IRC) connected with the team from the International Centre for Diarrhoeal Disease Research (ICDDR,b) in Bangladesh to adapt the intervention for Rohingya refugees, and with a team from Bogazici University in Turkey for the Syrian refugee populations in that country.

The feedback from the key stakeholders informed the development of new resources that can be used to present and discuss the features of the intervention with policy makers and other potential users. Content developed include the theoretical background of the curriculum and the theory of change to facilitate communication of the development and mode of action of Reach Up. The PowerPoint presentations and the short film (with footage of training sessions and home visits in various countries) provide target audiences with a better "feel" for the intervention. Overall, the new advocacy products are available to help with communicating and engaging with prospective implementers, including policy makers, community members and funders.

Reach Up is designed to strengthen the capacity of parents and other caregivers to promote the development of their children through interactions with implementation staff who play a key role in the success of the program. Therefore, it is essential that the package provides the content and resources to guide, support and build capacity among the workforce. This was addressed through modifications to the curriculum, training resources and new materials related to workforce competencies and motivation. The Reach Up curriculum was designed to be delivered by facilitators with limited educational qualifications and no special knowledge of children's development. The inclusion of information from the LEGO Foundation's Playful Parenting Framework (33) provides facilitators with some theoretical knowledge applicable to the intervention, as well as understanding of benefits of playful parenting in promoting child development.

Key informants feedback also led to improvements in guidance for supervisors/mentors who support frontline delivery staff to maintain quality. The Supervisor Training manual was enhanced with additional content on building positive, respectful relationships, and providing positive feedback for home visitors and a new Supervisor Handbook developed.

Like other ECD programs, challenges remain around retention of staff, especially in contexts where Reach Up is integrated into existing services and is delivered by an existing cadre of workers (24, 35, 37, 37). Competing responsibilities and/or additional duties and lack of motivation (often linked to inadequate compensation and benefits), have been cited as the main contributing factors. While quality relationships, as described above can help to motivate staff, we have now included a list of proposed monetary and non-monetary incentives intended to help program managers develop strategies appropriate for their context.

With restrictions on travel due to the COVID-19 pandemic beginning in early 2020, face-to-face training was suspended and the suggestions from members of the global community for more adaptable train the trainers' workshops using technology was fast-tracked. Two virtual workshops were held during 2021 and feedback from participants is being used to continue to integrate virtual delivery into training options. Opportunities to shorten the face-to-face training time, using a blended approach with a combination of virtual and face-to-face sessions, and offering the training in phases, are now possible.

We will monitor the use, of the new knowledge goods, through continued engagement and knowledge sharing with stakeholders. Use of a more structured approach to inform scaling of the intervention, was discussed at the knowledge meeting in 2019. For example, in addition to the implementation of the current systems for sharing learnings and making resources accessible (e.g., WhatsApp®, Dropbox®, etc.) the global partners considered development of a Reach Up learning consortium. This would provide a systematic process for what information to collect, how this will be collected, co-ordinated, analysed and reported. An initial step towards developing a learning consortium will focus on within country scaling.

Reach Up is a "living program" and further resources and extensions may be developed informed by continued learnings from implementation partners and other stakeholders. For example, the use of tablet-based applications to support home visitors to select appropriate activities for a child and collect data for program monitoring is being tested in China, Brazil and Jordan and may be important in supporting quality delivery at scale. One extension to date, is the Parent Manual (38) developed in response to the COVID-19 pandemic and demand from partners for ways to continue to provide parenting services. The Parent Manual can be used directly by parents and also provides content from the Reach Up curriculum that can be delivered through text and video messaging, radio and telephone calls. It also includes content on materials in the home that can be used for all activities in this new manual. This addition is important as providing play materials can be a challenge as programs scale.

Experiences with the integration into government services such as the primary care program in Brazil, the nutrition program in Madagascar, Peru's *Cuna Más* program, Colombia's FAMI program and ChinaREACH in China, have had mixed results that provide lessons for scaling and suggest large-scale replications of the Reach Up program are possible. The revision and extension of the Reach Up program resources and materials reported here, should help to address some scaling challenges and many of the knowledge goods produced may also be useful for other ECD programs.

The study has a few limitations. There was ongoing networking and interactions prior, during and after projects are implemented, between co-authors and country partners. Therefore, the data may be influenced by social desirability bias. We selected individuals from the existing network of Reach Up partners who were country program leads and trainers. Thus the views of other groups, for example policy makers, front line workers and families in the program, were not included.

This paper illustrates the importance of including the perspectives of key stakeholders in intervention evaluation and using the

information in program enhancement so that materials and resources can support scaling. The findings from this study add another dimension to the ongoing debate about "what will be scaled up and how" (39). This case study of Reach Up demonstrates the value of a community of program partners and in-country stakeholders who can exchange experiences and evidence to inform transitioning to large-scale programs.

Data availability statement

The datasets presented in this article are not readily available because in order to maintain the confidentiality of the key informants, the interview transcripts will not be made available. Requests to access the datasets should be directed to jacqueline. coore@uwimona.edu.jm.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee, The University of the West Indies, Mona, Kingston, Jamaica. The participants provided their written informed consent to participate in this study.

Author contributions

JC-H, JS, HB-H, and SW contributed to the conceptual design of the paper. JC-H, JS, and MK were responsible for data collection. JC-H and JS conducted data analysis. SC led the revision of the program materials. JC-H, JS, MK, HB-H, SC, and SW contributed to the interpretation of the findings. JC-H drafted the paper with assistance from all co-authors. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Piloting, testing and scaling parental training: a multi-partnership approach in Côte d'Ivoire

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Background and objectives: Early Childhood Development is high on the policy agenda in Côte d'Ivoire, where the government has identified it as part of its overall approach to improve human capital outcomes. This paper describes a multi-partner approach to piloting, monitoring, adaption, testing and scaling of parental training for ECD. It discusses the learnings from the pilots, and present early evaluation results from two RCTs, focusing on parental participation in trainings and acceptability of messages, with the objective to inform national scaling strategies. As such, this paper illustrates how "MEL systems contributed to ensuring that positive early childhood development (ECD) outcomes were improved as interventions were seeking to achieve scale," one of the research questions outlined in the call description for the special issue. The paper further provides a real-world example of "How MEL systems can support contributions and buy-in from a variety of stakeholders as ECD interventions (seek to) achieve impacts at scale (e.g., through the public system)?

Methods: Five training approaches to improve caregivers' knowledge and practices around nutrition, preventive health, stimulation, and disciplining were piloted at small scale between 2018 and 2020. An intensive process evaluation was embedded to identify strengths and weaknesses, adapt through an iterative phase, and ultimately make recommendations for their scale up against 11 defined criteria. In early 2021, the two most promising approaches were scaled through two clustered randomized control trials to more than 150 villages each. A cost-effectiveness study was designed in consultation with government stakeholders, centered around targeting different caregivers and decision makers in the household and the extended family and on enhancing community interactions around ECD.

Results: The evaluation of the five pilots identified one model recommended to be scaled, and one other model to scale after further adaptations. Monitoring and evaluation data from the two models at scale show high levels of participation and acceptability of core messages. Experimental variations involving community champions and fathers increase participation.

Conclusion: The iterative and multi-partner process led to two models of parenting training that have wide acceptability. Future work will analyze impacts on cognitive and socio-emotional outcomes, together with cost analysis.

Introduction

The government of Côte d'Ivoire has made early childhood development (ECD) a strategic policy priority with the goal to improve the country's human capital indicators, stimulate economic growth and alleviate poverty. This commitment is reflected in the Multisectoral Government Project for Nutrition and Early Childhood Development, a multi-stakeholder investment of 60.4 million USD and the creation of the National Council for Nutrition, Food and Early Childhood Development. The policy focus is motivated by Côte d'Ivoire's strong lags in human capital development. Despite being a middle-income country, and some improvements in human capital over the last 10 years, Côte d'Ivoire still ranks only 158 out of a total of 171 countries in the World Bank's Human Capital Index in 2020, a composite measure of health and education. The ranking reflects a low probability of survival until age 5, low schooling and low learning, which are all at levels below the average for Sub Sahara Africa, and much below the average for lower middle-income countries (1). Moreover, evidence of low human capital investments is apparent at very early ages [with adequate meal frequency among children 0–23 months only at 48 percent, and pre-primary enrollment at 10% (1)], a particular concern given the importance of the early years for a child's brain development (2), and motivating the government's prioritization of early childhood development.

Learning from international evidence on the powerful potential of early childhood stimulation (3–5), parenting training focused on nurturing, playful and loving care for children in the first years of life is an important component of the national strategy. Yet little empirical evidence existed on the effectiveness of parenting training approaches in the Ivorian context, and even less on optimal ways to embed such training into existing government structures. Linking early childhood development programs to existing social welfare systems with established administrative capacity and local community networks has been identified as a promising way to scale (2) and the international evidence on such approaches is growing (6–9). There are however many open questions on how to sustainably and effectively scale parenting interventions in Côte d'Ivoire, and more widely in low- and middle-income countries (10–13). Part of these questions are operational (such as how to leverage existing infrastructure and staff while assuring the necessary quality of content and delivery of training), while others relate to understanding the decision-making process among caregivers and their communities when deciding to adopt new parenting practices and behaviors (14, 15).

This paper documents the development, implementation, and initial findings of a pilot-to-scale program in Côte d'Ivoire, aimed at tackling these operational and conceptual challenges, and highlights the essential role of monitoring, evaluation and learning in the pilot-to-scale process. The pilot-to-scale process was led by TRECC, which stands for "Transformer l'Éducation dans les Communautés de Cacao" or (in English) "Transforming Education in Cocoa Communities program," an initiative funded by the Jacobs Foundation, the Bernard van Leer Foundation and UBS Optimus Foundation, with the aim to foster close collaboration between public and private institutions to help ensure that children in Côte d'Ivoire are afforded a good start in life and quality education. TRECCs approach is explained in the next section. TRECCs pilot-to-scale process built in a strong MEL (Monitoring, Evaluation and Learning) approach to maximize learnings from pilots and make evidence-based scaling decisions illustrated in Figure 1. The paper first outlines the MEL approach used to conduct in-depth process evaluations of five different small-scale pilots and explains how this led to an identification of the two most promising candidate models for scaling. The pilots further revealed that many of the tested approaches ultimately relied on components that were deemed hard to sustain after the end of the pilots and that there was overall limited vision on cost management when scaling. The next section explains how subsequently, the two pilot approaches deemed most likely to overcome those challenges were rolled out at a larger scale, with a randomized quantitative impact evaluation built in, to obtain estimates of cost-effectiveness at scale, and rigorously test different design options within them. The implementation at scale showed some concerns with low participation and knowledge transmission in the cascade model approach relying on volunteer trainers, but also some encouraging results on design features that could help offset participation constraints. As such, this paper contributes to the growing literature specifically discussing the contributions of MEL approaches to the global ECD agenda (16, 17) and relates to other recent work documenting the importance of MEL for specific ECD interventions (18, 19).

TRECC approach to scaling

To inform scaling of early childhood parenting training by the Ivorian Government, TRECC, supported the piloting, testing, adaptation, and scale up of various multi-partner implementation models. TRECC mobilized a range of stakeholders including the Government of Côte d'Ivoire and pooled resources and expertise toward the common goal of improving ECD outcomes through a public-private partnership approach, catalyzing an initial investment of approximately 10 million CHF (see Annex A for details on TRECC's approach and a list of partners). The subject matter technical expertise for caregiver training content and approaches developed and adapted by international NGOs and think tanks, was brought together with the mandate, long-term interests, and infrastructure of various line

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Abbreviations: CoP, Communities of Practices; ECD, Early Childhood Development; HKI, Hellen Keller International; IPA, Innovation for Poverty Action; IRC, International Rescue Committee; M&E, Monitoring and Evaluation; MFFE, Ministère de la Femme, de la Famille et de l'Enfant; MSHP, Ministère de Sante et Hygiène Publique; NGO, Non governmental organization; PNN, Program National de Nutrition; VSLA, Village Savings and Loan Associations.

FIGURE 1
Road-map diagram MEL in pilot-to-scale approach.
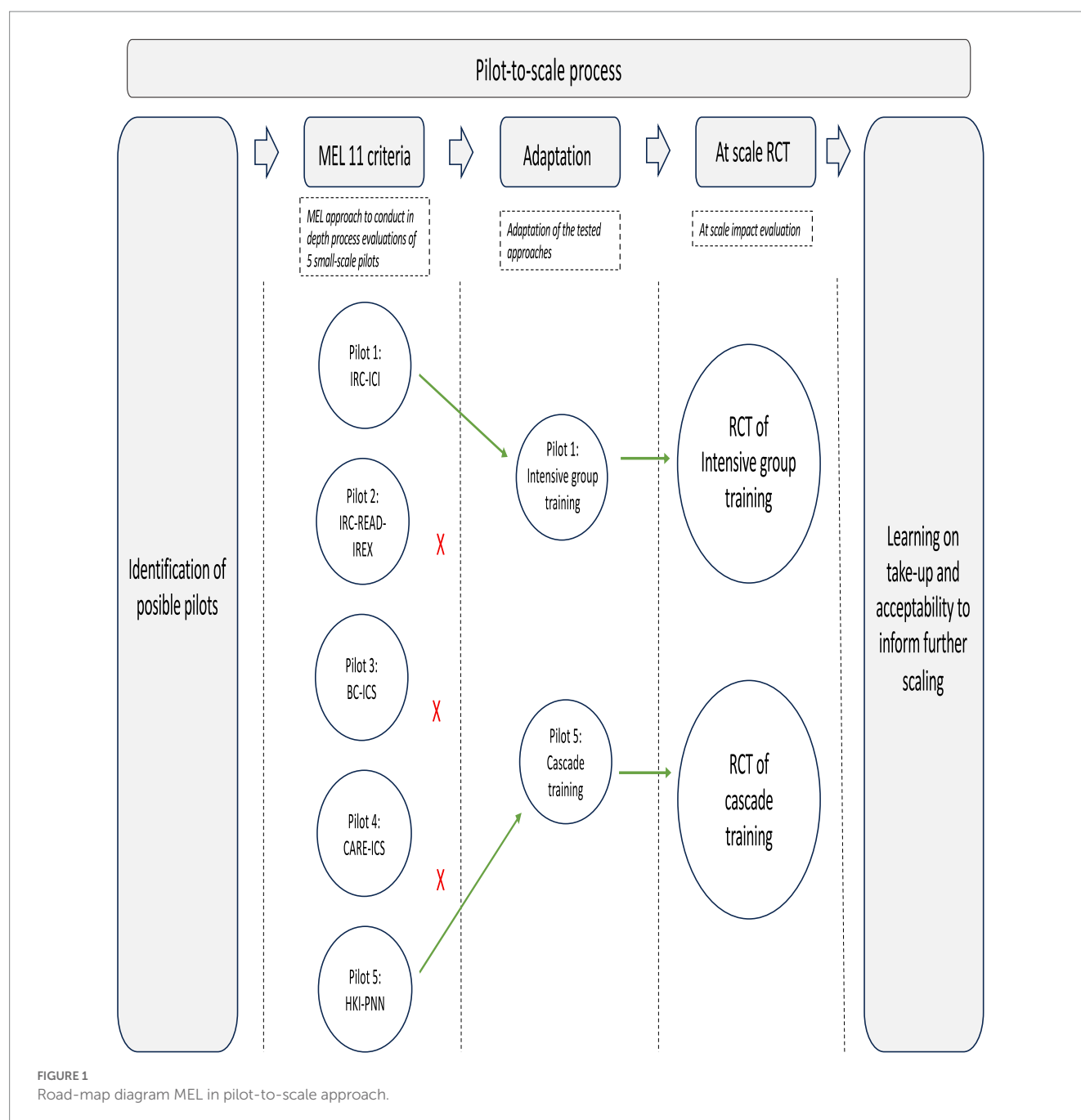
ministries, resources from the private sector and philanthropic foundations, and M&E (monitoring and evaluation), impact evaluation, and ECD expertise from local research organizations and global academia. To assure effective allocation of resources and provide lessons for contextualized actionable solutions for scaling, TRECC built in a deliberate process of evidence generation and data-driven decision-making.

In a first step, several promising approaches were selected for piloting. The purpose of the pilot phase was to adapt and test approaches with proven effectiveness in other settings in the context of rural Côte d'Ivoire and assess their potential for integration in national programs. To assure optimal learning from this pilot phase, a robust and collaborative Monitoring, Evaluation and Learning (MEL) approach was designed to accompany the pilots. Apart from informing the government's policy, learning from MEL was also seen

as a key input into decision making regarding the funding of any scaling initiatives by the industry partners who were providing the operational funding for the pilots.

After iterative adaptations based on the results of the pilot phase, the most promising approaches were selected to be rigorously tested at larger scale. A specific objective of this testing-at-scale was to seek government buy-in for integrating the most effective approaches into government plans for national scaling.

Learning from small-scale pilots

Drawing on the strengths of the different partners, five approaches to improve caregivers' knowledge and practices and promoting nurturing care for healthy child development outcomes were piloted

at small scale between 2018 and 2020 in cocoa growing areas. The approaches to be piloted were identified through TRECCs broad network of partners. Selection was based on demonstrated effectiveness in other contexts (20–22), presence of NGO partners in the country to provide technical support, and interests from the government partners, in light of the ultimate goal of scaling as part of government policies. The approaches were adapted to Côte d'Ivoire, and then tested on a small number of communities along with monitoring and process evaluation activities focused on collecting empirical evidence on the early steps in the theory of change of parenting training programs. The goal was not primarily to compare the models, but rather to document for each of them whether basic operational and acceptability criteria for successful scaling were satisfied.

At the pilot stage, NGOs implemented the programs either directly or indirectly–by training the government local services and strengthening local capacities. Table 1 describes the partners, activities, targets, curriculums, frequency of the training, trainees, and costs of the pilots (see Annex B1 for details). Different implementation modalities and partnerships were tested, but also different approaches to beneficiary targeting, selection of trainers, and intensity of training. All curricula incorporated common aspects of nurturing care along various domains of ECD. In 4 out of 5 pilots, trainings were in group, while the 5th pilot tested a combination of group trainings and home visits. Some pilots incorporated other interventions in addition to parenting training. Pilot 2, for instance, with the highest cost per child, included the creation of community learning centers as well as training in financial literacy and income generation. In contrast, pilot 5 with the lowest cost per child, is uniquely focused on parental ECD training.

TRECC and its partners purposely embedded an intensive process evaluation into the pilot stage to identify strengths and weaknesses of each pilot. The results from the process evaluation informed iteratively adaptations and ultimately recommendations for scaling. IPA, an NGO with expertise in data collection and management for monitoring and evaluation purposes, provided the technical support to the implementing partners to design and implement their own monitoring systems, including assistance on data collection methods, quality checks and analyzes. Complementing these administrative data collected by the partners themselves, IPA also directly engaged in independent primary data collection through a combination of methods. Beneficiary parents were surveyed for input and their knowledge tested at the start and end of trainings. The number of beneficiary parents interviewed differed for each pilot (see Annex B3), reflecting the different scales of the pilot. For the first pilot, for instance, all 240 beneficiary parents were targeted to be interviewed at baseline (before the start of the pilot), at midline (during program implementation) and at endline (after the program ended). The baseline survey aimed at gathering beneficiaries' characteristics at the beginning of the pilot, including levels of need. The midline collected data on beneficiaries' feedback about the implementation of the program and rates of non-attendance. The endline checked beneficiaries' learning and collected overall feedback from the participants. In addition, non-beneficiaries were also interviewed at baseline to verify the program reached the farmers who needed the intervention the most. Focus groups were organized to complement the quantitative data collection with qualitative insights and spot-checks were conducted to observe the training implementation and

check reliability of monitoring data. Finally, key informant interviews provided perspectives of trainers, implicated government officials, community leaders, and partners' implementing staff. The information collected was used to provide real-time feedback to the different implementing partners and other stakeholders, to allow for course correction, when needed. In addition, the combination of the administrative data and primary data was used to produce a comprehensive report after the end of the pilot for the final assessment.

Each pilot was assessed by IPA on 11 common pre-agreed criteria (specified in Table 2) using these different information sources, which provided measures of relevance, results, costs and operational management, capacity to learn, improve and innovate, and sustainability. The criteria together evaluate the preconditions for pilot approaches to be scalable, considering both vertical, horizontal and organizational scaling (see Annex A2). For any parenting intervention to be able to reach impact at scale, it first needs to assure that trainings with adequate transmission of knowledge can be organized, and parents of children at risk of development delays can be identified, are likely to attend trainings, and accept the trainings' messages. Moreover, for implementation models to be scalable they need to build on realistic assumptions of available human resources and have cost structures that can be sustained (see (12, 23) for related in-depth discussion of factors to account for when scaling ECD interventions). Empirical evidence on these criteria requires the right type of data, coming from process evaluation and monitoring activities (24, 25). Validating these initial steps in the theory of change was deemed a critical step before moving to testing impact at scale.

Table 2 reports the results of the pilot evaluations. Each cell describes the data and information used to evaluate the specific criterium for a given pilot, with cells highlighted in green indicating full compliance with the agreed upon criterium. As the criteria capture a variety of aspects about the pilots, the data sources for each criteria differ, some being more qualitative in nature while others are quantitative (see Annex B1 for details). The criteria to evaluate sustainability, for instance, rely heavily on qualitative key informant interviews. The criterium related to achieving the targeted outcomes in terms of ECD knowledge and parenting behavior, on the other hand, is based on the independent quantitative data collections at baseline and endline. Scoring on this criterium is based on a before-after comparison of beneficiaries' answers to questions capturing knowledge and parenting practices covering the different topics of the respective curriculums (see Supplementary Table SA1). The evaluation during the pilot stage was hence based on documenting change, with more rigorous evaluation methods to estimate causal impacts reserved for the scale-up. See materials and methods section for detailed results on targeted indicators for each pilot.

The table shows large heterogeneity in results between pilots and illustrates that while some criteria - notably positive feedback by beneficiaries as well as good use of monitoring data for improvements in implementation–were fulfilled by all pilots, other criteria were more difficult to achieve. Particularly notable were doubts on the sustainability of benefits in target communities, with 4 out of 5 pilots containing components for which it was deemed unlikely they could be maintained after the end of the pilot period. Moreover, for 3 out of 5 pilots, partners had an incomplete vision on cost management under a scaling scenario. We will return to these points in the conclusion.

The first pilot in Table 1 with all 11 criteria compliant received an unconditional recommendation for scale-up. As this pilot included

TABLE 1 Partners, components, parental training organization and costs of the 5 pilots.

	Partners *technical **government ***financial	Intervention details/activities	Target beneficiary groups	Parental training curriculum	Frequency of the training activities	Profile of trainers	Training-of-Trainers (ToT) and supervision	Average cost per child
1	International Rescue Committee (IRC)* International Cocoa Initiative (ICI)* Ministry of the Family, Women and Children (MFFE)** Touton***	Promote a nurturing environment for children through parental training in the Family Makes the Difference (FMD) curriculum Preschool (CACE) construction, equipment and staffing to implement ECD activities Child Labor Monitoring and Remediation System (CLMRS)	240 parents of Touton cooperatives (max 25 per group) 600 children aged 0–5 75 pre-primary school children aged 2–5	Nurturing care, early learning, developmentally appropriate guidance, adult stress management, positive discipline and communication practices, effects of toxic stress and violence on child brain development, health and nutrition best practices	10 training sessions (2 h per session) scheduled according to beneficiaries and Government partners' availability over a 5 month period.	Training provided by 12 social workers (7 men & 5 women) who are state agents 2 community members for each village (6 in total) also supported social workers in leading the FMD sessions.	ToT and Supervision and direct observation of FMD sessions by IRC staff	about $302 per child
2	International Rescue Committee (IRC)* Rights Education And Development Center (READ)** The International Research & Exchanges Board (IREX)** Ministry of the Family, Women and Children (MFFE)** Mondelez***	Promote a nurturing environment for children through parental training in the Family Makes the Difference (FMD) curriculum Creation of READ community learning centers to build parenting skills and improve the physical, intellectual, and social–emotional well-being of young children's Training of VSLA members on financial literacy and income generation with READ and IREX's support to sustain the basic operating costs of the Community center.	200 parents mainly women members of existing Village Savings and Loan Associations (max 26 per group) (VSLA) groups 800 children aged 0–5 500 community members	Nurturing care, early learning, developmentally appropriate guidance, adult stress management, positive discipline and communication practices, effects of toxic stress and violence on child brain development, health and nutrition best practices.	11 training sessions (2 h per session) scheduled according to communities and government partners' availability over a 4 month period	Training provided by social workers who are preschool educators, who had received specific training in early childhood development during their initial training at the National Institute of Social Training (INFS)	ToT and supervision and direct observation of FMD sessions by IRC staff	about $320 per child
3	Investing in Children and their Societies (ICS)* BC-SACO*(both implementing and financial partner)	Contextualize and implement parental training in Skillful Parenting curriculum Connect families to social support services Training of VSLA members on financial literacy and income generation/ diversification	307 parents (max. 25 per group) 900 children aged 0–8 300 partners of farmers sensitized. Community members and 12 social services providers and government workers sensitized on parenting.	Age-appropriate parenting, functional adult relationships; roles and responsibility of skillful parents; Early Childhood Development; nutrition; self-esteem and self-care; values and discipline; communication; child protection.	Weekly training (2–3 h per session) delivered at the Farmer Field School meeting place during 3–4 months	Training provided by Farmer field school coaches (agronomists, 11 men and 2 women).	BC Coaches trained by ICS staff and receive a facilitation pack for Skillful Parenting curriculum.	About $201 per child

(Continued)

TABLE 1 (Continued)

	Partners *technical **government ***financial	Intervention details/activities	Target beneficiary groups	Parental training curriculum	Frequency of the training activities	Profile of trainers	Training-of-Trainers (ToT) and supervision	Average cost per child
4	Investing in Children and their Societies (ICS)* CARE* Mars***	Parental Training in Skillful Parenting curriculum to VSLA groups. Connecting families to social services Training of VSLA members on financial literacy and income generation/diversification	225 parents of 9 VSLAs (max 30 per group) 1000 children aged 0–18 years old	Family relations; roles and responsibility of a skillful parent; self-esteem and self care; ECD; nutrition; values and discipline; communication; child protection; family budgeting	Weekly training (2 h per session) during 3 months	Training provided by Volunteer VSLA promoters trained as community facilitators & cofacilitators.	Promoters trained by ICS staff and receive a facilitation pack for Skillful Parenting curriculum.	About $61 per child
5	Helen Keller International (HKI)* Program National de Nutrition (PNN), part of the Ministry of Health and Public Hygiene (MSHP)** Blommer*** Hershley***	Training of Master trainers, Health workers and Community Volunteer agents. Group trainings whereby mothers, grandmothers, fathers and any other closest family members are introduced to Care for Child Development (C4CD) curriculum and Essential Nutrition Actions/Essential Hygiene Actions (ENA/EHA) Home visits	4531 caregivers, specifically pregnant women, mothers of children up to age 2, fathers, and grandmothers (max 20 per group)	Nutrition, health and hygiene practices to enhance maternal and child nutrition; early childhood development practices through appropriate play and communication	8 monthly sessions (1–2 h per session) during 8 months Home visits	Training provided by 136 Community volunteers with no specific profile	ToT and Supportive supervision to reinforce knowledge and skills over time provided by HKI and PNN staff once a month for the first few months, then periodically as needed thereafter.	About $47 per child

Table the main information on all interventions in column 2 and provides more details of parental training (the focus of this article) in the remaining columns. Costs include set-up costs of the NGOs that given the small scale of the pilots can be a relatively high share, in particular for pilots with a relatively small number of beneficiaries (first 4 pilots). Costs per beneficiary are likely to be smaller in the scaled-up versions. Costs are calculated using average exchange rates of 2018.

TABLE 2 Evaluation outcomes for the 5 pilots on 11 criteria and overall recommendation.

Evaluation criteria	1. IRC-ICI	2. IRC-READ-IREX	3. BC-ICS	4. CARE -ICS	5. HKI
Relevance					
Targets an important need in the community	- about 50% of children in the target communities are not developmentally on track (see Methods for definition) - 85% beneficiaries are caregivers of at least one child in the target age group (0–8) - needs are at least as great among beneficiaries as non-beneficiaries	- about 50% of children in the target communities are not developmentally on track (see Methods for definition) - 95% beneficiaries are caregivers of at least one child in the target age group (0–8) - needs are at least as great among beneficiaries as non-beneficiaries	- 48% of beneficiaries are caregivers of at least one child in the target age group (0–8 yrs) - working through cooperatives does not result in targeting the population that is most in need in the communities	- most of parents in the target communities not aware of the appropriate means of child stimulation - 83% beneficiaries are caregivers of at least one child in the target age group (0–8) - needs are at least as great among beneficiaries as non-beneficiaries	- less than half of parents can name 2 stimulation practices (baseline survey) -57% of beneficiaries are caregivers of at least one child in the target age group (0–2 yrs)
Aligns with the priorities of the donors	- a clear will of the donors to scale-up the program	-donors are not willing to scale resources centers as they were implemented	- unclear alignment with BC's approach and expected results (tackle directly child labor)	- unclear involvement and will of donors to scale-up the program	- a clear will of the donors to scale-up the program
Results: outputs and direct outcomes					
Outputs delivered	- Implementation of planned training sessions and government workers' training completed -85% of beneficiaries attended at least 80% of the trainings	- implementation of the planned training sessions completed - failure to implement community centers and related activities due to low engagement of the communities - 98.5% of beneficiaries participated to at least 8 sessions	- implementation of planned training sessions completed -82% of beneficiaries completed all 9 modules through main sessions or catch-up sessions	- implementation of planned training sessions completed -56% of beneficiaries attended at least 7 out of the 9 training modules	- implementation of planned trainings and home visits completed - about 80% of the beneficiaries attended 8 sessions per month during the last 3 months of the pilot
Achieves direct outcomes (see **Supplementary Table SA1** for details)	- significant improvement on 4 out of 6 knowledge and practice indicators	- significant improvement on nutrition and child protection related knowledge - significant improvement on reported practices - no improvement on the indicators related to the community centers	- significant improvement on 3 out of 6 knowledge and practice indicators	- significant improvement in 1 out 2 practice indicators	- significant improvement on nutrition related knowledge - no improvement on hygiene related knowledge and ECD reported practice
Beneficiaries' feedback about the program is positive	−71% of beneficiaries reported that they would recommend the training sessions	−99% of beneficiaries reported that they would recommend the training sessions	−99% of beneficiaries reported that they would recommend the program	- 93% of beneficiaries reported that they would recommend the program	−90% of beneficiaries reported that they would recommend the program
Costs and operations management					
Costs are well managed/ cost scale-up vision	- efficient use of pilot's resources - clear partners' vision of cost management when scaling	- efficient use of pilot's resources - incomplete partners' vision of cost management when scaling	- efficient use of pilot's resources - no information available on in-kind contributions and opportunity costs	- exceeded initial budget - no information available on in-kind contributions and opportunity costs - incomplete partners' vision of cost management when scaling	- efficient use of pilot's resources - incomplete partners' vision of cost management when scaling

(Continued)

TABLE 2 (Continued)

Evaluation criteria	1. IRC-ICI	2. IRC-READ-IREX	3. BC-ICS	4. CARE -ICS	5. HKI
Project management is successful	- project implemented as planned -excellent cooperation between partners	- substantial delays in the implementation of the community centers	- project implemented as planned -few delays in the implementation -excellent cooperation between partners	- substantial delays in the different activities	- project implemented as planned -excellent cooperation between partners
Capacity to learn, improve and innovate					
Project collects reliable and valid monitoring data	- credible real time monitoring data collected	- credible real time monitoring data collected	- no disaggregated data collected on attendance rate to the sessions	- credible monitoring data collected	- no credible data collected on home visits
Monitoring is used to learn and improve	-implementation of appropriate changes based on data collected	-implementation of appropriate changes based on data collected	-implementation of appropriate changes based on data collected	-implementation of appropriate changes based on data collected	-implementation of appropriate changes based on data collected
Sustainability					
Provides sustained benefit to community	- set up of community of practices in the communities	- set up of community of practices in the communities - low engagement of the community for centers	- limited concrete actions taken by the community to sustain the project	-no prospects of maintaining practices over time - complains of VSLA promotors concerning the lack of financial support	- limited concrete actions taken by the community to sustain the project
Prospects of scale-up beyond GMM2	- first draft of Memorandum of Understanding b/ IRC and the Ministry of the Family, Women and Children (MFFE) for FMD	- first draft of Memorandum of Understanding b/ IRC and the Ministry of the Family, Women and Children (MFFE) for FMD	- scale up strategy unclear at this stage	- scale up strategy unclear at this stage - no sign of government buy-in	- evidence of government involvement (PNN)
Overall recommendation for Scale up	**Full**	**Conditional**	**Conditional**	**Conditional**	**Conditional**

Green cells indicate compliance with the evaluation criteria. Orange cells indicate partial compliance with the evaluation criteria. Results based on process evaluation and primary data collection among beneficiaries by IPA independent evaluators.

trainings by highly qualified ministry staff (social workers of the Ministry of women, family, and children, MFFE) to relatively large groups of beneficiaries (25) for a two-hour weekly session over 11 weeks we will refer to this pilot as the "intensive group training" pilot. The remaining pilots received a conditional recommendation, with conditions being corrective actions addressing the partially compliant criteria. As a result, TRECC and its partners decided to scale the core component of the "intensive group training" pilot. While pilot 1 also included the construction of preschools, the donors and the government conjointly decided that this component would not be systematically scaled in parallel, as they could not secure the financial and human resources necessary for their sustainability.

While none of the other pilots was compliant on the 11 criteria, given the prospects for scale-up through the existing structures of MSHP (Ministry of health and public hygiene), the parental training approach tested in the 5th pilot (Table 1) was further adapted. As this pilot relied on cascade training with knowledge transfer from ministry staff, to paid community health workers, to community volunteers and then to parents, we refer to this pilot as the "cascade training pilot." Notably, this pilot, implemented by two partners with strong institutional expertise in nutrition and health, had shown

positive change for nutrition but not for child stimulation. An adjustment phase in four new pilot localities therefore tested a revised curriculum for stimulation based on (26), new learning methods that stimulated interactive discussions, and improved training for community health workers. The adjustment phase also helped identify remaining constraints around the motivation of volunteers and beneficiaries with formative research pointing to barriers to participation and change in ECD practices (27–29). Certain training topics (such as using positive disciplining methods rather than physical punishment; or the age at which to introduce solid foods into children's diets) were found to be less well accepted because of existing beliefs and cultural norms, resulting in community pressure on parents deviating from social norms. Qualitative findings further revealed misconception around certain practices and pointed to lack of buy-in by fathers as reasons for low participation. Approximately 40% of session for mothers and almost 50% of session for fathers and grandmothers had participation rates lower than 80%, implying that a substantial share were missing out on key messages (Supplementary Table SA2). Grandmothers were found to play a key role in transmitting ECD practices across generations. These resonate with other evidence from Sub Saharan Africa (30–36).

Rigorous testing of interventions at scale

The formative research on the pilots led to the identification of several questions in need of rigorous evidence prior to national scale-up. Two RCTs were set up to test the cost-effectiveness of the two core models selected for scaling (see Materials and Methods section B for details on the RCT designs and study protocols) through a process of co-design between the various partners and an independent research team. While the trials are not at population scale, they were designed to be scalable, as in (6).

The Minister of Women, Family and Children and the NGO IRC (International Rescue Committee) teamed up to roll-out the intensive group trainings in 158 villages spread across 5 departments (Agneby Tiassa, Goh, Lôh-Djiboua, Haut Sassandra, and Nawa). Following the approach from pilot 1, the projects targeted the main caregiver through formal in-group training sessions, with 25 beneficiary households with children 0–5 years old per locality, selected among members of the Village Savings and Livelihood Associations (VSLAs). The trainings covered the FMD ("Families Make a Difference") curriculum over a period of 11 weeks (one per week). Trainings were given by local social workers employed and identified by MFFE. Each social worker was assigned two villages, to allow them to combine the training sessions with their other assigned tasks and responsibilities. Social workers are all trained in community-level training activities and are employed in a variety of such activities as part of their regular responsibilities. The FMD curriculum has a strong focus on (verbal) communication, positive discipline, and intra-household relationships, and encourages the use of home-made toys rather than material inputs.

The scaled-up version of the "cascade training model" from the 5th pilot, implemented by the National Program for Nutrition (PNN) and the NGO HKI (Hellen Keller International) targeted all households with children 0–5 years old in 173 different villages, covering the universe of villages in the sanitary district of Lakota (in the department of Lôh-Djiboua) through in-group training sessions and home visits. Monthly group training sessions were offered for a period of 10 to 15 months, to groups of 15 caregivers at a time, adapted from the "Care for Child Development" program. This was complemented with home visits (1 h, once a month for each household) and village-level sensibilization activities. Trainings and home visits were the responsibility of community-volunteers, trained and supervised by community health agents, who report to the local health district personnel of MSHP (nurses or pharmacist), and receive technical backstopping from HKI. Ministry staff was also responsible for initial community mobilization. Both community volunteers and community health agents were identified for this project specifically and have no responsibilities outside of the project. The local health district personnel, however, combine the oversight tasks with their regular responsibilities. The training integrates topics on early childhood learning and stimulation, positive discipline and socio-emotional support with nutrition and hygiene messages.

Apart from testing the cost-effectiveness of the two models, the RCTs also aim to test whether the effectiveness depends on interventions' ability to sustainable shift intrahousehold and community social norms around ECD. Randomized variations were introduced to estimate the differential impacts of additional training sessions for grandmothers, raising fathers' awareness through targeted videos, setting up Communities of Practices (CoP) around ECD

allowing a larger group of parents to be exposed to the training messages, and seeking the active involvement of selected community champions (Figures 2, 3). The community champions are members of the village leadership or other influential figures in the community, who were invited to the training by the ministry staff and then asked to help mobilize and motivate parents for the trainings by the volunteers. Training started in August 2021, along with data collection to measure impacts. Cost data using the ingredient approach (37) were collected in parallel.

The two approaches that are being tested strongly rely on existing infrastructure, and in particular human resources and ministry staff, but under two different models of knowledge transmission. Both models relied on local ministry staff with tertiary education relevant to the topics of the parental training, which was deemed important by the implementing partners for the initial transmission of the trainings' messages. As such ministry staff is locally relatively scarce, their time commitment provides a potential important constraint on scalability. It is therefore useful to compare the models from this perspective (Supplementary Figure SA1). The intensive group training model relies on direct training by MFFE ministry staff, each of whom provides training in two villages, with one NGO staff providing light-touch technical assistance covering 40 villages. In contrast, the model followed by PNN and HKI has a much stronger reliance on cascade training. Each ministry staff supervises about 3 community health agents, who in turn train and support 6.5 community volunteers on average. The NGO staff provides technical assistance to ministry staff and community health agents (covering about 20 villages). In the intensive group training model, ministry staff directly train a large share of targeted households (25 per village) while another 15 households per village are then reached through the CoP. With full compliance, this comes down to 7 households trained per day of ministry staff's time. In contrast, in the cascade training model 1 day of ministry staff indirectly helps reach approximately 20 households, though with all training of parent beneficiaries done by (much) lower educated community volunteers. Apart from possible implications on the quality of the knowledge transmission, the extent to which either model leads to impacts on parental behavior and, ultimately on children's outcomes will also depend on participation to trainings by targeted beneficiaries, to which we turn next.

Take-up, acceptability, and retention of key messages during scale-up

As for the pilot, the analysis of the effectiveness of the two models implemented at scale rely on a combination of monitoring data collected by the implementing partners, and independent data collected by IPA through qualitative and quantitative surveys (see Annex B3). Analysis was done by the authors of this article.

The monitoring data shows that participation in the intensive group trainings was high, even without financial compensation to parents, with 73.6% of beneficiaries attending at least 80% of sessions (median rates of participation is 90%). Participation remained stable over the course of the intervention (Supplementary Figure SA2). Attendance records show no differences between experimental variations in take-up, suggesting that the core design was sufficient to assure high participation by parents, with no additional gains in take-up of the main beneficiaries from targeting grandmothers or
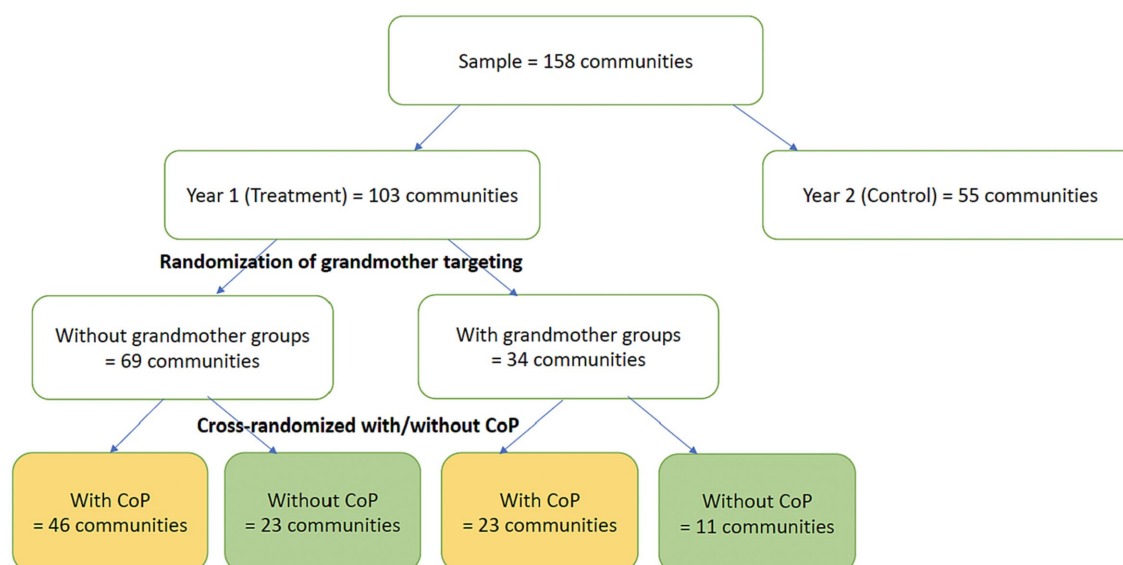
FIGURE 2
Design of the experiment on the intensive group training project.
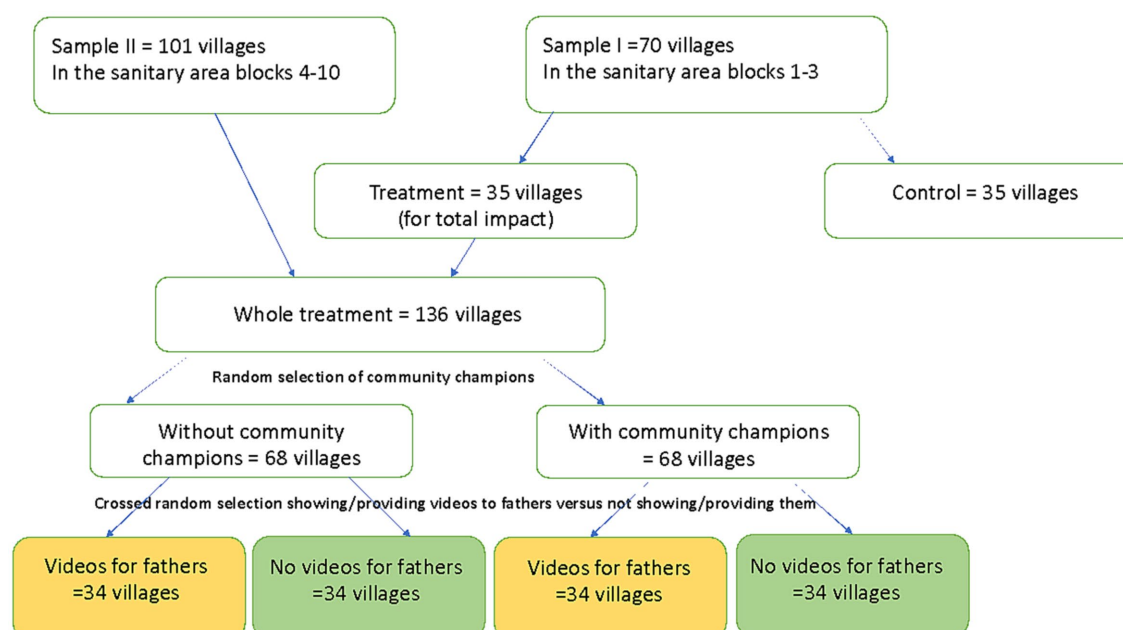
FIGURE 3
Design of the experiment on the cascade training project.

CoPs (See Supplementary Table SA2). Results confirm the broad reach of the trainings among the 25 pre-identified households, with take-up highest among parents with more children, echoing (38).

While the continued high take-up over 11 weeks is suggestive, we further analyze acceptability through information from a survey on beneficiary parents conducted just after the trainings. Supplementary Figures SA3a,b show large retention of the key messages, with virtually all mothers and grandmothers remembering at least one message, and messages about communication with children, feeding and disciplining mentioned by many. While about

30% of mothers (60% of grandmothers) point to at least one message that is hard to implement, a very large share (82% of mothers and 83% of grandmothers) report agreeing with all messages and almost none of the caregivers reported lack of agreement with messages as a reason for having missed sessions. An IRC satisfaction survey confirms the positive feedback, with both main beneficiaries and grandmothers reporting they found sessions useful, enjoyable, clear, and understandable. These results provide support for a key assumption underlying the Theory-of-Change, as the general interest and receptibility for key messages is a precondition for further impact.

A similar satisfaction survey for the cascade trainings in the PNN-HKI scale-up project was also positive, with more than 90% of respondents indicating that content was interesting, easy to understand and helpful in daily life. Even so, available data from the first 5 months of trainings show that participation rates to training sessions declined compared to the pilot, with 65% of sessions having an attendance rate lower than 80%, and a median attendance rate of 60%. Interestingly, however, administrative data on attendance show higher participation in organized sessions in villages where fathers were randomly exposed to the videos, and also in villages randomly selected to have community champions. Notably, father's video exposure leads to higher participation of mothers (Supplementary Table SA4). Mobilization by community champions increased the number of mothers per session by 2.36 (CI: 0.49 to 4.22; $p = 0.014$) while the videos increase participation on average by 1.78 (CI: −33 to 3.90; $p = 0.097$). The effectiveness of the community champions and video exposure to increase participation is confirmed with attendance data from the home visits. Participation of fathers in home visits goes up with 17 percentage points (p.p) with video exposure (CI: −0.00 to 0.34: $p = 0.059$), while participation of mothers goes up with 10 p.p (CI: 0.03 to 0.18; $p = 0.005$). Community champions increase mothers' participation with 6 p.p. (CI: −0.00 to 0.12; $p = 0.060$). These results hence provide supporting evidence for the importance of intrahousehold and community dynamics to increase take-up of parental training, suggesting openness of mothers to the interventions in part can depend on perceived acceptability of the messages by their husbands and the wider community.

Openness to the intervention and its messages of course does not mean that they have been internalized, or that they lead to the same behavioral changes in the two interventions or across the variations. There is also an open question on whether all messages were effectively passed on through the cascade models of learning that both interventions rely on. Results from tests conducted on volunteer trainers of the cascade model before and after the training-of-trainers suggest this could be concern, as their knowledge only increased by 50% compared to that of the trainers-of-trainers (Supplementary Table SA5). Hence while the experimental evidence-to-date points to mechanisms to increase reach and acceptability at scale, impacts on final outcomes will need to be studied as the RCTs are completed.

Discussion

The iterative and multi-partner process of small-scale piloting, monitoring, evaluation, formative research, adaptation, and subsequent testing at scale has led to two models of parenting training that have wide acceptability. Participation by the intended beneficiary parents differed between the two models, possibly reflecting different targeting. The primary target of the intensive group training intervention are 25 pre-identified parents who were organized in VSLA and had expressed interest in parenting training, while the CoP are meant to subsequently reach a wider set of households. In contrast, the cascade training model set out to reach all households with children 0–5 in a village simultaneously. In this later model, parental participation was found to be affected by community and household influencers. Even so, overall participation stayed relatively low, and

imperfect knowledge transmission through the cascade also raise questions regarding its sustainability.

For parenting interventions to have impacts at scale, complying with early steps in the theory-of-change, including high-quality implementation of trainings, take-up by parents and acceptability of messages are important preconditions. The iterations and learning cycles of the various pilots and scaled up versions in Côte d'Ivoire provided an opportunity to learn across different implementation models on those early steps. One particularly salient trade-off highlighted by the two models being tested is between recruiting local community-based volunteers and outside trainers. Intense training over a relatively short period by highly qualified trainers, who can rotate to other villages when finishing in a first set, can be one potentially mechanism to limit costs while assuring high quality knowledge transmission. Volunteer-driven models have lower cost per beneficiary and allow to scale to more parents with involvement of relatively few professional staff. They might not be more cost-effective, however, if it is difficult to find volunteers with sufficiently high qualification and motivation to effectively transmit knowledge to parents. Volunteers' knowledge was found to be relatively low and knowledge transmission was imperfect, risking key messages of the training to become distorted. The evaluations also point to difficulties of maintaining volunteer commitment but provide promising indications of the potential of increasing reach by obtaining buy-in of community and household influencers. The cost-effectiveness analysis of the scaled-up programs will provide quantitative evidence on these different trade-offs to inform national scaling efforts.

As such, the stepwise pilot-to-scale approach employed by TRECC with a strong focus on monitoring, evaluation and learning at every step of the process, has allowed to provide nuanced answers to operational and conceptual questions regarding the scaling of parental training programs, a potential key element of Côte d'Ivoire's commitment to improving its human capital outcomes. The MEL approach notably has allowed to zoom in on some of the more promising models, and focus energy for adaptation and improvement on those models. Having clearly identified criteria from the start of the piloting process that addressed different criteria to account for when making a scaling decision, and a purposeful and mixed-methods data collection investment specifically designed to evaluate each of those criteria, was undoubtedly a key ingredient to achieving the MEL objectives. The strategy of using both administrative data sources from partners and independent data that could speak to each other, was also crucial for the buy-in of the lessons learned by different stakeholders and partners. Finally, a strength of the TRECC pilot-to-scale approach was to start with multiple models to pilot, which increased the probability to be able to move forward with at least one of them, and as such built in a long-term assurance that there would be a way ahead. Finally, while the multi-partner engagement is costly in coordination, it is crucial for ownership of the results.

Providing comprehensive and actionable information based on common agreed criteria to a certain extent can correct priors of partners, including those with a clear stake in the process. Yet it can be a slow and imperfect process. A clear illustration of this last point was that the interests of several partners led to the scaling of the cascade-training approach even if the MEL information pointed to the remaining weaknesses in the approach. Several stakeholders saw the cascade-training as a necessity, given lack of sufficient staff capacity and technical expertise to eventually scale nationally, and wanted to test the adaptations

made as part of the adjustment phase in an "at-scale" implementation. As such, after 5 years of such piloting and adaptation, questions remain on the effectiveness of knowledge transmission in cascade models and on the sustainability of approaches based on community volunteers, pointing to the need for continued learning and adjustments. Addressing those limitations after a scaling decision is made can be difficult, as operational bandwidth constraints and lack of budget flexibility can become more binding when programs are taken to scale. Pilot-to-scale approaches based on rigorous MEL systems to improve ECD outcomes may want to consider flexibility in timelines and accept the possible need for multiple rounds of adaptations, including decisions to delay scale, to maximize returns to the MEL investment.

Finally, because the ultimate payoffs of investment in early childhood only materialize 20 to 30 years after the investment, having reliable, scalable, and effective MEL systems built into ECD programs is crucial for accountability, and therefore ultimately for their sustainability. Retaining buy-in of implementing partners, as well as those parties possibly interested in providing financing for ECD interventions (as is the case with the private sector cacao partners in Côte d'Ivoire), can be facilitated with credible data systems that allow to track fidelity of implementation. Finally, at the appropriate stage and after implementation constraints have been addressed, providing rigorous causal estimates on early childhood cognitive and socio-emotional outcomes becomes crucial to assure long-term effectiveness, as such early childhood outcomes are the best predictors of pay-offs later in life. Future research will therefore return to this question.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human were approved by Paris School of Economics Institutional Review Board and by the Comité National d'Éthique des Sciences de la Vie et de la Santé (CNESVS) of Côte d'Ivoire. The studies were conducted in accordance with the local legislation and institutional requirements. Informed consent for participation in this study was provided by the participants and by the legal guardians/next of kin for all participants that were minors.

Author contributions

TF, SG, KM, CP, CT, and JV conceptualized and designed parts of the study. RA, TF, CP, SR, CT, and JV designed part of the data collection instruments and collected data. RA, CP, SR, CT, and JV led part of the data analysis. TF, SG, CP, and CT drafted parts of the initial manuscript, and reviewed and revised the manuscript. RA, SR, and JV critically reviewed the manuscript for important intellectual content. KM coordinated and supervised part of the design of data collection instrument and data collection, as well as all data analysis, drafted the initial manuscript, and reviewed and revised the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1106565/full#supplementary-material

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Spare the rod, spoil the child: measurement and learning from an intervention to shift corporal punishment attitudes and behaviors in Grenada, West Indies

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Childrearing practices in the Caribbean and other postcolonial states have long been associated with corporal punishment and are influenced by expectations of children for respectfulness and obedience. Evidence across settings shows that physical punishment of young children is both ineffective and detrimental. Saving Brains Grenada (SBG) implemented a pilot study of an intervention based on the Conscious Discipline curriculum that aimed to build adult caregivers' skills around non-violent child discipline. We hypothesized that attitudes towards corporal punishment would shift to be negative as adults learned more positive discipline methods, and that child neurodevelopment would correspondingly improve. This report reviews the impact of monitoring and evaluation on the design and implementation of the intervention. Study 1 presents findings from the pilot study. Despite positive gains in neurodevelopmental outcomes among children in the intervention compared to controls, attitudes towards corporal punishment and reported use of it did not change. Additionally, several internal conflicts in the measures used to assess corporal punishment behaviors and attitudes were identified. Study 2 is a response to learning from Study 1 and highlights the importance for monitoring and evaluation to be data-informed, adaptive, and culturally appropriate. In Study 2, the SBG research team conducted cognitive interviews and group discussions with stakeholders to assess the content and comprehensibility of the Attitudes Towards Corporal Punishment Scale (ACP). This yielded insights into the measurement of attitudes towards corporal punishment and related parenting behavior, and prompted several revisions to the ACP. To accurately evaluate the intervention's theory of change and its goal to reduce violence against children, reliable and appropriate measures of attitudes towards corporal punishment and punishment behaviors are needed. Together, these two studies emphasize the value of continuous monitoring, evaluation, and learning in the implementation, adaptation, evaluation, and scaling of SBG and similar early childhood development interventions.

Introduction

Corporal punishment–physical force used and intended to cause pain or discomfort, however light (1)–is common worldwide (2). Despite its prevalence, and irrespective of cultural normativeness (3) or parental warmth during non-disciplinary interactions (4, 5), abundant evidence shows that corporal punishment,[1] including spanking, is detrimental to young children's development (4, 6–9) and ineffective at maintaining discipline (8–10). Children who are physically punished have fewer social skills, reduced empathy, more aggressive behaviors, lower achievement, higher rates of learning difficulties and physical and mental illness in both childhood and adulthood, and they are more likely to perpetuate violent behaviors as adults (11–14).

In the Caribbean, corporal punishment is considered a necessary part of childrearing (15–21). Due to a history of violence, danger or perceived danger, punitive attitudes and expectations for respectfulness and obedience, physical punishment has been passed from generation to generation as the most widely used disciplinary method (16–18, 21). Even recent studies in the region continue to document wide-scale prevalence of physical punishment: 88 percent of young adults in a Bahamian study reported having been hit or beaten (22), and 86 percent of adolescents in Suriname reported recurring harsh punishment (23). A review of UNICEF Multi Indicator Cluster Survey data of 5,339 mothers with children under age 5 across five Caribbean countries found that 57 percent used physical punishment (spanking) or harsh physical punishment (using an object, shaking, hitting on the face or head, beating) and 55% reported psychological aggression (screaming, yelling, calling the child names) (24).

Despite all Caribbean states having signed the UN Convention on the Rights of the Child (25), which commits them to protecting children from violence, including corporal punishment, only one nation, Cuba (26), has banned corporal punishment in all settings. Understanding why a known risk factor for child development persists is key to early childhood interventions (27). However, assessing beliefs and practices around corporal punishment is fraught with challenges. Measures generally rely on retrospective self-reports. Most researchers have used self-generated questionnaires or items from other measures (28), and most instruments, such as the Attitudes Towards Spanking Scale (29), the Parent–Child Conflict Tactics Scale (30), and the Punitive Discipline Scale (31), are U.S.-based and have not been validated in postcolonial societies or low- and middle-income countries (LMICs).

Attitudes towards corporal punishment are challenging to assess (27). Straus (9) and Kish and Newcombe (10) suggest that beliefs around corporal punishment are often based in selective inattention and an inability to recognize the potential harm. Lack of knowledge or confidence in alternative discipline strategies may also contribute to the difficulty of assessing attitudes (27, 32). For instance, most Caribbean parents believe that physical punishment is necessary and have traditionally used discipline to show disapproval of undesired behavior, rather than positive discipline to encourage desired behavior (24, 33).

Interventions aimed at reducing corporal punishment range from targeted programs for at-risk families to universal education programs to strengthen parenting skills and/or provide education on the harmful effects of punitive parenting (34). The World Health Organization (WHO) recommends evidence-based practices for reducing violence against children, including implementation of laws, addressing social norms and values, ensuring safe environments, providing caregiver support, and providing education and life skills (35). A recent analysis of interventions to reduce violence against children in LMICs concludes that most effective interventions have focused on education and life skills and addressing norms and values, although study confidence is medium to low, and geographic distribution of the research is uneven– no Caribbean studies are included (36).

Effective early childhood interventions are needed, including those that ensure responsive physical and social–emotional care as a foundation for neurodevelopment (37). Nonetheless, challenges in improving access to early childhood development (ECD) interventions across populations persist (38–40). Efforts to scale interventions need accurate, well-integrated monitoring, evaluation, and learning (MEL) systems (41, 42) that assess effectiveness within an intervention's particular context.

The Saving Brains Grenada (SBG) initiative was launched in 2014 in response to concerns about violence against women and children and calls for interventions that address ECD in LMICs (15, 43, 44). SBG is a physical punishment prevention program that promotes neurodevelopment by fostering social–emotional connections between caregiver and child (45, 46). The intervention focuses on teaching and modeling responsive caregiving behaviors under which young children thrive: physical and psychological safety and secure attachment. As children experience safety, adult composure, and consistent social–emotional connections, they are more cooperative and self-regulated, requiring fewer and less punitive disciplinary events (47). They are also more willing to explore their environments, which promotes neuronal growth and cognitive and social–emotional development (47, 48).

Consistent with WHO's recommendations for addressing norms and values, ensuring safety, supporting caregivers, and providing education and life skills, we hypothesized that when adults acquire knowledge and skills about positive responsive care, create safe, predictable environments, and manage conflict and misbehavior effectively, their use of physical punishment will decline, and attitudes towards corporal punishment will become disapproving.

From the outset, SBG's intention has been to learn from doing by piloting the initiative's intervention program and its assessment tools for scale-up in the Caribbean and similar developing regions. This report presents two MEL studies from the SBG program. Study 1 presents findings from the 2014–2016 SBG pilot and highlights the importance for MEL to be data-informed and for interventions to be adaptive. Study 2 is a response to learning from Study 1, and describes findings and measurement revision to improve both assessment and intervention.

Study 1: Pilot intervention

Methods

The SBG pilot study was a parallel single-blind, waitlist-controlled, post-only design, enrolling children and their parents who were either

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1 Some literature uses the terms "physical punishment" or "harsh physical punishment" for the legal term "corporal punishment" interchangeably. In this paper we use these terms interchangeably to refer to any form of physical punishment including spanking, pinching, slapping, smacking, whipping, strapping, etc.

participating or wait-listed in a community-based intervention (St. George's University IRB #14099; https://clinicaltrials.gov/ct2/show/NCT04697134). The intervention was based on the Conscious Discipline curriculum (46, 49), which aims to build adult caregivers' skills in non-violent child discipline. For implementation, SBG partnered with the Roving Caregiver Program, a home visiting service providing infant stimulation to at-risk Grenadian children ages 0–3 (50). Roving Caregivers underwent intensive training in Conscious Discipline. The aim of the intervention was to promote social–emotional connection between Roving Caregivers and parents, and between parents and their children. We hypothesized that attitudes towards corporal punishment, and use of physical punishment, would shift as parents learned positive discipline methods and their impact on a developing brain (51–53). A description of study methods and results is provided by Waechter and colleagues (45); a manual is available from the corresponding author. This case study specifically reports on methods and results of assessing attitudes and behaviors towards corporal punishment and parent–child interactions, rather than the effectiveness of the intervention, which is reported elsewhere (45).

As part of the SBG pilot, caregivers in intervention and control groups were administered questionnaires including the Home Observation for Measurement of the Environment (HOME, Part A) (54) Acceptance subscale and the Attitudes Towards Corporal Punishment (ACP) Scale (ACP; Appendix A). The HOME-A, a widely-used tool among ECD researchers, examines caregiver response to child behavior *via* parent report (reports no more than one instance of physical punishment in the past week) and assessor's observation (caregiver not shouting at child, expressing overt annoyance with or hostility to child, hitting, scolding, or restricting child during home observation; Appendix B). The ACP was developed in-house to assess pre-post attitudes and behaviors related to corporal punishment after a literature search did not yield a suitable existing measure for the study setting. It adapted several items from the US-based Attitudes Towards Spanking Scale (29). The ACP includes items on physical punishment use and recency of use, as well as items assessed on a 5-point Likert-type scale of agreement.

Seven hundred fifty-two (752) families were enrolled in the SBG pilot, and were randomly selected for assessment. Three hundred forty-eight (348) participants were administered the HOME-A and ACP at baseline, with 379 administered post-intervention. Descriptives and chi-square analyses were used to compare groups on the ACP measure, and an independent samples t-test was used to compare groups on the HOME-A.

Results

At both baseline and endline, in both arms, the vast majority of primary caregivers of 0–24 month-old children used physical punishment, and had done so in the past week (Table 1).

Significant differences between post-intervention and control groups were detected on responses to the HOME-A Acceptance subscale, t(583) = −2.09, p = 0.037. Intervention group caregivers demonstrated more acceptance of their child's behavior (M = 3.52, SD = 3.42) compared to caregivers in the control group (M = 2.96, SD = 3.12). (Higher mean = greater acceptance of child behavior.) However, there were no significant differences between post-intervention and control groups on responses to the ACP. In both groups, most participants believed that corporal punishment helps build respect for authority figures (72–75 percent), helps children become successful adults (71 percent), and should be used as a disciplinary method in schools (59–67 percent). When considering differences detected between post-intervention and control groups on responses to the HOME-A Acceptance subscale, this lack of difference in the ACP suggested that the ACP may not have been effective in capturing differences between the groups, thereby raising questions about its validity and/or sensitivity.

Further analysis of baseline ACP data yielded conflicts within participants' responses. For example, of 316 participants who reported using corporal punishment, 125 (39.6 percent) also agreed with the statement, "I would support a law that made it illegal for parents to use corporal punishment." Of the 109 participants who chose the statement, "I believe that if you spare the rod, you spoil the child" as most aligned with their views, 44 of those same participants (40.4 percent) disagreed with the statement "Corporal punishment leads to the development of good character." Finally, of the 186 participants who reported that corporal punishment was not their most effective form of discipline, 31.7 percent (n = 59) nonetheless agreed with the item, "Smacking/beating children is a good way to teach them right from wrong," or the item, "It is sometimes necessary to beat a naughty child" (36.6 percent, n = 68) (See Figure 1).

Study 1 Discussion

We expected to see attitude changes towards corporal punishment among intervention participants, as measured by the ACP, and were surprised to find none. We were intrigued to find internal conflicts in participants' responses on the ACP and incongruent findings between the ACP and HOME-A. One explanation for these discrepancies is that study participants misunderstood items or response options on the ACP. Another is that caregivers feel ambivalent about corporal punishment, resulting in conflicting responses. Payne (18) described a similar "interesting ambiguity" among survey respondents regarding use of corporal punishment in Barbados. Similar discrepancies between attitudes and behaviors exist elsewhere: mothers in 34 LMICs acknowledged using physical punishment, even though most said they believed physical punishment was unnecessary (27). Attitudes and practices around corporal punishment may also take time to shift–the study may have been of insufficient duration to demonstrate change.

TABLE 1 Percentages of participants pre- and post-intervention who utilize corporal punishment.

	Pre-intervention (*n* = 348)		Post-intervention (*n* = 379)	
	Control	Intervention	Control	Intervention
Caregivers smack/beat their child	81%	84%	91%	96%
Caregivers smacked/beat their child within the last week	76%	81%	72%	73%

FIGURE 1
Conflicting responses found in the ACP results during the pilot study.

Given the high number of participants endorsing and defending corporal punishment, SBG used ACP data from the pilot study to shift emphasis away from physical punishment. Rather, we drew from principles of Conscious Discipline (46) to focus on what was wanted— responsive care—rather than what was not wanted—physical punishment. Interventionists encouraged parents to add new, positive behaviors without challenging existing beliefs or practices. This change in intervention approach was a direct result of the SBG pilot study measurement system.

Study 2: Quality assurance of the Attitudes Towards Corporal Punishment Scale

To evaluate SBG's theory of change and its objective of reducing violence against children, reliable measurement of corporal punishment attitudes and behaviors is needed. In response to findings from Study 1, the SBG research team conducted a quality-assurance study of the ACP (Study 2) to explore whether the scale fulfills its intended purpose.

Methods

From February to August 2022, the SBG team conducted group discussions and cognitive interviews to capture feedback on ACP items' wording, content, and comprehensibility. Cognitive interviewing is a qualitative method that explores how people process and respond to questionnaires, with the goal of developing instruments that produce high quality data (55). Cognitive interviewing is a valuable method for developing and improving quantitative surveys, and adapting measures developed in one context

and utilized in another–it can help identify and resolve issues with survey questions, including word choice and alignment with local views (56).

First, a group discussion was conducted with Roving Caregiver Program supervisors who oversaw implementation of the pilot. The SBG team proceeded with two rounds of cognitive interviewing and group discussions, using concurrent probing techniques to review each item and explore item clarity, wording, and response options. The team followed general guidance for conducting cognitive interviews to improve questionnaire design (57–59) and conducted two rounds of 9-10 interviews each (Figure 2). After the first round, team members reviewed all responses and wrote comments on each item. In the first round, the team recruited a convenience sample of parents from within the project's network. In the second round, the team interviewed a subset of participants from the first round and also recruited new individuals from within the project network. In the second round, a revised ACP was used for all interviews (Appendix C). Interviews were conducted in-person or over video-conferencing (Zoom). All interviews were recorded, and detailed written notes taken. Responses were combined in a matrix for review.

Study 2 was exempt from IRB review given its focus on measure-testing quality assurance.

Results

Four categories of issues with the ACP emerged: (1) definitions and measurement of corporal punishment; (2) restrictive items or response options; (3) unclear relationship between item and construct; and (4) minor issues with terminology and/or comprehension. For each theme, examples of the original item, findings from both rounds of cognitive interviews and group discussions, and modifications to

FIGURE 2
Cognitive interviewing process for ACP quality assurance study.
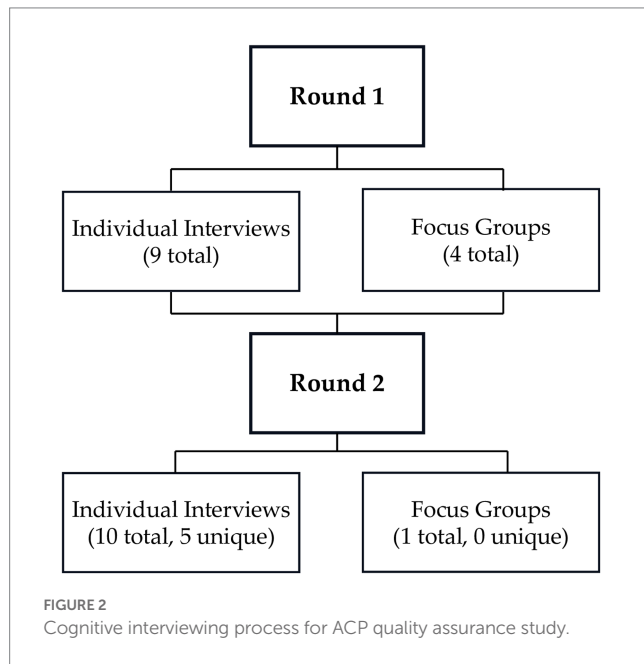
items are outlined in Table 2; a table outlining findings for all items is available in Appendix D.

An additional topic that aligned with the study's objective also came through in the data: conflicts between attitudes or beliefs and corporal punishment behavior. An overview of findings is presented here.

(1) Definitions and measurement of corporal punishment.

An early observation from participants was that the two descriptive terms used in the ACP to represent corporal punishment ("smack/beat") were not considered equal forms of punishment.

> *"It sounds like two different questions."* -Roving Caregivers Supervisors Discussion

> *"Lumping 'smacked' and 'beat' makes it difficult [to answer the question]."* -Round 1, Group Discussion 3.

> *"A tap/smack is using a hand or ruler across a leg or on the bottom… Beat is using force all over the body and it can cause bruising."* -Round 1, Cognitive Interview 1.

In Round 1, participants were asked to provide their own definition of corporal punishment. Participants' responses varied, with several mentioning physical punishment or naming a form of physical punishment (e.g., lashing); others described a broader definition, including other forms of punishment, such as "removing privileges" or "causing physical and emotional distress to a child/individual."

The suggestion from participants to resolve this issue was to use a separate term, like "hit," or to say "physical punishment" instead of naming a specific action. As a result, in Round 2, items previously asking about smacking/beating were revised to ask about physical punishment, and a definition of physical punishment was provided (see Appendix C).

The original version of the ACP included four items to record parents' disciplinary actions (Appendix A, Items 1–4), including items asking if the participant had ever smacked/beaten their child(ren), and recency and circumstances of the event(s).

> *"…You have to ask how often! 'I beat them every day but not this morning.'"* -Round 1, Group Discussion 1.

In Round 1, participants indicated that this set of questions did not fully capture parents' disciplinary actions, and the items were revised for Round 2 (Table 2).

(2) Restrictive items or response options.

In Round 1, several items were considered "too general," and therefore difficult to answer. In addition, many of the items with yes/no response options in Round 1 were answered with "maybe" or "it depends." Most participants felt that a dichotomous response option was too extreme or not sensitive enough. For example, the original ACP asked, "Does corporal punishment lead to the development of good character?" While some participants were able to respond "yes" or "no" with justification for their answers, others struggled:

> *"I'm not sure. [It could go] both ways."* -Round 1, Cognitive Interview 4.

For Round 2, these items (Appendix C, Items 11–15) were changed from questions with a dichotomous yes/no response option to statements with a 5-point agree/disagree Likert-type response. This change was well-received by those who participated in both rounds.

Two other items and their response options were considered restrictive. In one item, parents were asked to indicate the disciplinary method previously mentioned that had the most effect on a child's behavior (Appendices A, C, Item 2). Participants, however, said that it depended on the child, the child's age, the behavior that required punishment, and the parent themselves. At the same time, the SBG team wanted to better capture the potential conflict between parents' disciplinary actions and what they perceive to work best; in Round 2, additional questions were added to explore this (Table 2; Appendix C).

The other item considered restrictive asked parents to identify, from among a list of statements on corporal punishment, the one that aligned best with their beliefs (Appendix A, Item 5; Appendix C, Item 4). Some participants felt that the statements were not mutually exclusive, or that multiple statements aligned with their beliefs.

> *"They all apply to me. Growing up, my grandmother beat my older cousins, me too, we came up ok. For Option C (I'm comfortable with the idea of smacking/beating a child and will do it when I think it's necessary), right now technology has created a great wall. My grandma will watch you up and down. For me, children now lack discipline. I'm not against corporal punishment."* -Round 1, Cognitive Interview 2.

Participants had suggestions for how to improve the content of each statement in the question, and each was revised ahead of Round 2. However, a few participants in Round 2 still felt the statements were not mutually exclusive, or representative of their beliefs.

TABLE 2 Learning from the quality assurance of the ACP—examples of the original item, findings, and modifications.

Original item (Response option)	Findings from Round 1	Revised item (Response option)	Findings from Round 2
Definitions and measurement of corporal punishment (behavior)			
Have you ever smacked/beaten your child? (Yes/No) If yes, how recently? (Last week/Last month/Last 6 months/Last year) Please indicate in which circumstances, if any, you have smacked/beaten your child(ren) in the past year. (Open-ended)	- "Smack" and "beat" are different - Unclear how to answer if smacked but never beaten - This does not capture other forms of punishment - There is a difference between recency, frequency, and severity of punishment	Have you ever used any form of physical punishment with your child? (Yes/No) If yes, please describe. With hand? With object(s)? (Open-ended) When was the last time you used physical punishment? (Open-ended) How often do you use physical punishment? (Open-ended)	- Revision seems clear, but participants do not always clearly answer each part of the question
Restrictive question/item or response options			
Is corporal punishment an effective method of disciplining a child? (Yes/No)	- Participants are not always able to answer yes or no, several answer with "it depends" or "sometimes"	Physical punishment is an effective method of disciplining a child. (Agree/Disagree)*	- Revision seems clear, though item may not fully capture situation-dependent use of corporal punishment
Minor issues with terminology			
Smacking/beating a child is as unacceptable as hitting an adult. (Agree/Disagree)*	- "Just as bad" used instead of "unacceptable" in practice - Smacking, beating, and hitting all different terms	Using physical force on a child is the same as using physical force on an adult. (Agree/Disagree)*	- "Physical force" is too strong a term - General sense/purpose of the item seems clear

*Response options were a 5-point Likert-type response of Strongly Disagree, Disagree, Neutral, Agree, or Strongly Agree.

"I do not find any that represent me. (Interviewer then clarified to choose which comes closest to personal opinion). I don't like the idea of using physical punishment but I will sometimes use it; it's something I don't like to do but it does happen." -Round 2, Cognitive Interview 5.

A note for the participant above: she selected Option A, "I think it is always wrong to use physical punishment on a child," as the one that best represents her, although Option B, "I do not like the idea of using physical punishment, but I will do it if nothing else works" fit more closely with her interview response.

For this item, participants also noted that the phrase "Spare the rod, spoil the child" (Option D) could be understood differently by different people, and could be a held belief alongside other statements in the item.

"Option D, '"Spare the rod and spoil the child,"' is not the most intense…it could be both Options B and D." -Round 1, Group Discussion 1.

Responses to this item in Round 2 indicated that additional item generation and evaluation are needed.

(3) Unclear relationship between item and construct.

One item asked participants to agree or disagree with the statement, "Only bad parents smack/beat their children." In Round 2, the statement was modified to change "smack/beat" to "physical punishment." In both rounds, the statement was clear and participants were able to provide a response and a justification that aligned with their close-ended response.

"Strongly disagree. It doesn't mean you're bad, you're making sure the child is on the right path. All parents mean well but

circumstances and experience prevent them from being good. Willingness and support is needed." -Round 1, Cognitive Interview 6.

"Agree, but parents might not be educated enough; they aren't necessarily bad parents. They don't mean to harm the child. Beating a child is just short term [effective]. Two or three days later, the child will do the same thing." -Round 2, Cognitive Interview 1.

In review of participants' explanations, it was evident that responses were not reflective of an attitude towards corporal punishment, but rather an attitude towards parenting. It was also unclear how this item should be scored in a composite measure. As a result, the item was dropped from the scale.

(4) Minor issues with terminology and/or comprehension.

Cognitive interviewing and group discussions uncovered minor issues with terminology and/or comprehension (Table 2). For example, for the item, "Smacking/beating a child is as unacceptable as hitting an adult," SBG team members who had administered the questionnaire noted that in practice they were saying "just as bad" instead of "as unacceptable," so this change was made to the item. In Round 2, "smacking/beating" was replaced by "physical force" for this item, though participants felt the term was too strong and did not meet the objective of the item. Different terms and iterations of the item are being tested.

(5) Conflicts between attitudes or beliefs and behavior.

The SBG team identified several instances of conflict between attitudes or beliefs and participants' actions (e.g., corporal punishment behavior), similar to those identified in Study 1.

For example, in response to the question about whether they had ever smacked/beaten a child, two participants said yes, but also

mentioned negative outcome expectations. One participant, a grandmother, said she "threatens punishment to grandchildren, but it ruins the relationship." Another participant said she smacked/beat her children, but "[did not] want [her] children to expect licks like [she herself had experienced], as it could "create a greater monster."

As another example, in response to the item, "It is sometimes necessary to smack/beat a child," agreement was not necessarily reflective of an endorsement of corporal punishment.

> Interview notes: First answer given was "tend to agree" as they are "influenced by culture." The second answer given was "strongly disagree" as it is "not necessary, you could use other methods." -Round 1, Cognitive Interview 5.

(6) Other findings.

In a few cognitive interviews and group discussions, participants noted that the survey questions had been thought-provoking, suggesting that the process of responding to questions encouraged reflection of attitudes and beliefs around the practice:

> *"It makes me think a lot more of other measures to try to correct behavior."* -Round 1, Cognitive Interview 1.

> *"Interesting. I never really thought about it so much before."* -Round 2, Cognitive Interview 10.

Discussion

These two studies share a common objective: improving and leveraging measurement and evaluation in order to strengthen an intervention. In Study 1, ACP results prompted a shift in focus to better align with local context. Moreover, conflicting results suggested a problem with measurement, the theory of change, or both. In Study 2, data from the ACP prompted critical revisions for future applications–results from cognitive interviews and group discussions yielded insights into the content and measurement of attitudes and behaviors. Together, the studies provide important learning for implementation, adaptation, evaluation, and scaling efforts to address physical punishment against young children.

Key monitoring and evaluation learning

Findings from both studies suggest that, in the short-term, despite increased acceptance and tolerance for a young child's behavior, attitudes towards physical punishment did not change as anticipated. Even as they learned and implemented methods for relationship-based positive discipline that supports neurodevelopment, parents continued to endorse cultural norms around corporal punishment. Nonetheless, in societies in which corporal punishment is increasingly less prevalent, data show a steady rise in negative attitudes towards physical child discipline (60) and increasing acceptance of legislation against its use (61). As participants in Study 2 indicated, corporal punishment of children is cultural; therefore, attitudes may take longer than the pilot study funding cycle to shift.

The studies presented underscore that attitude measurement is challenging. Attitudes are not always accessible or stable, which affects attitude-behavior consistency (62). In their meta-analysis on attitude-behavior association, Glasman and Albarracín (62) found that easily recalled attitudes that are stable over time best predict behavior, particularly when attitudes are confident. In Study 2, respondents' attitudes and behaviors remained consistent with predominant cultural views, but with closer inspection, they endorsed conflicting attitudes and beliefs. In this context, it is possible that attitudes towards corporal punishment were not easily recalled (e.g., "*I never really thought about it so much before.*" -Round 2, Cognitive Interview 10). Many caregivers are likely ambivalent about corporal punishment, as evidenced by participants responding "sometimes," "it depends," and "maybe" to multiple items. Conflicts in the data may also suggest changing attitudes. A key takeaway from Study 2 was that the cognitive interviewing process seemed to prompt reflection about corporal punishment. Increased thinking about attitudes, and more reporting on attitudes, may increase attitude accessibility (62). A future study may investigate whether administering the ACP with concurrent probing, as was done in Study 2, could serve as an intervention, resulting in an "ACP Heisenberg Principle" or "ACP Mere-Measurement Effect" (63), wherein the act of measurement can lead to positive change.

While attitude measurement is difficult even with valid and reliable questionnaires, these studies identified weaknesses with the ACP itself. First, due to time and resource constraints, cognitive interviewing was not used in the initial development of the ACP. This could have averted issues identified in Study 2, especially around terminology. The original scale did not include several items important to corporal punishment attitudes and behaviors identified in Study 2 (e.g., recency, frequency, and severity of physical punishment; attribution for instances of physical punishment). The SBG research team has since conducted a wider literature review and is pre-testing items informed from Study 2 for inclusion in future iterations of the ACP. A potential issue for scoring is that the ACP queries both attitudes and behaviors, which require separate domain scores that may continue to illustrate conflicting results.

Measuring for Change

Among ECD researchers, practitioners, and policy makers, there is recognition of the need for data to guide effective implementation and scaling (39). The Measuring for Change movement, with its aspirations for MEL to be dynamic, inclusive, informative, interactive, and people-centered (64), asserts that, rather than focusing on impact alone, ECD programs should use data to generate change, not just measure it.

In aspiring to be "dynamic," ECD programs should incorporate systems that allow interventionists to adapt to new information in their specific contexts. The SBG team responded to conflicting data (i.e., new information) by conducting a quality assurance study on the ACP, involving participants and other stakeholders in the process (consideration of context). Further efforts to adapt the program based on learning from these studies continues: development and pre-testing of new items for the ACP is underway, and additional measures for corporal punishment behaviors will be considered for future evaluations. Responsive caregiving literature has been reviewed for clarification about safety and connection, and studies of adults raised with and without corporal punishment are underway. SBG will also

consider alternative theories of change for the intervention, which achieved the primary outcome of improved neurodevelopment, but not the secondary outcome of behavior and attitude change, at least as measured.

To be "inclusive," interventions should involve stakeholders in the development and implementation of MEL. More thorough input from Roving Caregivers and other stakeholders with in-depth knowledge about parents' behavior and the cultural and social relevance of corporal punishment has been sought. Future rounds of questionnaire development, implementation, and evaluation will include this learning.

Lastly, interventions that aspire to be "informative" need data at multiple time points (e.g., development, implementation, and evaluation). A critique of ECD interventions is that data collection traditionally focuses only on child outcomes at intervention's end (40). SBG's investigation of corporal punishment attitudes and behaviors is an example of collecting and using data from adults as well as children, and at multiple time points.

The role of monitoring, evaluation, and learning in the process of scaling

A further consideration regards the use of MEL to inform scaling. The WHO defines scaling as "deliberate efforts to increase the impact of successfully tested pilot, demonstration, or experimental projects to benefit more people and to foster policy and program development on a lasting basis" (65). The current study informed the SBG team's thoughts on scaling ECD interventions in two key ways.

First, to inform scaling decisions and strategies, data from timely and accurate MEL are needed across different stages of the program. For example, a more detailed assessment of corporal punishment behavior that includes recency, frequency, and severity of punishment may identify smaller changes in behavior than the ACP was able to detect in its original form. Tracking attitudes and behaviors over time can support eventual legislation and normative shifts towards recognition of child rights.

Second, while vertical scaling of ECD interventions is one goal, findings from this case study suggest an alternative scaling construct: one that is chronological and intergenerational. In this case, impact can be achieved as children–raised by adults with knowledge, skills, and self-efficacy to create and sustain safety and social–emotional connections–become parents themselves. Much like the intergenerational nature of corporal punishment behavior, safe environments and strong social–emotional connections could become normative. The question remains whether corporal punishment attitudes and behaviors *will* change alongside improved social–emotional connections over time and in a way that supports lasting change. Demonstrating lasting change provides strong justification for scaling.

Reflecting on measuring for change raised potential approaches to scaling the intervention to other regions. For example, is a focus solely on social–emotional connection sufficient for this postcolonial context, or is more information about the potential harmful effects of physical punishment needed for greater impact? What if attitudes do not change, even if behaviors do? What will we learn by asking about adults' own experiences of corporal punishment as children? These and other questions illuminate the dynamic, inclusive, and informative potential for

measuring attitudes and practices towards corporal punishment, and the potential for a long-term cultural shift in attitudes towards raising children.

The SBG Conscious Discipline intervention is a candidate approach for improving ECD in settings where violence against children is normative. Such violence, including corporal punishment, remains a significant public health problem (66–68). Correlations between physical punishment in childhood and adverse health, behavioral, and neurodevelopmental outcomes across the lifespan (7, 11–13) are a driving force behind efforts to provide alternatives. A valid, sensitive, reliable, and appropriate ACP measure is critical to assess the impact and effectiveness of efforts to shift attitudes and behaviors.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by St. George's University Institutional Review Board. Written informed consent to participate in Study 1 was provided by the participants' legal guardian/next of kin. Study 2 was exempt from IRB review given its focus on measure-testing quality assurance.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1127687/full#supplementary-material

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Scaling up the training of teachers through digitalization: the case of the aeioTU network

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The use of digital platforms opens up the possibilities to scale up and strengthen interventions in the field of early childhood development, but also entails challenges regarding engagement, connectivity, or digital literacy. In this paper, we describe and critically assess the use of Monitoring, Evaluation, and Learning (MEL) to guide the process of digitalization undergone by aeioTU, a well-established Colombian organization working in the early childhood development ecosystem, to improve and scale up their educational practices. We reflect from the organization's perspective on two phases of this process: the creation of a digital learning community to share aeioTU's educational knowledge and experience, and the expansion of this learning community to become a network aimed toward the development of collaborative relationships and the co-creation of knowledge. From a policy viewpoint, three main learnings are obtained from this process: start with the needs from the local communities; use digital tools already available, and embrace technology without compromising the organization's core values.

1. Introduction

aeioTU is a social enterprise aimed at developing the full potential of early childhood through direct service provision as well as the training of other actors in the early childhood scene in Colombia. They have been an active organization for over 14 years and so far have impacted more than 30,000 children through direct service provision and over 470,000 via their training and advisory activities.

One of the key elements in reaching that level of impact has been their use of digital tools to both refine and scale up their activities. For example, the organization uses digital tools to centralize their administrative processes or to track the development of the children attending their centres. Regarding the scaling up processes, they have focused in the development of digital platforms to sustain learning communities that make easier to train, guide, and nurture a larger group of educators, families, and communities around Colombia and other parts of the world.

Therefore, the main purpose of this article is threefold: first, describe the different stages of the digitalization process undertook by aeioTU, summarize the main learnings obtained from the scale up using digital tools process, and reflect on the current characteristics of the digital learning communities that they have promoted.

This paper also makes two major contributions: first, it informs other organizations and initiatives of the benefits and challenges that are present in scaling up processes via digital tools, by presenting a detailed description of the processes, and changes undertook by the organization.

The paper also contributes to the literature that analyse digital learning communities for teachers and educators. This strand of the literature has been burgeoning in recent years [see (Lantz-Andersson et al., 2018) and (Dille and Røkenes, 2021) for a review], so the study of the characteristics of a digital community implemented within an organization that is undertaking a scaling up process will provide a relevant insight for academics and organizations alike.

The rest of the article is structured as follows: section 2 describes aeioTU's activities, section 3 present the various stages of the digitalization process by aeioTU and reflects on aeioTU's digital learning communities characteristics, section 4 summarizes the main learnings from the digitalization process, section 5 discusses some existing challenges, and section 6 concludes.

2. Context

aeioTU started its activities in 2008 in collaboration with the Colombian government to provide and scale early childhood services throughout the country via the establishment of center and family-based care services and professional development and technical assistance in early childhood development. Currently, aeioTU operates 10 early childhood development centers in 5 cities and municipalities in Colombia, and so far has reached 31,291 children, 59,139 parents and caregivers and 6,368 educators.

The activities of aeioTU lie within Colombia's national strategy De Cero a Siempre (DCAS), which aims to "increasing access and improving the quality of early childhood services provided to poor children. Its objective is to deliver high-quality integrated early childhood services for 1.2 million in poverty under age 6" (Nores et al., 2018, p. 201).

In 2015, aeioTU started accompanying other early childhood organizations, teachers, and educational leaders, helping them to improve their daily practices. In 2021, they formalized those activities with the Consulting and Special Projects direction, through which they have impacted 471,449 children, 891,220 parents and caregivers, 25,271 educators and 3,745 educational spaces.

All these projects are immersed in an advocacy strategy aimed to mobilize different actors around important issues for early childhood education, seeking to improve public policy and ensuring that stakeholders are aware of the importance of education and culture in children under 5 years of age.[1]

In May 2020, aeioTU created the digital direction with the objective of scaling the impact of their educational model by leveraging the advantages and functionalities of digitalization. To do so, they launched an online platform aiming to articulate the different actors in Early Childhood Ecosystems. The platform currently has 21,100 users and has impacted 54,781 children.

Regarding aeioTU's activities, their main goal is to provide a strong and solid foundation to children development in all of its spheres including socio-emotional development. To this extent,

previous literature has evaluated both the effects of the programme (Nores et al., 2019) as well as the development and strengthening of its methods in more initial stages (Nores et al., 2018).

Specifically, aeioTU focuses on six areas within early childhood development: "a comprehensive combination of nutrition, health and education objectives, clear pedagogical objectives and a curriculum with an emphasis on continuity across the early years, continuous professional development, adequate physical space and materials, family participation, transition to formal schooling, strong centre management and planning for sustainability" (Mesa et al., 2021, p. 3).

Nores and co-authors (Nores et al., 2019) find that the programme had positive and statistically significant effects on various areas of language, cognitive, and motor development for a sample of over 450 infants and toddlers that attended two aeioTU centres in northern Colombia between 2009 and 2010. In terms of language development, the children had an improvement of 0.111–0.114 standard deviations – measured using the language items of the Bayley scales of infant development III (BSID III). The cognitive improvement was of 0.07 SD and the motor improvements ranged between 0.04 and 0.06 SD. The authors did not find significant changes in the socio-emotional development of the children.

About the strengthening of aeioTU's educational practices, Nores and co-authors (Nores et al., 2018) present the results of their assessment of those practices and facilities in various aeioTU's classrooms between 2011 and 2014. The authors use the ECERS-R, an observation and rating instrument for preschool classrooms serving children aged 3–5 where a rating of 1 indicates inadequate quality, 3 indicates minimal quality, 5 indicates good quality, and 7 indicates excellent quality.

The authors assessed 17 classrooms in 2011 and 30 in 2014 and they found that the programme averaged a score of 2.3 (out of 7) in 2011 while in 2014 that score increased up to 2.9 points. A closer look at that score shows that the language and reasoning and interaction activities were among the highest scoring in 2011 when they scored 2.04 and 3.16, respectively, and they grew to 2.80 and 3.89 in 2014 (Nores et al., 2018).

Given the nature of the special issue, it is relevant to mention here aeioTU's approach and use of MEL processes to strengthen their work.

For aeioTU, the MEL system fulfils four different goals: first, achieving greater effectiveness and efficiency in every process of the organization. Second, gain insights to ensure that efforts and resources are invested in activities that can be sustainable across time.

Third, it aims to foster organizational capacities to ensure effective use of evidence and learning as part of decision-making. Finally, aeioTU's MEL systems aim to strengthen the quality of data and monitoring, evaluation and learning systems or tools to, consequently, improve the goals described above.

More precisely, aeioTU's monitoring involves using tools such as surveys, focus groups, and SWOT analysis to track various processes and their outcomes. These results are recorded in the organization's balanced scorecard, and are followed up periodically.

Evaluation is conducted at predetermined intervals to improve processes, and be accountable to stakeholders. Different evaluation tools such as internal and external audits, "Beacons" (pedagogical and healthy operation evaluation instruments) evaluation instruments that are implemented in their educational centres to measure the quality

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1 For further reading on aeioTU's activities and projects, we invite the reader to consult the following articles in both scientific and non-scientific outlets (Paz, 2018; PopatPlay - The Lego Foundation, 2020; Bernal et al., 2022; SUMMA, 2023).

their operations, and external evaluations are used to measure the quality of different processes in the organization.

Finally, the learning process takes place through joint meetings with relevant stakeholders and recorded in various formats, including root cause analysis, corrective actions, and change management by following these three processes, aeioTU can continually evaluate and improve their performance, innovate, and be accountable to their stakeholders.

3. Detail to understand key programmatic elements

3.1. Stages of the digitalization process

In this section, we explain the different stages during which aeioTU evolved in their use of digital tools to scale up their work. We also reflect on how their community of practice relates to the characteristics laid out by the relevant literature.

aeioTU started embracing digital technologies in 2012, when they were operating 16 centers with over 6,000 children. At that time, aeioTU had a significant need to access developmental information for each of those children in an effective way. So they created a software (ConecTU) to monitor children's development. With this software, teachers were able to input relevant information about every child and keep track of their changes over time. ConecTU allowed teachers to understand how each child progressed in terms of their own development, but also compare each individual with other children in their group, and with other children of the same age in other aeioTU centers. Later, this application evolved and became a management tool for the centers, which also allowed them to monitor other administrative processes such as the registration, assistance and others.

Despite achieving important progress, aeioTU found themselves with a challenge: their centers are located in remote places that do not have good internet access, which makes it difficult for the teachers to enter the information on a timely manner. An additional challenge was that teachers had difficulties in using the software, which required a significant effort to train them on its characteristics and uses.

In 2015, they were operating 28 centers, and the management of processes such as accounting, purchases or hiring needed a robust tool to support it. To help with that, they started using SAP, an ERP (Enterprise Resource Planning) system. Its implementation allowed aeioTU to migrate the company's data from different programs to a single tool and centralize the management of the entire administrative operations.

However, they also faced a great challenge in terms of process adaptation. Getting all the centres and the aeioTU staff to be comfortable with the new system was a long process. Migrating all the data that had been stored for years on other platforms also took considerable time and effort.

In 2018, they began developing a tool that would allow teachers to strengthen their knowledge and improve their educational practices within the aeioTU Educational Model. They wanted to create a learning community for teachers and families, both from aeioTU and other Early Childhood operators that aeioTU was offering training to. They developed a LMS (Learning Management System) called *Learning,* which they launched in May 2020. The platform offered over

a thousand of free educational contents for teachers and parents, and a pilot digital course.

However, the high level of digital illiteracy among their users, and the cumbersome navigation through the platform, made the whole process very difficult for users. Teachers gave up using the tool and the interaction between users was not working to foster the intended community of practice.[2] With this learning experience, they carried out some structuring and analysis sessions to develop a new platform.

In March 2021, after a rigorous optimization process, they launched the aeioTU Network. A much friendlier and easier platform to navigate that allows users to communicate with each other, develop collaborative relationships and co-create knowledge.

Currently, they face a challenge on this platform regarding to its role as a network.[3] Although they have a community of 21,500 users, those users engage with the platform mainly to strengthen their knowledge using their e-learning module, but they still do not use it as much to meet or dialog with others.

3.1.1. Effects of the COVID-19 pandemic

One of the main effects of the COVID-19 pandemic was the sudden pivot toward remote learning, forced by the school closures implemented to stop the spread of the virus. That created an adaptation challenge amongst teachers all over the world, who needed to adapt their usual pedagogical strategies and activities to a digital environment that difficulted personal interactions.

In the case of aeioTU, this sudden change was a challenge, but they were able to continue with their digitalization strategy and implementation thanks to two main elements.

First, aeioTU was already working on the development of their professional development platform since 2018, and their original plan was to launch it on December 2020. The onset of the COVID-19 pandemic accelerated that process by a few months, but there was already enough material and work done for the platform to start operating.

Secondly, the materials uploaded to the platform by March 2020 (around 1,000 educational activities and materials) were already developed in a way that made them useful also in the pandemic context. The materials were largely produced by aeioTU educators, promoting interactive virtual sessions between adults and children, fostering parental participation in play and exploration experiences, learning from everyday moments, and working with materials from the families' environment. Incidentally, that reflected the way in which virtual care was provided to children during the COVID-19 pandemic, even though the materials were not originally developed to be used during a pandemic.

3.2. aeioTU network as an online teacher community

As stated in the 3.1 section, the development of the aeioTU Network aims to create an online platform that serves as a meeting

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2   Internal data from aeioTU shows that the average session duration was below 2 min long and the completion rate for the main course offered on the platform at the moment was around 6% only.

3   Personal communications with staff members from aeioTU.

point for teachers' professional development and strengthens the formative relationships amongst all the relevant stakeholders within the aeioTU sphere.

The aeioTU Network is an example of an online teacher community, a type of community aimed at professional development for teachers that takes place online. In recent decades, there has been a substantial increase in the number of such communities thanks to two main reasons: first, the improvement of information and communication technologies, and second, the acknowledgment of the importance of sharing knowledge and experiences with others to achieve an effective professional development (Dille and Røkenes, 2021).

Another consequence of the expansion of those online communities is the wide variety of characteristics they can have: formal vs. informal communities, their purpose, communication mechanisms, etc. And accordingly to that, the literature has already explored which characteristics and elements are relevant to design successful online communities that can scaffold the professional development of their members (Khalid and Strange, 2016; Lantz-Andersson et al., 2018; Dille and Røkenes, 2021).

Therefore, in this section, we present those characteristics and compare them to the current state of the aeioTU Network. With this comparison, we can critically assess the aeioTU Network's potentialities, limitations, and challenges to develop into a successful professional development space.

A relevant taxonomy of important elements in successful professional development spaces is the one laid out by Dille and Røkenes (2021). In their overview, the authors divide those elements in three main categories that are crucial to achieve professional development in online communities: (i) internal factors, (ii) communication factors – that can be subdivided between support and collaboration elements, and (iii) the content of the programmes implemented within those online communities.

According to Dille and Røkenes (2021), the most relevant internal factors are "participants' fear of 'losing face' and technological fear." In their definition, losing face refer to teachers that are afraid of receiving bad or negative reviews and comments from other teachers or supervisors in the online space. Through their review, they find that that fear is a factor that shows up in different studies and is mentioned as driving element to reduced engagement. Meanwhile, technological fear is a fear rooted in participant's low technological knowledge that acts as a barrier that also leads to reduced engagement and contributions.

In the case of the aeioTU network, we also have suggestive evidence of this technological fear that diminished engagement and participation in the platform. Educators do not necessarily have the level of digital literacy needed to operate the platform, but aeioTU has encountered that this 'technological fear' is easily overcome if the educator is motivated to learn.[4] In other words, if there exists an internal motivation to learn, technological barriers are set aside – an idea that is already presented in the literature by Graham and Fredenberg (2015). But on the other hand, aeioTU has also dealt with educators who are still reluctant to use technology and find themselves in situations where they do not progress as quickly as

others to complete their courses, stalling in their progress and even dropping out of the online community.

Moving to the communication factors (Dille and Røkenes, 2021) divide those between what they call 'horizontal scaffolding' factors, that are those related to the collaboration between peers within those online communities, and 'vertical scaffolding' factors, referring to all those processes that involve the presence of facilitators or initiators to guide the development of participating teachers.

A prevalent factor in the horizontal scaffolding process is the creation of a sense of community amongst the educators that participate in the digital community. Building an environment based on confidence and trust is crucial to foster the improvement of the educators involved because "teachers reported new perspectives, insight and experiences" which in turn "strengthened and created a sense of belonging to the community" (Dille and Røkenes, 2021). An interesting fact, reported by Karam et al. (2018), is the existing correlation between the teachers' sense of isolation in the school, mostly present at rural schools, and their high interest and engagement in the online community. This points toward the benefits of the diffusion of both geographical and temporal boundaries that happens in online communities (Trust and Horrocks, 2019).

Describing the 'vertical scaffolding' elements (Dille and Røkenes, 2021) highlight that all agents with facilitating roles are key elements in those online development communities to support and foster participation. Their description as vertical scaffolding comes from the existing difference in power and/or status with respect to the participants. The literature mention that facilitators have both affective and cognitive roles in their support work and that they could also take different roles, ranging from choosing to place themselves as experts to a more horizontal and collaborative role (Dille and Røkenes, 2021).

In relation to how the horizontal scaffolding elements have been developing in the aeioTU's Network we note that they are still on an early stage. aeioTU identifies that educators are recognizing the Network as a source of professional development, due to its free content and courses, but they think there is still long way to go before positioning it as a hub for practitioners. That is like that because so far the interaction pattern of the educator on the web is mostly centred on themselves (discovering courses, etc.) rather than in a communal sense (see in foot note text 4).

Linked to that, another relevant element of the current development state of the network is that communication between peers in the community happen in a superficial level, praising or motivation each other's work but without approaching in deeper and more critical feedback. aeioTU has observed that, especially in the e-learning module course forums, educators compliment others on their strategies, or the ideas or experiences they have shared in the groups, but they have yet to see examples of educators questioning others, or asking for help, or even inviting others to reflect on their strategies/actions in a more critical way - a phenomena that has already been described in previous literature (Erixon, 2016; Zhang et al., 2017). In order to promote better interactions between the Network members aeioTU hired a Community Manager and is currently structuring a strategy to foster a more insightful and deeper engagement amongst the network members.

Regarding the vertical scaffolding roles in the platform, aeioTU has also found the key mentoring role that facilitators have. For example, when an educator is following a course on their own but does not have a mentor to guide them in the process, the process of

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4   This statement is based on personal communications with members of aeioTU staff that have a large involvement with the platform and its members (i.e., accumulating more than 10 thousand logins to the platform).

effective change in their educational practice is slower than if they had a mentor. The role of the mentor who accompanies the acquisition of this knowledge and helps to "ground" it in practice is a very positive element in fostering this process of change.

An example of this is the testimony of a community leader who lived in Soacha, a town close to Bogotá, where there is currently a large migrant population from Venezuela, like her. As part of a training project in the area, she received personalized support to understand how to offer comprehensive early childhood care in alternative infrastructures (other than schools). In addition to the accompaniment, she completed the aeioTU Educational Experience diploma, which is a 120-h asynchronous certificate offered on the Network. With these two experiences, at the end of the project, she decided to receive children in her home, where she currently offers them comprehensive care and helps them to develop their full potential.

Another interesting experience from the Network is the role played by self-organized groups of educators that chose a mentor amongst them. Although the Network offers bi-weekly synchronous virtual meetings, and the number of educators attending is growing, it is still minimal compared to the number of educators who could take advantage of them (enrolled in the Network and in courses). However, sometimes when a group of educators have appointed a leader (of their own, not Network staff) to accompany them aeioTU finds that they progress more quickly in the development of their courses. This type of events point to two relevant elements: first, as already mentioned, the importance of mentoring and guidance to exploit all the advantages of online communities, and second, the emergence of parallel structures decoupled from the originally intended, an element that will require further research in order to clarify its prevalence and effects.

Finally, referring to the content of the programmes implemented within those online communities, two categories stand out according to Dille and Røkenes (2021) successful online communities tend to be flexible to accommodate the various usage profiles of their users and also providing relevant contents for their daily practice as educators.

Flexibility is one of the most relevant aspects for the members of the Network who make use of the E-Learning module. In this sense, a survey conducted among 65 students who have paid for courses/diplomas in the aeioTU Network showed that most of them highlighted the flexibility offered by the platform, as it gives them to possibility to study asynchronously. This asynchrony allows them to study in their free time, study while working and reduce costs since they do not have to travel. They also highlighted positively the possibility of learning at one's own pace, with one student answering that "I can take important notes more calmly and repeat if I do not understand something."

On the other hand, the same survey showed that, as disadvantages of E-Learning, network members felt that they lost interaction with others, especially with teachers; and that they lacked the support of a tutor to clarify doubts when they had them.

Therefore, there seems to be a consensus on the importance of face-to-face classes and that training should tend more toward a hybrid solution than face-to-face or digital-only training, so that digital can be a gateway to more robust training, which also includes on-site accompaniment.

On how relevant the platform is for the daily practices of educators, the contents of the aeioTU Network present practical ideas and

strategies on how to put into action what the educators are studying. To do this, the platform is structured in such a way that the educator is first invited to reflect on their prior knowledge - how do you do this today; how did this happen to you when you were a child; or how have you handled this situation when it has come up? These kinds of questions help the educator to comprehend the situation by reflecting on them from their own perspective. Then, the platform contents invite them understand the reasons behind their answers and behaviors. Is in that moment where they can access videos and supporting documents with relevant content. Special attention is given to provide the educators with practical examples of how to put into action what they are learning.

In the different satisfaction surveys that have been carried out so far, the students value their learning experience on the platform because it allows them to transform and improve their educational practice; they learn things that they can apply in their daily lives with the children, and they find practical examples that allow them to understand more clearly the concepts they are learning.

4. Discussion and limitations

In this section, we summarize the main learnings that have emerged from the digitalization process undertook by aeioTU to scale up their activities so they can serve for future applications.

1. The digitalization process should always start with understanding the needs of both internal and external stakeholders and then develop systems based on those needs.

This learning is closely related the notion of relevance laid out by Dille and Røkenes (2021) on where programmes and activities develop within online development communities had a higher completion and engagement rate if they included examples and situations that the educators could relate to because they were likely to happen in a real world situation, and therefore, there is a need to understand and work on it.

2. The digitalization process should rely as much as possible on already designed tools and platforms.

For example, ConecTU was a great tool for aeioTU, as it was custom designed and was really tailored to their needs, processes, and goals at that moment, but it also became obsolete very quickly and they were forced to make a new investment to update it. This shows that tailored tools are really effective, but can become very costly to keep them updated to a dynamic environment where priorities and capabilities may change often.

Therefore, it is important to note that there are many platforms (e.g., LearnDash, Moodle, Ed-App) already developed and periodically updated that could be used for an annual fee; a fee that would be substantially less than the cost of updating and improving the tailored tool in various occasions.

3. The digitalization process should not compromise the values of the organization.

In the case of the aeioTU Network, the organization understood that there was a risk that the network it could get transformed in an

entertainment channel for children. That risk came from their assessment of other educational platforms available on the Internet that offered a wide array of audio-visual content for children, but without embedding those in a larger, more cohesive educational framework as it is the case of aeioTU.

aeioTU claims to understand technology as a tool that, if used properly, helps to enhance the development of children, but not in a way that might confront the values of their educational model and organization.

4. The digitalization process will imply a substantial increase in the amount of available data from the various activities and projects run by the organization. Organizations should learn how to take the most potential out of it.

In the case of the Learning Community, Google Analytics was a tool that prove to be very helpful in determining that the platform chosen was not friendly enough for their users, and this took aeioTU to the next step: developing the aeioTU Network.

5. The digitalization process will foster all of their advantages if technology is used to integrate the different processes of the organization more cohesively.

The tools and solutions you develop can help you articulate areas that might not seem to be articulated together. Leveraging those synergies across areas within the organization will increase the efficiency of the overall processes.

One of the main takeaways that we can gather from the aeioTU experience is that scaling trainings in the field of early childhood development using digital tools is possible. Albeit the process is not straightforward and required different iterations and redesigns, aeioTU's progress shows that this scale up process can take place.

There are two elements of digital platforms that are highly relevant in the scaling up process. First, digital platforms give access to a large variety of resources that can be easily accessed by the educators in a much more convenient way that if those resources and materials needed to be shared and stored in a psychical format. And second, being able to access a large variety of resources also makes it easy to tailor the learning process to the individual needs of the educators. These two characteristics allow the organizations to streamline their contents and reach a larger group of people in an easier way.

It is also important to note that the success of that scaling and digitalization process lies in the fact that those are processes embedded within a robust and well defined organization – an element that becomes highly relevant in the horizontal and vertical scaffolding axis in digital communities of practice described in the literature.

5. Acknowledgment of any conceptual or methodological constraints

Despite the success in the aeioTU's scaling process described in this article, there are also a few limitations and challenges that are worth mentioning. For example, the existence of technological barriers amongst the targeted individuals or communities; scaling through digital tools may be hindered by limited access to the Internet, poor connectivity, lack of investment in information technologies, etc. in those communities and individuals.

We have evidence such as the number of courses completed, number of registrations, etc. that the training implemented by aeioTU can be delivered at scale, but we remain agnostic about the quality of those trainings in a digital environment, as we do not have robust evaluation evidence about its effects. We argue that online training is better than no training, but we do not have evidence to rule out that delivering trainings in person might be of a higher quality. Nonetheless, an internal qualitative study made in early 2021 showed that teachers considered "Aprendiendo" a necessary platform with reliable information, which also helps parents to have an active participation in their children's education; while making them digitally more active.

Finally, as an avenue for further research, the network is still on its early stages of development, so there is still a long way to go before it is properly established as a digital community of practice. To fully grasp all the mechanisms and interactions that may take place within such a community of practice we need to wait and leave the network grow and gain internal and external stability before we can engage in a deeper analysis.

6. Conclusion

In this article, we have described the process undertook by aeioTU, a Colombian organization working in the early childhood development ecosystem, to scale up their training programmes for teachers and educators by using digital tools.

We have presented the various stages of that scaling process, reflecting on the challenges that arose in each of those and how they were tackled in following iterations. The learnings of this iterative process of scaling through digital tools can be summarized in the following statements:

1. The digitalization process should always start with understanding the needs of both internal and external stakeholders and then develop systems based on those needs.
2. The digitalization process should rely as much as possible on already designed tools and platforms.
3. The digitalization process should not compromise the values of the organization.
4. The digitalization process will imply a substantial increase in the amount of available data from the various activities and projects run by the organization. Organizations should learn how to take the most potential out of it.
5. The digitalization process will foster all of their advantages if technology is used to integrate the different processes of the organization more cohesively. The digital contents produced should be included in already existing training programs to guarantee people will engage with those contents and the activation of the community of practice.

Additionally, focusing in the latest stage of this digitalization and scaling process: the creation of a digital community of practice, we have introduced the main characteristics of successful digital communities of practice for teacher training described in the

relevant academic literature and we have used those as benchmark for the current state of those same characteristics in the aeioTU's community of practice.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

ML and NQ conceptualized the original idea. EV-V expanded the original conceptualization and wrote the draft. NQ contributed to the draft writing. ML provided the input and supervised the draft. ML, NQ, and EV-V approved the draft for publication. All authors contributed to the article and approved the submitted version.

Conflict of interest

ML and NQ were employed by the company aeioTU.

The remaining author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Preschool child growth attainment and velocity during an agriculture intervention in rural Panama may be diminished by soil-transmitted helminths

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Background: Agricultural interventions are often recommended to address undernutrition in subsistence farming communities. However, intensified agriculture exposure can increase soil transmitted helminth (STH) infections, which are linked with poor child growth. This study examined impacts of the VERASAN public health and agricultural intervention program on preschool child growth attainment (HAZ and WAZ) and relative growth velocity over 7 months [change in height-for-age (ΔHAD) and weight-for-age (ΔWAD) difference].

Methods: VERASAN was initiated in 15 subsistence farming communities in rural Panama experiencing chronic undernutrition. Activities targeted improved household food security, preschool child diets and growth by intensifying and diversifying household agriculture. Our objectives were to explore the relationship between VERASAN and preschool child growth attainment (HAZ and WAZ) and velocity (ΔHAD and ΔWAD) during one agricultural cycle in 238 households. We compared those new to VERASAN with those involved for 1 or 5 years, and identified if agricultural practices, food security, diet diversity and treatment of pre-existing STH infection were associated with growth attainment or velocity.

Results: Prior participation in VERASAN did not directly influence WAZ, HAZ or ΔHAD but VERASAN-related benefits had an indirect influence. ΔHAD was positively associated with VERASAN-associated improvements in diet diversity and food security. HAZ and WAZ during land preparation were positively associated with diet diversity and HAZ with food security during harvest. HAZ was negatively associated with children visiting the agricultural plot, consuming leafy green vegetables and pre-existing hookworm infections. Both agricultural season and STH influenced ΔWAD. Children in VERASAN for 1 or 5 years experienced growth faltering between land preparation and growing season, but not those new to VERASAN. In contrast, between growing and harvest, ΔWAD declined in children new to VERASAN compared to children in VERASAN for longer. ΔWAD from land preparation to harvest was higher with pre-existing *Ascaris* infection whereas it was lower between growing season and harvest for pre-existing hookworm infection.

Conclusion: In a context of preschool child growth faltering, malnutrition and STH infections, improved food security, agricultural production and diet diversity associated with VERASAN were associated with improved growth. In contrast, STH infections were negatively associated with some, but not all, growth outcomes.

1. Introduction

Agricultural interventions have become an important tool in eradicating poverty and undernutrition, particularly in poor, rural areas of developing countries that practice some level of subsistence agriculture (1–3). There has been considerable effort to design nutrition-sensitive interventions (4–7) around objectives to improve the supply of nutritious foods in lean seasons of the year (8, 9), and to increase dietary diversity by including a greater variety of nutrient-dense and micronutrient-rich foods (7, 10–14). However, Ruel and Alderman (4) define "nutrition-sensitive" agricultural interventions as those that go beyond providing an adequate diet to addressing underlying causes, including food insecurity, insufficient childcare, gender inequity, and an unhygienic environment.

Child growth has also been shown to be negatively impacted by chronic infection with soil-transmitted helminths (STHs), with infection and malnutrition mutually reinforcing each other (15–17). Co-occurrence of STH infection and undernutrition is well documented in rural developing regions (18). Further, there is evidence that preschool child growth is improved when STH treatment is incorporated in interventions that provide nutritional support (18–20). However, most agricultural interventions have disregarded the impairment that STHs have on preschool child growth, including farming communities where STHs are endemic (10, 21–24). Undetected STH infections may help to explain why recent reviews on the impact of agriculture-based interventions have not shown the growth benefits, especially height-for-age *z*-scores (HAZ), that would be expected to accompany improved nutrition and diet (4, 25–30).

In the province of Veraguas in Panama, approximately 50% of preschool children in the poorest, rural subsistence farming communities experience chronic undernutrition (31). In response, the agricultural intervention VERASAN ("Proyecto para el mejoramiento del consumo y la disponibilidad de alimentos en comunidades de la provincia de Veraguas," translated as "Project for the improvement of consumption and availability of food in communities in the province of Veraguas") was implemented in rural subsistence farming communities in Veraguas by the Panama Ministry of Health (MoH) with support from the Japan International Cooperation Agency and in collaboration with the Panama Ministries of Agricultural Development and Education. The targeted goals were to improve food production for household use, household food security and child diets, and ultimately child growth, by intensifying and diversifying household agriculture. Agricultural training occurred primarily in community demonstration gardens where participants met weekly to learn new agricultural techniques and interact with nutritionists and agricultural extensionists (32).

Five years after the program had begun, our team was invited by the MoH to conduct an interim evaluation of VERASAN outcomes. All households practiced subsistence agriculture on plots approximately 0.9 ha in size and located up to 2 h by foot from the home (33). Households grew rice, maize, beans, pigeon peas, cassava, plantains, cucumbers, squash, sweet peppers, and tomatoes, almost exclusively for their own consumption. Most households also raised chickens and a few had pigs (34). As described previously, at the time of the study, households lived in extreme poverty with an average earned monthly *per capita* income less than $6 USD. Very few households were food secure (34). Homes were adobe or concrete block with 1–2 rooms, palm or tin roofs and dirt or concrete floors. Houses either had untreated water piped to a faucet in the yard or relied on river or other unprotected above-ground sources. Most had pit latrines but very few had electricity. Each community had a primary school, and a few communities had a secondary school and/or a health post which was visited by medical staff on a regular but not daily basis (35). We have previously shown that the VERASAN program was positively associated with improved agricultural practices, increased household food production, and improved household food security and aspects of preschool child diets such as greater animal-source foods and vitamin A-rich foods (32), but that intensification of agricultural practices and the associated increased presence of children on the agricultural plots increased STH transmission and infection in preschool children (33).

The goal of the present study was to examine the impacts of the VERASAN program on preschool child growth attainment (HAZ and WAZ) and relative growth velocity over a 7 month period measured as change in height for age difference (ΔHAD) and weight for age difference (ΔWAD) in the context of the ongoing delivery of public health and agricultural interventions. We posited that preschool child growth would benefit from diversified diets and improved household food security but might be impaired by exposure to other health risks such as inadequate nutritional intake and STH transmission when the preschool child accompanies the caregiver to the household agricultural plot for field work. Our specific objective was to assess whether VERASAN involvement and/or agricultural, environmental, dietary, and STH variables were associated with preschool child growth attainment (HAZ and WAZ) or relative growth velocity (ΔHAD and ΔWAD) during one agricultural cycle that included land preparation, growing and harvest seasons.

2. Materials and methods

2.1. Study design

This 7-month longitudinal, interim program evaluation followed participating families of the 15 VERASAN communities during one agricultural cycle in 2012. At the start of the evaluation in January 2012, 8 of the communities had been involved in VERASAN for 5 years, 5 for 1 year; and 2 were new to VERASAN. Communities with 1 or 5 years participation did not differ significantly in growth outcomes and therefore were pooled for all analyses (data not shown). Outcomes were measured at 3.5 months intervals in land preparation (February–March), growing season (June–July) and harvest (September–October) periods (Figure 1). The three inclusion criteria for households were: (1) the household practiced subsistence agriculture; (2) at least one member of the household reported participating in VERASAN programming; and (3) at least one child
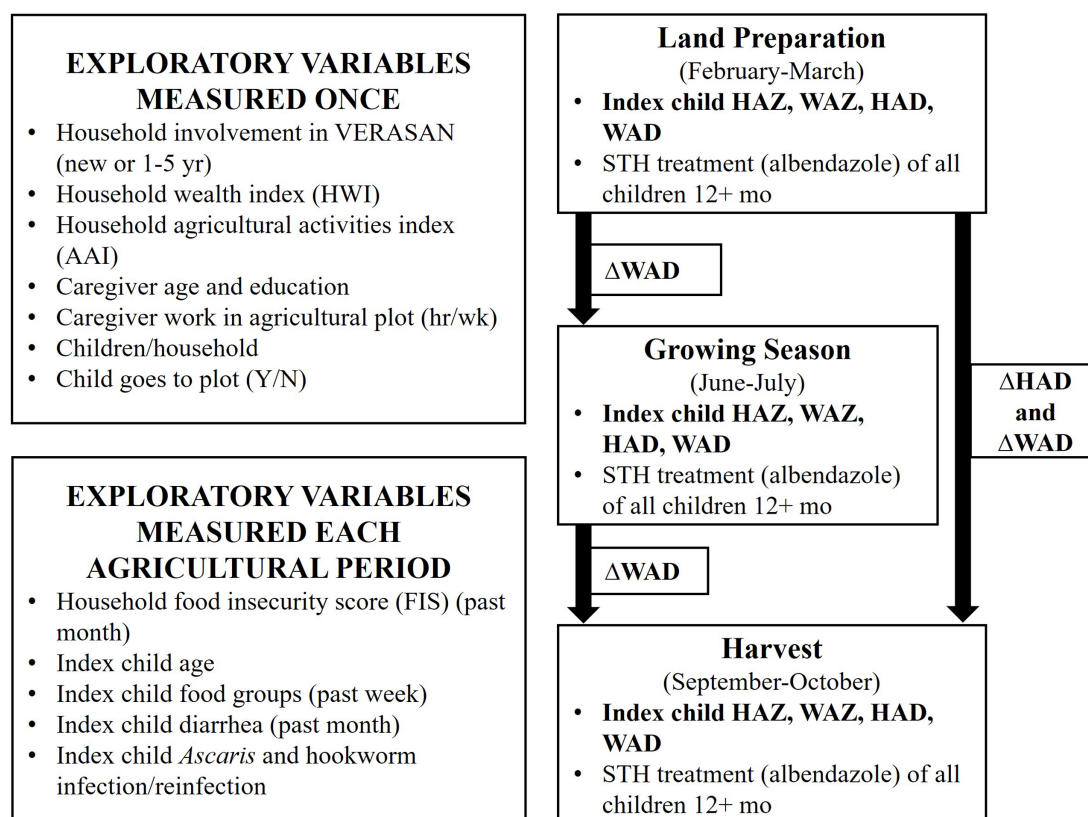
FIGURE 1
Study design and variables measured over the study during land preparation, growing, and harvest seasons.

was between the ages of 6 months and 5 years at recruitment. All eligible preschool children in the household were enrolled in the study and one preschool child per household who was not breastfeeding was randomly selected as the index child for data analysis.

2.2. Recruitment and ethics protocol

The study protocol was reviewed and approved by the Internal Review Board of the Faculty of Medicine of McGill University, Canada, and the National Research Bioethics Committee of the Gorgas Commemorative Institute for the Study of Health, Panama. Prior to visiting the study communities, permission was obtained from the national and regional directors of the Panama MoH. Then, the lead author and local MoH staff visited all study communities, explained the research, answered questions from community members, and obtained verbal permission to conduct the study. When households were formally recruited into the study, the research was again explained, questions answered, and signed consent was obtained from a representative adult.

2.3. Household economic and sociodemographic variables

Demographic and socioeconomic data characteristics relevant for the present analysis are summarized in Table 1. This includes the

asset-based household wealth index (HWI) developed previously for these subsistence farming communities (34). We chose to use HWI instead of income because HWI has been shown to be a more reliable measure of longer-term household wealth than irregular monthly income that is easily missed on infrequent questionnaires (36, 37). Our HWI was constructed using principal components analysis of 12 variables including durable assets, home building materials, type of roof, floor and cooking stove, and ownership of a variety of agricultural tools. HWI values averaged 0.78 ± 0.05 and ranged from -0.58 to 2.74 (34, 35).

A questionnaire administered once during the study provided data on whether the index child accompanied their caregiver to the household's agricultural plot, how many hours per week the primary caregiver worked in the household's agricultural plot, and the use of a variety of crop production methods summarized in an agricultural activities index (AAI). The AAI was developed using principal components analysis and included 17 agricultural methods including use of purchased fertilizers and pesticides, methods for improving and conserving soil, and methods for seed saving, planting, and growing. AAI averaged 1.47 ± 0.08 and ranged from 0 to 4.07 (33).

The food insecurity score (FIS) was derived for each sampling period from an experience-based food insecurity scale previously validated for this population that categorized the degree of household-level food insecurity on a scale from 0 ("food secure") to 42 ("extremely food insecure") [see details in (34)].

2.4. Child diet-derived variables

Data from a semi-quantitative 7-day food frequency recall questionnaire administered for each index child at each sampling period was used to obtain a diet diversity score (DDS) adapted from Arimond et al. (38) based on 11 food categories (grains and starches, legumes, dairy products, eggs, meat and fish, vitamin A-rich leafy green vegetables, orange-fleshed vegetables, vitamin A-rich fruits, vitamin C-rich vegetables, citrus and other vitamin C-rich fruits, and other fruits and vegetables). The final score was the number of categories the child had consumed in the previous 7 days in any quantity (32). In the present analysis, in addition to the DDS we considered all animal-source foods combined, vitamin A-rich fruits and vegetables, vitamin A-rich leafy green vegetables, all vitamin A-source foods combined, and all vegetables combined.

2.5. Intestinal infection and treatment

In order to explore whether VERASAN-associated changes in growth were associated with initial STH infection and reinfection, fecal samples were collected at each sampling period for prevalence and intensity, after which all children over 12 months were treated with albendazole according to WHO guidelines to clear *Ascaris* and hookworm (35). Children infected with hookworm also received a further three-day course of albendazole to ensure clearance of this infection (39). This allowed us to measure reinfection during the growth and harvest periods. Also, at each sample collection, caregivers were asked how many days in the previous month each child had experienced diarrhea.

2.6. Anthropometry

Given the debate in the literature regarding indices for child catch-up growth (40, 41), both growth attainment and relative growth velocity were used as outcome variables. *Z*-scores are appropriate for cross-sectional analyses (41) but may underestimate growth faltering or improvement over time because the observed height or weight is divided by standard deviations from the WHO global growth standard (42) that increase with age (41, 43, 44). This is corrected by measuring the change in absolute height-for-age difference (ΔHAD) and weight-for-age difference (ΔWAD) over time (41, 43, 44).

The primary outcome variables were preschool child height and weight, which were used to calculate HAZ and WAZ for each sampling period as well as ΔHAD and ΔWAD over the whole 7-month study (land preparation to harvest), as well as ΔWAD from land preparation to growing season, and from growing season to harvest.

Weight and height/length of each index child were measured during each interval. Weight was measured to the nearest 0.5 kg using a portable anthropometry scale (Seca 750; Seca). Height of children older than 24 months was measured to the nearest 0.1 cm using a portable stadiometer (Seca 214; Seca). Length of younger children was measured to the nearest 0.5 cm using an infant measuring board (Seca 210; Seca). For simplicity, length and height are referred to as "height."

Growth attainment was calculated as height-for-age z-scores (HAZ) and weight-for-age z-scores (WAZ) calculated according to the WHO Child Growth Standards (42), using WHO Anthro software

(version 3.2.2) for children 6–60 months and WHO AnthroPlus software (version 1.0.4) for children >60 months. Children with z-scores between <-2SD and ≥-3SD were categorized as moderately stunted or underweight, and those with z-scores <-3SD were categorized as severely stunted or underweight.

The absolute difference in height (HAD) or weight (WAD) of the index child compared with age- and sex-specific median height or weight from WHO growth standards was calculated at each sampling period. For relative growth velocities, ΔHAD and ΔWAD were calculated over the duration of the study and ΔWAD was also calculated from land preparation to growing and from growing to harvest. Positive ΔHAD and ΔWAD were interpreted as catch-up growth and negative values as further growth faltering.

2.7. Data analysis

All statistical analyses were carried out using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA) and statistical significance was set at *p*-values <0.05 unless otherwise noted. All analyses were done on the index child as described above.

Stepwise multiple linear regression analysis was used to explore variables associated with growth attainment (HAZ and WAZ) during land preparation and harvest. All initial stepwise models included socio-demographic and basic household data (child age and sex, caregiver age and years of education, number of children ≤12 years in the household, water piped to the yard, HWI), and our variables of interest: whether the household was new to VERASAN, agricultural variables [AAI, the caregiver worked in the agriculture plot (hr/wk), whether the child went to the agriculture plot with the caregiver] infection variables (presence of *Ascaris* and hookworm at land preparation, *Ascaris* reinfection measured at harvest, presence and days/month of diarrhea), and household food insecurity (FIS), and diet-derived variables (DDS, consumption of vegetables, vitamin A-rich fruits and vegetables, vitamin A-rich leafy green vegetables, and animal-source foods). Independent variables collected during the agricultural period that matched the model were used. However, as HAZ was expected to reflect longer-term infection and nutrition status, HAZ at harvest was first correlated with each diet-derived variable and infection variable from each sampling period and the most strongly correlated variables overall were then included in the initial model. From the initial stepwise models of HAZ and WAZ, independent variables with $p < 0.3$ were selected, and variables with $p < 0.15$ were retained in the final model. Variables were considered non-collinear for variance inflation factors <10 and tolerances >0.10.

In order to understand the underlying growth profile, the relationship of HAD and WAD with child sex and age category was examined using two-way ANOVAs with data from all children at the beginning of the study (land preparation). Growth velocity variables were then explored using three statistical approaches. One-way ANOVA was used to determine if ΔHAD and ΔWAD were associated with prior experience with VERASAN, inclusion of specific items in the child's diet, and infection with *Ascaris* and hookworm at the beginning of the study (during land preparation). Linear regression analysis was used to explore the relationship of ΔHAD and ΔWAD with FIS and DDS. Logistic regression was used to assess the effects of FIS on diet components and one-way ANOVA was used to assess the effects of being new to VERASAN and eating leafy green vegetables

on number of days of diarrhea. Finally, two-way ANOVA was used to explore the impact of measurement interval (land preparation to growing, growing to harvest) and prior involvement with VERASAN on growth velocity as represented by ΔWAD.

3. Results

3.1. Study participants

A total of 238 households were recruited. The 27 households lost to follow-up did not differ from other participating households in socio-demographic, child anthropometry, infection characteristics, AAI or frequency of children visiting the agricultural plot (data not shown). A summary of descriptive data relevant to this study is presented in Table 1. The average age of the 211 index children was 40.4 ± 1.1 months and 50.8% were girls. Almost 50% of index children were stunted (47.1–49.1% depending on sampling period) and underweight was less common (16.2–20.7%) (Table 1). Very few children were overweight. This was reinforced by HAD and WAD (Table 1). Child age category was significantly associated with both HAD and WAD (Figure 2), with older children having greater height and weight deficits relative to the WHO reference data (HAD: $F_{4,190} = 20.94$, $p < 0.0001$; WAD: $F_{4,190} = 7.56$, $p < 0.0001$). Child sex was not associated with HAD or WAD and there was no interaction (Figure 2).

At baseline, 28% of children were infected with hookworm and 16.2% were infected with *Ascaris*. Reinfection prevalence following anthelmintic treatment was very low for both infections between land preparation and growing (*Ascaris,* 3.8%; hookworm, 1.9%) and from growing to harvest (*Ascaris*, 10.6%; hookworm, 3.1%), and intensities were extremely low (Table 1). Diarrhea was common but of very short duration (Table 1) and was higher in children from households with longer exposure to VERASAN (prevalence: 26.7% vs. 9.3%, $X^2 = 8.64$, $p = 0.003$; duration: 2.5 days/month vs. 0.8 days/month, $F = 12.6$, $p = 0.0005$) although only during the growing season and not during land preparation or harvest.

Children from households with higher food insecurity (higher FIS) were more likely to have consumed leafy green vegetables [OR (95% CI) = 1.12 (1.05, 1.19), $p = 0.0006$] but less likely to have consumed animal-source foods [OR (95% CI) = 0.94 (0.90, 0.98), $p = 0.005$], all measured during land preparation. Children who had consumed vitamin A-rich leafy green vegetables during land preparation experienced significantly more days of diarrhea in the same season ($F = 10.07$, $p = 0.0018$).

3.2. HAZ

HAZ was explored in multiple regression models during land preparation and harvest. During land preparation, HAZ was positively associated with diet diversity (DDS) and negatively associated with the child accompanying their caregiver to the household agricultural plot, initial infection with hookworm, and child having eaten leafy green vegetables (Table 2). During harvest, HAZ was negatively associated with being from a household with more children, the child going to the agricultural plot, presence of hookworm at the beginning of the study, higher household food insecurity, and the child eating leafy

green vegetables (Table 2). Being new to VERASAN did not enter the multiple regression models. Variables with $p > 0.15$ that were not included in the final models are listed in Table 2.

3.3. WAZ

Multiple regression models for WAZ were also constructed during land preparation and harvest. In the land preparation model, WAZ was positively associated with diet diversity (DDS) and negatively associated with consumption of animal-source foods (Table 3). During the harvest, WAZ was positively associated with years of caregiver education and HWI and negatively associated with presence of hookworm at the beginning of the study (Table 3). Being new to VERASAN entered the multiple regression model for harvest but was not significant ($p = 0.1268$). Variables with $p > 0.15$ that were not included in the final models are listed in Table 3.

3.4. ΔHAD

Linear regression analyses revealed that ΔHAD from land preparation to harvest increased with a more diverse diet (Figure 3A) and decreased with greater household food insecurity (Figure 3B) but did not differ between those new to VERASAN and those involved for 1 to 5 years (Figure 3C). In addition, ΔHAD was unaffected by presence of *Ascaris* or hookworm at the beginning of the study (Figure 3D), or by consumption of vitamin A-source or animal-source foods (data not shown).

3.5. ΔWAD

Although ΔWAD between land preparation and harvest did not differ between those new to VERASAN and those with longer involvement, there was a highly significant interaction between VERASAN involvement and the two sampling intervals ($p = 0.0009$) reflecting the difference in direction of association with VERASAN between the sampling windows (Figure 4A). During the land preparation-growing interval, we found a positive ΔWAD (0.13 ± 0.28 kg) in children from households new to VERASAN in contrast to growth faltering (-0.65 ± 0.15 kg) in children in households participating for 1 or 5 years. This pattern was not seen in the growing-harvest interval when children new to VERASAN had a lower ΔWAD (-0.80 ± 0.28 kg) relative to the global growth standard in comparison to children from households with 1 or 5 years in VERASAN, whose ΔWAD was 0.07 ± 0.10 kg.

Presence of both *Ascaris* and hookworm at the beginning of the study affected ΔWAD, a measure of relative growth velocity for weight. Compared with children with no *Ascaris* who showed growth faltering between land preparation and harvest (ΔWAD -0.73 ± 0.16 kg), those initially infected with *Ascaris* had a significantly higher ΔWAD (0.04 ± 0.35 kg) (Figure 4B). When separated into the two study intervals, ΔWAD was unaffected by initial STH infection between land preparation and growing season (Figure 4C) but ΔWAD between the growing and harvest periods was significantly lower (-0.78 ± 0.20 kg vs. 0.13 ± 0.14 kg) in children who had been infected with hookworm at the beginning of the study (Figure 4D), indicating growth faltering. ΔWAD

TABLE 1 Household demographic, caregiver, and index preschool child characteristics during land preparation, growing and harvest periods (values are percentages or means ± standard error[1,2]).

	Land preparation	Growing season	Harvest
Demographic and behavioral variables			
Child age at baseline (mo)	40.4 ± 1.1	–	–
Child sex, % female	50.8	–	–
Caregiver age (year)	33.1 ± 0.6	–	–
Caregiver education (year)	5.0 ± 0.2	–	–
Children ≤12 years in household (#)	3.0 ± 0.1	–	–
Caregiver hours in plot (hours/week)	11.1 ± 1.0	–	–
Child goes to plot (%)	27.6	–	–
Food security and diet			
Food insecurity score (FIS)	7.9 ± 0.6	7.3 ± 0.5	6.6 ± 0.5
Diet diversity score (DDS)	4.7 ± 0.1	5.3 ± 0.1	4.7 ± 0.1
Child ate vitamin A-rich foods (%)	13.9	33.3	23.8
Child ate animal-source foods (%)	88.9	91.3	85.5
Child ate vitamin A-rich leafy greens (%)	4.5	0.7	2.0
Child ate any category of vegetable (%)	57.2	58.0	65.1
Infections			
Ascaris baseline prevalence (%)	16.0	–	–
Ascaris baseline intensity (epg)	264.6 ± 155.0	–	–
Ascaris reinfection prevalence (%)	–	3.8	10.6
Ascaris reinfection intensity (epg)	–	127.6 ± 121.5	1421.2 ± 1208.8
Hookworm baseline prevalence (%)	28.2	–	–
Hookworm baseline intensity (epg)	85.2 ± 24.8	–	–
Hookworm reinfection prevalence (%)	–	1.9	3.1
Hookworm reinfection intensity (epg)	–	1.7 ± 1.3	4.0 ± 2.0
Diarrhea prevalence (%)	24.5	36.0	13.9
Diarrhea duration (days in previous 30 days)	0.7 ± 0.1	1.1 ± 0.2	0.4 ± 0.1
Anthropometry			
Height			
Height-for-Age *z*-score (HAZ)	−2.00 ± 0.07	−2.00 ± 0.08	−2.03 ± 0.08
Moderately stunted (%)[3]	37.6	37.0	39.0
Severely stunted (%)[4]	11.8	12.6	11.8
Height-for-Age difference (HAD) (cm)[5]	−7.13 ± 0.31	−7.30 ± 0.34	−8.02 ± 0.34
ΔHAD land preparation to harvest (cm) [6]	–	–	−0.64 ± 0.13
Weight			
Weight-for-Age *z*-score (WAZ)	−1.17 ± 0.08	−1.35 ± 0.08	−1.29 ± 0.08
Overweight (WAZ > 2SD) (%)	1.2	0.0	0.0
Moderately underweight (%)[3]	11.2	13.3	14.7
Severely underweight (%)[4]	5.9	5.9	3.7
Weight-for-Age difference (WAD) (kg)[7]	−1.67 ± 0.14	−2.12 ± 0.15	−2.26 ± 0.14
ΔWAD land preparation to harvest (kg)[8]	–	–	−0.58 ± 0.14
ΔWAD land preparation to growing (kg)[9]	–	−0.54 ± 0.14	–
ΔWAD growing to harvest (kg)[10]	–	–	−0.06 ± 0.10

[1]Sample sizes for variables measured at all three sampling times: land preparation, 170; growing, 135; harvest, 136. [2]Sample size for variables measured only once, 238. [3]Z scores <-2SD and >-3SD. [4]Z scores <-3SD. [5]Calculated as difference in cm between individual children and median from the WHO reference group. [6]$n = 139$. [7]Calculated as difference in kg between individual children and median from the WHO reference group. [8]$n = 140$. [9]$n = 145$. [10]$n = 125$.

FIGURE 2
(A) Height-for-age difference (HAD) and **(B)** weight-for-age difference (WAD) for index children age 6 months to 5 years by age category and child sex during land preparation.

TABLE 2 Multiple regression models[1] of HAZ of index children during land preparation ($n = 107$) and harvest ($n = 103$) periods of the study.

	Land preparation		Harvest	
	β	p	β	p
Overall model	$R^2 = 0.2817$	<0.0001	$R^2 = 0.2542$	<0.0001
Children in household (#)	−0.096	0.0916	−0.129	0.0266
Child went to agriculture plot (Yes)	−0.470	0.0044	−0.443	0.0138
Hookworm infection (Yes)[2]	−0.326	0.0457	−0.396	0.0263
Food Insecurity Score[2]	NI[3]		−0.030	0.0099
Dietary Diversity Score[2]	0.122	0.0278	NI	
Child ate leafy green vegetables (Yes)[2]	−0.916	0.0488	−1.032	0.0200

[1]Variables initially included in the model that did not emerge in any of the final models at $p < 0.015$: household was new to *VERASAN*, child age and sex, caregiver age, household wealth index (HWI), water piped to the yard, number of hours/week. the caregiver worked in the agriculture plot, agricultural activity index reflecting diversity of agricultural methods used, *Ascaris,* number of days of diarrhea in the previous 30 days, consumption of vegetables, vitamin A-rich fruits and vegetables, and animal-source foods. [2]Measured during land preparation (beginning of the study). [3]NI, not included in final model ($p > 0.15$).

was not associated with FIS, DDS, or consumption of vitamin A-source or animal-source foods (data not shown).

4. Discussion

Important goals of agricultural interventions in subsistence farming communities are to increase food availability and diet diversity, to reduce household food insecurity and to improve growth of children, especially preschool children who routinely fall outside school feeding programs. Previously we showed that the VERASAN intervention in subsistence farming communities in Panama improved agricultural production, food security and preschool child diets (32, 34) but that STH prevalence in preschool children was positively associated with visiting the agricultural plot and with the hours the caregiver spent per week on the plot (33, 35). This highlighted the likelihood of transmission on the plot, potentially limiting growth (15–17). Our goal was to identify among this set of factors those that were positively or negatively associated with preschool child growth.

Three major findings emerged. First, participation in VERASAN for 1 or 5 years did not directly influence child height (HAZ) or weight

(WAZ) or ΔHAD but VERASAN-related outcomes did. The VERASAN-related increase in diet diversity was positively associated with HAZ and WAZ, VERASAN-related reduction in food insecurity was positively associated with HAZ but not WAZ, and the VERASAN-related increase in intake of leafy green vegetables was negatively associated with HAZ. Similarly, ΔHAD was positively associated with the VERASAN-driven improvements in diet diversity and food security. Second, VERASAN increased the time that caregivers spent on their agricultural plots with their preschool children and their presence on the plot was positively associated with hookworm infection and hookworm was negatively associated with WAZ. Third, both agricultural season and STH influenced relative change in weight. Whereas ΔWAD relative to the global growth standard from land preparation to growing was marginally positive in children from households new to VERASAN, children from households in VERASAN for 1 or 5 years experienced growth faltering. However, between growing and harvest, ΔWAD declined in children new to VERASAN in comparison to children participating in VERASAN for 1 to 5 years.

To date, reviews of nutrition-sensitive agricultural interventions have shown limited impacts of interventions on child anthropometry, particularly height gain (4, 25–30). In our study, history of participation in VERASAN did not modify HAZ, WAZ or ΔHAD but for households new to VERASAN, ΔWAD was higher for children between land preparation and growing periods. This might be associated with greater initial support in these new communities from VERASAN staff, through more frequent visits from staff and more resources provided, such as food provided from demonstration gardens that would have supplemented limited stores from the previous harvest (pers. obs.). Between land preparation and growing seasons, children in households with 1 or 5 years in VERASAN showed a negative ΔWAD, which is consistent with lower food availability during the land preparation to growing season. Between growing and harvest, the opposite pattern was seen with those new to the program having much lower ΔWAD, suggesting that these households were not

TABLE 3 Multiple regression models of WAZ[1] of index children during land preparation ($n = 107$) and harvest ($n = 98$) periods of the study.

	Land preparation		Harvest	
	β	p	β	p
Overall model	$R^2 = 0.1059$	0.0184	$R^2 = 0.2368$	0.0005
Household new in VERASAN	NI[5]		0.448	0.1268
Child age (month)	NI		−0.009	0.1235
Caregiver education (year)	0.079	0.0659	0.128	0.0030
Household wealth index	0.233	0.1212	0.273	0.0465
Ascaris reinfection (Yes)[3]	NA[6]		0.525	0.1070
Hookworm infection (Yes)[2]	NI		−0.444	0.0332
Diet Diversity Score[4]	0.192	0.0217	NI	
Child ate vegetables (Yes)[4]	NI		0.289	0.1398
Child ate animal-source foods (Yes)[4]	−0.920	0.0208	NI	

[1]Variables initially included in the model that did not emerge in any of the final models at $p < 0.015$: household was new to *VERASAN*, child sex, caregiver age, number of children ≤12 years, water piped to the yard, food insecurity score, number of hours/week, the caregiver worked in the agriculture plot, agricultural activity index reflecting diversity of agricultural methods used, diarrhea (Y/N and number of days in previous month), whether the child went to the agricultural plot, consumption of vitamin A-rich fruits and vegetables, and consumption of leafy green vegetables. [2]Measured during land preparation. [3]Measured during harvest (end of the study). [4]Measured in same season as modeled WAZ. [5]NI, not included in final model ($p > 0.15$). [6]NA, not applicable in the season for which the outcome variable was measured.

yet experiencing improvements to home agriculture from the intervention. This contrasted with children whose families had been in the intervention for 1 or 5 years, whose weight deficit remained constant relative to the global growth standard, as expected during a more plentiful time of year (growing season to harvest). These findings were not evident using HAZ and WAZ, highlighting the importance of choice of anthropometry indices to capture potential shorter-term as well as longer-term impacts of interventions on child growth, as linear growth depends on adequate weight gain (45, 46). Therefore, measures like WAZ, and in our study ΔWAD, may be expected to respond more quickly to interventions than HAZ and ΔHAD.

4.1. Seasonal food insecurity and diet diversity affect child growth

Interventions such as VERASAN would be expected to influence child growth outcomes through, for example, improved household food security and child diet diversity (4, 29, 30, 40) but the ability to observe growth differences can be obscured by seasonal patterns in food availability. Previously we showed that, during land preparation and the growing season, household food security and child diet diversity were higher for households with 1–5 years in VERASAN compared with those that were new, but the association with VERASAN disappeared during harvest when these outcomes, on average, were improved for all households (32). In the present study, we showed that food insecurity was negatively associated only with HAZ and only during harvest, and that diet diversity was positively

associated with HAZ and WAZ in land preparation but not during harvest. Thus, seasonality must be taken into account in subsistence contexts in which food availability may fluctuate over the year (47, 48). Furthermore, diet diversity was positively associated with higher growth velocity (ΔHAD), highlighting the value of including growth velocity when evaluating agricultural interventions (40).

4.2. VERASAN-associated dietary change linked to child growth attainment

Consumption of "vitamin A-rich leafy green vegetables" emerged as a significant predictor of lower HAZ during land preparation and harvest. This negative relationship was unexpected, given that many nutrition-sensitive agricultural interventions in rural, subsistence farming communities in developing countries have focused on increased production and intake of vitamin A-rich foods (10–14, 49). Consumption of leafy green vegetables, which in this setting are gathered in the wild, may be an indicator of lack of household access to preferred foods, given that more food insecure households consumed more leafy green vegetables (32). Similar relationships have been observed in Kenya where wild edible plants were more commonly consumed in households that were more vulnerable to food insecurity (50). In addition, leafy green vegetables are often contaminated with soil- or water-borne pathogens (22, 51, 52), and children who consumed leafy green vegetables experienced more days of diarrhea in the previous month, and diarrhea is negatively associated with linear growth (53–55).

Consumption of nutrient-dense "animal-source foods" emerged as a significant predictor of lower WAZ during land preparation. This may reflect an imbalance between protein and carbohydrates in the season when staples are scarce, as would be the case in many households in these communities during land preparation. Additionally, reliance on animal-source foods may increase during times of scarcity and signal a scarcity of other key food sources, as reported in a study in Mozambique where farming families increased their meat and vegetable consumption during lean periods of the year when maize, the local staple, was scarce (56).

4.3. STH infections limit growth attainment and velocity

Previous agricultural interventions have often overlooked STH infection when evaluating intervention effects on child growth (29), even though there are notable examples where failure to detect an impact on growth has been attributed to lack of attention to helminth infections (10, 57). We addressed this shortcoming by measuring STH infection and by repeated albendazole treatment of all preschool children both to clear existing infections and to monitor any reinfection that occurred. Our data indicate that treatment was successful, that minimal reinfection occurred, and that despite repeated treatment, STH infection present at the beginning of the study continued to exert an impact on anthropometric measures up to 7 months after treatment. Consistent with the literature [e.g., (54, 58, 59)], several sociodemographic variables associated with STH infection emerged in at least one of the growth models, specifically child age, maternal education, and household wealth (HWI), as well as child exposure to household agricultural activities (33).

Intestinal nematode infections have been associated with diminished child growth in other populations at risk for malnutrition
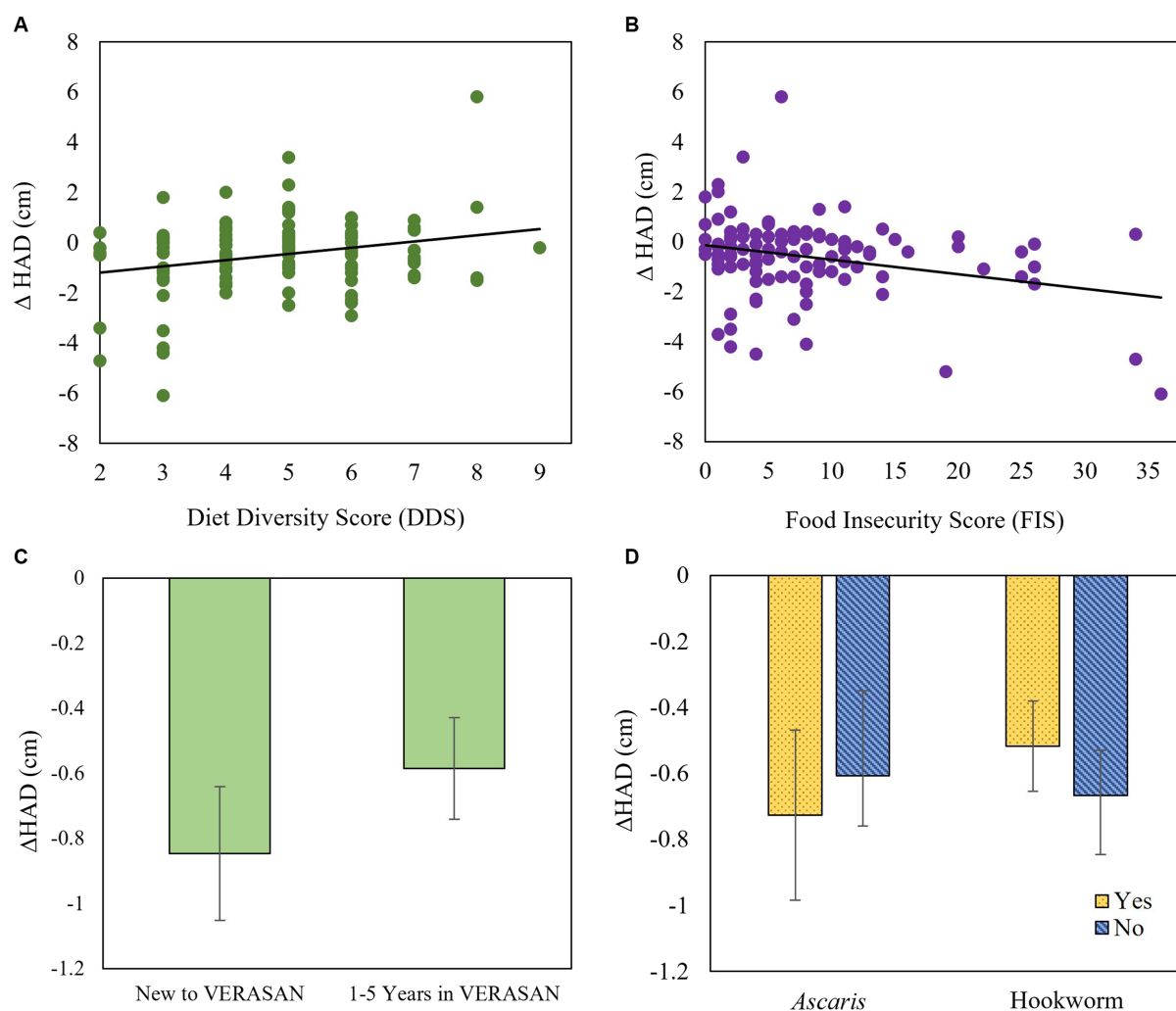
FIGURE 3
Change in height-for-age difference (ΔHAD; kg) for index children age 6 months to 5 years compared to the WHO growth standard during land preparation to harvest (whole study) by: **(A)** new or 1−5 years in the *VERASAN* intervention, **(B)** baseline *Ascaris* and hookworm infections, **(C)** diet diversity score [DDS; measured during harvest; β (95% CI) = 0.250 (0.007, 0.423), p = 0.005], and **(D)** food insecurity score [FIS; measured during the growing season; β (95% CI) = −0.058 (−0.097, −0.019), p = 0.004].

(60–64) and recovery from any infection-induced pathology can be prolonged in the context of malnutrition (18). We detected a negative association of initial hookworm infection with HAZ both at land preparation and harvest, and with WAZ at harvest. Furthermore, whereas the relative velocity of change in weight (ΔWAD) between the growing and harvest was +0.13 kg in children that did not have hookworms at the beginning of the study, ΔWAD was −0.78 kg in those initially infected with hookworm and successfully treated indicating a significant growth faltering. Thus, the association of initial hookworm infection with lower HAZ and WAZ and lower ΔWAD at the end of the study suggests that the pre-existing hookworm infection continued to exert a negative influence on child height and height even 7 months later. The blood feeding and hemorrhaging associated with even low intensity hookworm infection could contribute to anemia and iron deficiency (65) that might persist in undernourished children making catch-up growth more difficult to achieve (18). In contrast to hookworm, initial *Ascaris* infection was positively associated with ΔWAD over the 7 months of the study. Even though light infections with *Ascaris* are not

normally pathogenic or a cause of malabsorption (66), initial treatment appeared to provide a growth benefit to the initially infected children relative to initially uninfected children, consistent with studies demonstrating that treatment of *Ascaris* has immediate benefits for growth (16). These observations highlight the importance of considering STH infection as an important modifier of child growth particularly when exploring the impacts of agricultural interventions.

4.4. Risks associated with preschool children accompanying their caregiver to the agricultural plot

Interventions such as VERASAN involve a wide range of components that may benefit agricultural production or food security more rapidly than nutritional status or growth. We had hypothesized that the growth benefits resulting from improved diet diversity and food security might have been partially offset by increased exposure
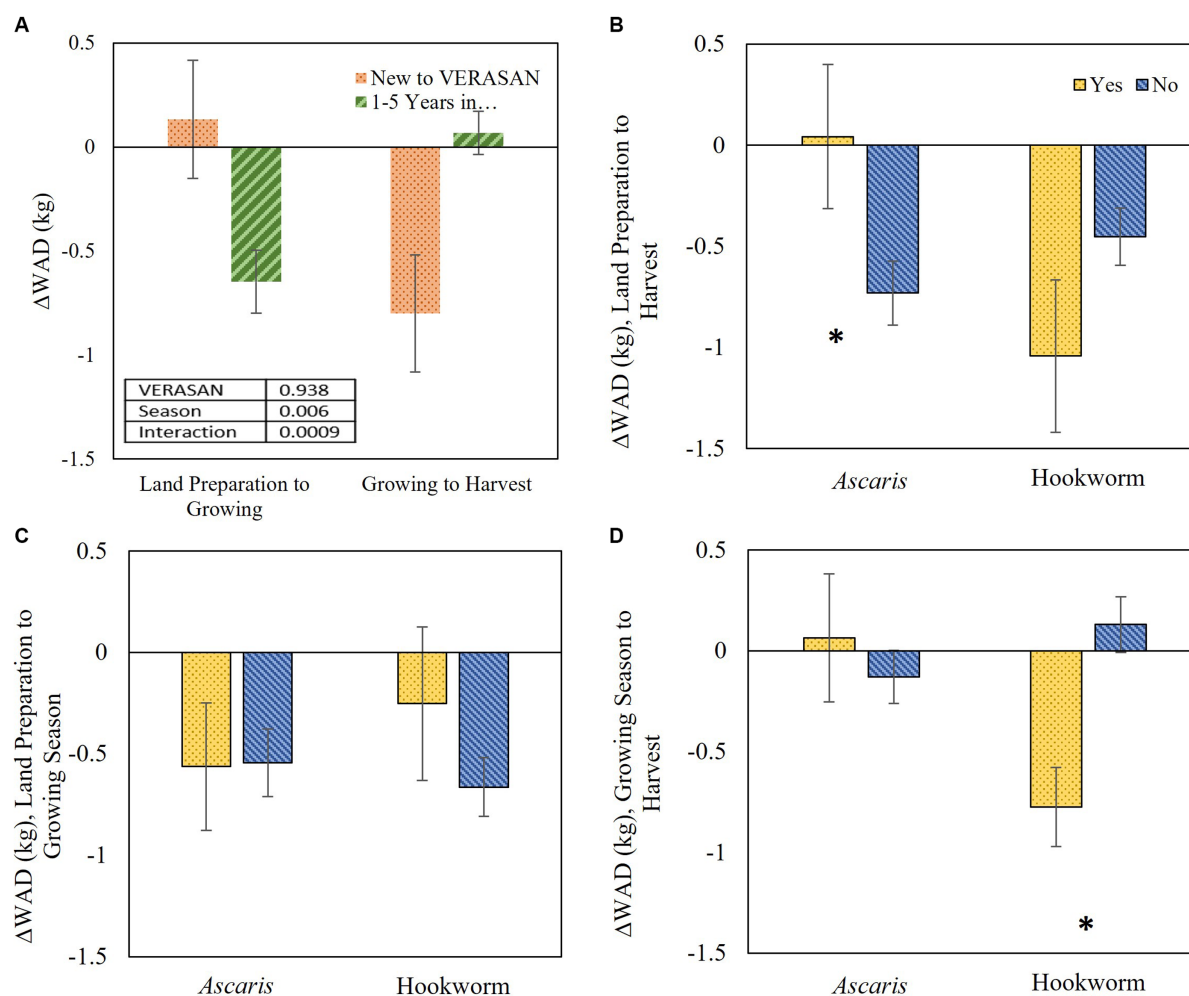
FIGURE 4
Change in weight-for-age difference (ΔWAD; kg) for index children age 6 months to 5 years compared to the WHO growth standard by: **(A)** being new to *VERASAN* in the first half of the study (land preparation to growing season) and the second half of the study (growing season to harvest); and baseline *Ascaris* and hookworm infections during **(B)** land preparation to harvest (whole study), **(C)** land preparation to growing season (first half of the study), and **(D)** growing season to harvest (second half of the study). Significant differences indicated with * ($p < 0.05$).

of preschool children to infections. Presence of children on the household agricultural plot was associated with lower linear growth attainment (HAZ) in both land preparation and harvest models, perhaps because exposure to intensified subsistence agriculture increased the risk of *Ascaris* and hookworm infections in preschool children and because STH transmission occurred when preschool children accompanied their caregiver who was working on the household agricultural plot (33). However, given the very low reinfection rates, increased presence of children on the plot may have limited child growth through other pathways. Plots were typically some distance from the home, meaning that access to latrines and water was limited. Exposure to unhygienic conditions can result in environmental enteropathy which can lead to growth faltering (67–69). Diarrhea, our only indicator of environmental enteropathy, did not affect growth attainment or velocity, possibly because the reported duration was about 1 day/mo. It is also possible that child feeding patterns may differ when children are in the plot. We did not explore this, but Bolivian women participating in their household's farming activity lacked the time and foods to feed their children in their agricultural plots, resulting in lower feeding frequency, a less diverse

diet, and a lower caloric intake (70). Taken together, children who accompany their caregiver to the agricultural plot are likely exposed to STH transmission and other pathogens and may receive a less nutritious diet, all of which could contribute to lower HAZ.

4.5. Strengths and limitations

Our interim program evaluation had three important strengths, each associated with limitations. First, the design of this ongoing multi-sector intervention program reflected the needs of the participants and the logistical requirements of the MoH and its partnering agencies. Our opportunity to evaluate this program allowed us to explore a comprehensive set of variables that potentially influence preschool child growth. However, these strengths limited our ability to follow best practices in intervention research design. All communities were involved with VERASAN, so we were unable to include a true control group. Fortunately, our study coincided with implementation of VERASAN into a new set of communities that we could compare with those involved for 1 to 5 years. Given the scope

of data collected, we relied on self-reported qualitative data for diet- and agriculture-related variables, which are less subject to recall bias than quantitative recall data.

Second, to our knowledge, this is the first study to explicitly include STH infections and STH-related infection risks within an agricultural intervention when exploring the impacts of an agricultural intervention on preschool child growth outcomes. However, the study partnership requirement that all children be treated with albendazole throughout the study precluded us from having an untreated comparison group. Low reinfection rates precluded us from directly exploring the impact of reinfection on growth, but we were able to observe the lasting impact of STH infections even after treatment and within this context of low-level transmission.

Third, we were able to explore seasons by incorporating a longitudinal design over one agricultural cycle (land preparation, growing season and harvest), allowing us to evaluate relative growth velocity (ΔHAD and ΔWAD) that revealed associations with measured variables that would not have been found using only routine HAZ and WAZ measures. Despite this, the 7-month window was relatively short for detecting changes in growth, particularly linear growth. We were limited to monitoring a single agricultural cycle, precluding us from making conclusions about agricultural seasons.

5. Conclusion

Taken together, this interim assessment of the VERASAN initiative provided evidence that the positive impacts on agricultural production, child diet diversity and household food security benefited child growth. It highlights the value of ΔHAD and ΔWAD as sensitive short-term growth indicators. It also indicates that such programs may also have unintended negative consequences for child growth especially if children's exposure to STH infections and unhygienic conditions is increased. Further research into nutrition-sensitive agricultural interventions should consider potential impacts of agricultural exposures on increased STH infections, as nutrition-sensitive, agricultural interventions that are also "infection-sensitive" may improve child growth.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Internal Review Board of the Faculty of Medicine of McGill University, Canada and the National Research Bioethics Committee of the Gorgas Commemorative Institute for the Study of Health, Panama. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

RK designed the study with contributions from MS, OS, and KK. RK collected the data, with logistical support from OS. RK analyzed the data, with contributions from MS and KK. RK wrote the manuscript, with contributions from MS, OS, and KK. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Design-redesign, implementation, and evaluation of effectiveness of maternal nutrition and responsive parenting program on child development at 2 years of age from rural India: a cluster RCT

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Background: To promote early childhood development (ECD), we require information not only on what needs to be addressed and on what effects can be achieved but also on effective delivery methods that can be adapted to local context. We describe design, implementation, and evaluation of a complex intervention to strengthen nurturing environment for young children.

Methods: Study participants were pregnant women and their children from birth to 2 years. We used design and redesign, implementation, and evaluation approaches for the study. We co-created curriculum and delivery plan with stakeholders, based on the theoretical framework, findings from formative research, and our preliminary work. We recruited 656 pregnant women and newborns, 326 (49.69%) from intervention and 330 (50.30%) from the control group. We conducted a cluster randomized controlled trial to evaluate the program's effectiveness. The outcomes of children were assessed at 12 and 24 months.

Findings: At recruitment, study participants from both the study arms were similar in sociodemographic characteristics. We conducted 6,665 home visits, 25 toy-making workshops, and 65 caregiver-meetings. The initial examination of program data revealed gaps in quality and coverage of interventions. The intervention was redesigned based on feedback from stakeholders in community meetings. At recruitment, participants in both study groups had similar socio-demographics. We conducted 6,665 home visits, 25 toy workshops, and 65 caregiver meetings. Initial program data showed intervention quality and coverage gaps, leading to a redesign program based

on community and stakeholder feedback. Post-re-designing, session quality improved, with program coverage rising from 32 to 98%. Male participation in home visits increased from 4.3 to 32.65%, and data errors reduced from 270 to 140 per month on average. At 24 months, program showed moderate−mild impact on ECD − cognitive (0.31, 95%CI: 0.13−0.48), language (0.2, 95%CI: 0.01−0.39), and socioemotional-development (0.19, 95%CI: 0.01−0.37), moderate effect on home-environment and mother−child interaction. 96% of women initiated breastfeed within one-hour of delivery, and exclusive-breastfeeding rate of 89.80%.

Interpretations: The study provides an evidence-based community centered ECD curriculum and implementation strategies to enhance service providers, and caregivers' knowledge and skills for promoting ECD in low-resource settings with the potential to scale within existing Government Program.

Introduction

The early years are crucial to ensure that each child reaches their productive and creative potential in adulthood (1, 2). To provide adequate nurturing care, families must address multiple needs for psychosocial stimulation, health care, nutrition, and environmental and economic security (3–7). Evidence of the effectiveness of single-target interventions in the early years of life is available and encouraging. However, information that adequately guides implementing complex programs that address holistic child development is limited.

A Holistic Early Childhood Development (ECD) fosters the overall growth of a child, with the various domains of child development collectively shaping a child's development and growth. This includes their physical development (i.e., gross and fine motor skills), brain or cognitive development, language development, socio-emotional development and behavioral development.

India's national Integrated Child Development Service (ICDS) program was initiated in 1975 to tackle child malnutrition and illnesses. ICDS is one of the government's most extensive and prominent initiatives that offer nutritional supplementation, immunization, height and weight monitoring, and non-formal education to children under six through Anganwadi Centers (AWCs). An Anganwadi Worker (AWW), operating at the grassroots level, is responsible for catering to a thousand population through an Anganwadi Center (AWC), with assistance from the Anganwadi Helper (AWH). However, the recent assessment of the ICDS programs recommended reinforcing the infrastructure, training, and support systems for AWC and staff. The report

suggested an adapted curriculum and a framework to oversee the program implementation. Despite the primary emphasis of ICDS being on the early years of life, its efforts primarily revolve around nutritional supplementation and children's healthcare needs. Unfortunately, the responsive parenting program, vital for fostering early childhood development, is considerably underrepresented within ICDS (8).

In India, 55% of children under 6 months are exclusively breastfed. Although breastfeeding is nearly universal in Maharashtra, only 57% of children under 6 months are exclusively breastfed, as the World Health Organization (WHO) recommends. Encouragingly, 87% of infants are introduced to breastfeeding within the first day of their lives, but it drops to 57% for those who begin breastfeeding within the recommended first hour of life. In the context of child health, the infant mortality rate in Maharashtra in NFHS-4 is estimated at 24 deaths before the age of 1 year per 1,000 live births (9).

Integrating parenting with nutrition interventions blended with traditional community-focused child-rearing approaches for Early Child Development (ECD) are evidence-based practices proven effective for ECD (6, 10–12). To take these complex interventions to scale requires a commitment of resources, often scarce and constantly competing with other demands. To achieve sustainability at scale, detailed evidence is necessary that convinces parents, service providers, policymakers, and the political system of the feasibility and value of the intervention in context, and thus to take on these costs (12–16).

In this paper, we describe the design, implementation, and evaluation of a complex intervention to strengthen the nurturing environment for young children. The evidence for ECD intervention

programs is well established; however, a critical design issue for such complex interventions is adequately addressing the sociocultural context and current childcare practices (17). Our proposed family-centered, locally developed intervention aimed to enhance the ICDS services targeted at the 0–2 years of age. The theory of change assumes that the additional components of this study shall enhance responsive parenting competencies and improve children's developmental trajectory (18, 19).

This study aims to determine the effectiveness of the integrated responsive parenting and nutrition program on child development outcomes in children under 2 years from rural India. The study also reflects upon the cycle of design, implementation, and evaluation using the lens of the Measurement for Change (10, 20) to develop an insight into the path to generating sustainability at scale.

Methodology

The context and the target population

The study area was a hard-to-reach rural setting, remotely located in two Blocks of the Wardha and the Nagpur districts in central India. The study villages were in the Forest Buffer Zone, a Tiger Sanctuary. People in the study area had an average annual per-capita income below the state average and worked as unskilled daily wage laborers in forests, farms, or cattle rearing. The traditional socio-cultural customs greatly influence childcare practices in these regions. Availability and accessibility of education, health, and social services for people from these villages are challenging, and access worsens during the rains and summer. Women in these villages are overburdened; as they are traditionally responsible for childcare, they work for income and face gender-specific risks and vulnerabilities. Wages for women are lower than for men. This social and economic distress contributes to challenges to adequate nutrition and caregiving.

Study design

We evaluated an integrated community-based intervention using a Cluster-Randomized Control Trial (C-RCT) design. We ensured all cluster members received similar interventions. Administratively, districts are subdivided into talukas or blocks in India. One taluka has around five Primary Health Centers (PHCs), and PHCs comprise five to six sub-centers (SCs). Sub-center caters to nearly five to six villages with a population of around 5,000. Each village has an Anganwadi center (AWC) catering to a population of 1,000 in a rural area.

We selected two adjacent blocks in central India, the Seloo and the Hingna blocks. The study team has strong community linkages in these areas, so delivering intervention and data collection in selected blocks was convenient. Since the community volunteers administered the intervention at the village level (Anganwadi center area) and the villages are situated very close to each other, we defined the sub-center as a unit of randomization to minimize the risk of contamination across the intervention and control groups. We used a stratified randomization approach.

Randomization and masking

The unit of randomization were sub centers. We randomly selected four PHCs comprising 21 sub-centers (clusters) and 106 villages from the study area. The 21 subcenters were randomly allocated using a random number sequence in the intervention and the control group. The random allocation of clusters were masked for the study team. The intervention group had 11 sub-centers (clusters) comprising 58 villages, and the control had ten sub-centers (clusters), including 48 villages. The intervention clusters received study intervention in addition to the routine ICDS services, while the participants from the control clusters received the routine ICDS services as part of the study (Figure 1).

Participants

The participants were pregnant women and their children from birth to 2 years residing in selected villages. We recruited pregnant women in the first or second trimester of pregnancy, permanently residing in study areas after informed written consent. High-risk pregnancies have the potential to introduce confounding factors into the study, making it challenging to determine the true impact of the intervention. By excluding high-risk cases, we aimed to enhance the quality and reliability of the data, thereby reducing the likelihood of bias that could affect the child outcome assessment. Additionally, this exclusion not only prioritized the safety of high-risk pregnant women by referring them to specialized healthcare facilities but also enhanced the generalizability of our findings, increasing their relevance to a wider range of expectant mothers. We recruited the participants over a period of 6 months, during which we provided counseling to pregnant women and their families, explaining the nature and purpose of the study.

From design to implementation to evaluation

Intervention design and development

We conducted formative research and collected data on the household, community, and environmental factors related to caregiving practices that influence the growth and development of children under 3 years through three group discussions at village levels and six interviews of Anganwadi workers, caregivers and other stakeholders. The formative research also explored the underlying beliefs and attitudes around childcare practices, nutrition practices, breastfeeding and complementary feeding practices, household decision-making, income levels, cultural traditions, and social norms around childcare. Additionally, the study team conducted three
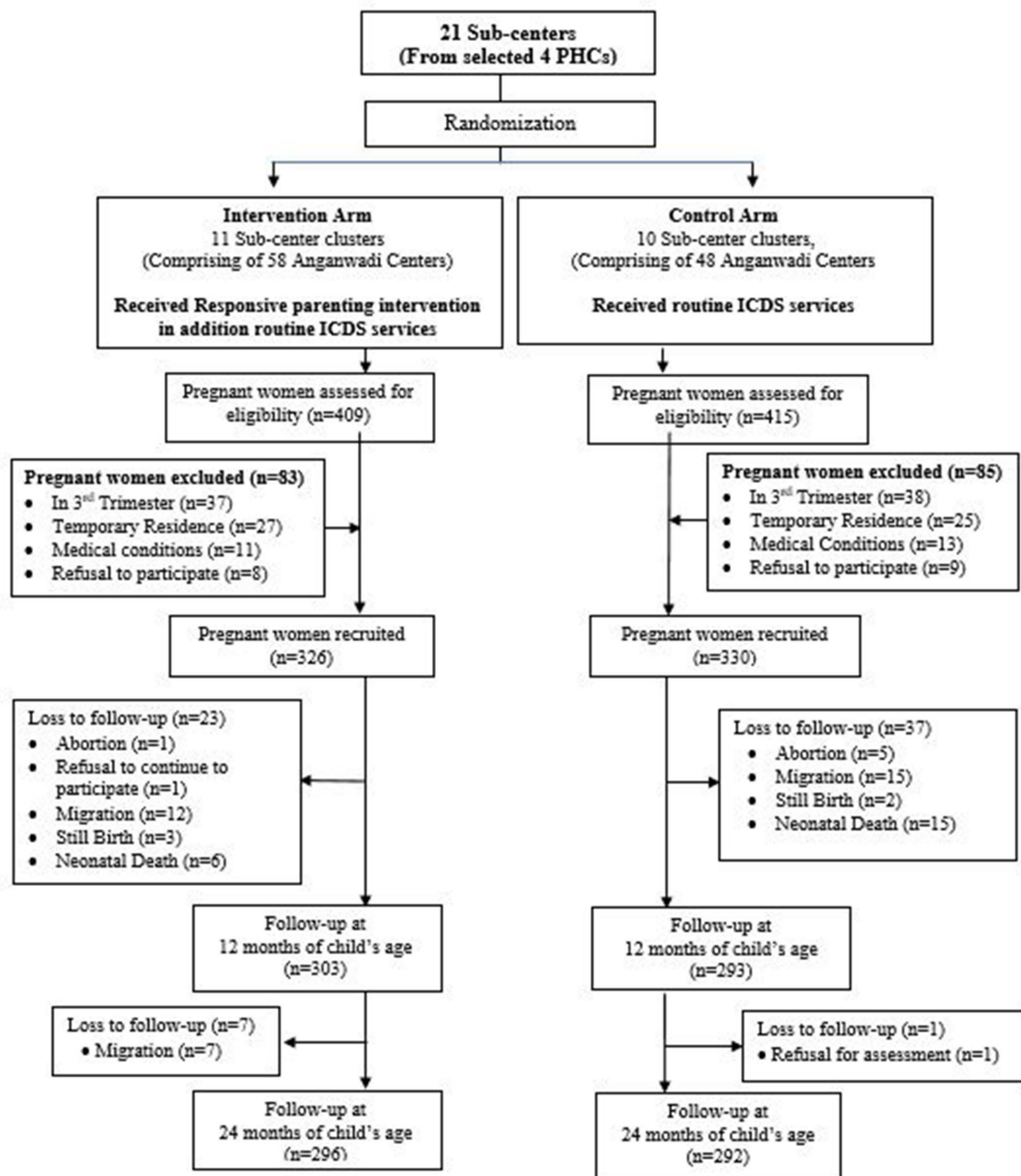
FIGURE 1
Consort flow chart.

community meetings to understand the sociocultural and childcare practices and specific challenges to access health and childcare services. In these meetings, the study team informed the community about the proposed Project and sought their consent for intervention. We engaged the community at all levels including intervention design, implementation, and program monitoring. During these community meetings, through a collaborative approach, community members collectively selected Balsakhi- a community volunteer from the village to implement the intervention. The team also collected data on nutrition practices, including breastfeeding and complementary feeding practices, household decision-making, income levels, and cultural traditions and social norms around childcare.

The development of a responsive parenting package drew its theoretical framework from Vygotsky's Zone of Proximal Development (ZPD). The ZPD is a theoretical framework that focuses on the difference between a learner's actual developmental level and their potential developmental level when provided with appropriate guidance and support. This concept involves nurturing independent actions, skills, and knowledge by offering the necessary scaffolding (11–13). Based on the theoretical framework, the findings from formative research, and our preliminary work (17, 21), we identified six areas of parental competencies, namely (1) shelter and nurturing care, (2) food and nutrition, (3) protection and discipline, (4) socio-emotional learning, (5) health, and (6) early childhood education.

The study team co-created a curriculum comprising locally/ culturally appropriate play-based activities covering these six groups' identified parental competencies. Community members, Anganwadi workers and supervisors, schoolteachers/early childhood educators, and other stakeholders participated in the curriculum development process. The enhanced nutrition program included a nutrition demonstration center and locally and culturally relevant recipes for pregnant women and infant and young child complementary feeding. The program linked the study participants with local Anganwadi centers to provide them with supplementary nutrition support. The program also integrated monitoring, evaluation, and learning (MEL) processes to track progress, direct adaptation for improved efficiency, and evaluate impact. Thus, the intervention package comprised age-appropriate content, curriculum, and necessary tools and materials. We designed tools to enable parents to use them with their children to promote their children's cognitive, language, socioemotional, and physical development at 2 years of age.

Implementation

The intervention delivery approach was community-driven, as community-based programs are an essential service delivery approach for early childhood intervention in under-resourced and developing contexts. Community-based implementation provides scope for identifying and analyzing specific community issues and prioritizing, designing, and managing activities at the local level (22). Our delivery approach focuses on interactive discussions adapted to the family's needs and the appropriate use of tools. Delivery was also intended to enable a Cluster Randomized Controlled Trial (cRCT) that assessed effectiveness and feasibility.

The delivery team

A 'Balsakhi' community volunteer delivered the intervention. Balsakhi is a local Marathi word, and it means 'child's friend.' Balsakhi were women from the village, preferably married, with some education (able to read and write in the local language), and willing to volunteer for 2–3 h daily. We selected one Balsakhi for each study village by conducting interviews and administering written examinations to evaluate basic skills and trained them.

The initial training spanned 3 days, certifying participants for conducting home visits, group sessions, and community workshops. During the Project's initial phase, the Project Research Associates accompanied each Balsakhi to provide initial support. The Balsakhi received refresher training on a one-to-one basis whenever required. The Balsakhi were mentored and supported by Anganwadi workers from the same village to deliver the responsive parenting intervention in the respective villages. Competencies of Balsakhis are assessed through regular supervision, observations of their interactions with children and parents, and periodic evaluations to gauge their knowledge and performance in providing childcare and early education services. Each Balsakhi received a monthly honorarium for their services.

Home visiting program

The focus was on the early initiation of breastfeeding, exclusive breastfeeding, and the appropriate introduction of complementary feeding. The Balsakhi through 44 home visits delivered the intervention over 24 months. We trained the Balsakhi to deliver the session interactively, using activities and reflective practice. We equipped the

Balsakhis with guidebooks, manuals, posters, flyers, flip charts, books, and toys to support session delivery. In addition to the material provided to Balsakhi, she was encouraged to use everyday household items in sessions. The trained and motivated Balsakhi to avoid being directive, adapt to the family's needs, and keep the family actively engaged in developing their knowledge and skills as responsive parents.

Community workshops

We organize a community workshop to support caregivers in preparing ECD play materials using accessible materials in alternate months. The workshops also demonstrated how to use the toys/play material, what development domain they stimulate, and what to observe while using the play material. The emphasis focused on health and safety issues when using the play materials. We provided the caregivers with a booklet and activity cards to guide them in toy making and play activities.

Community group meetings

We conducted monthly group meetings to create an enabling environment for ECD at the village level by intentionally building partnerships to support this process. The research assistants and Balsakhi coordinated these community meetings, inviting all stakeholders: Anganwadi workers, caregivers/parents, panchayat leaders, schoolteachers, volunteers, and the research team. We used a collaborative learning and sharing approach by inviting caregivers and parents to share their experiences around ECD and asking the larger group to reflect on those experiences. Based on the data, the stakeholders discussed the implementation progress and formulated a plan to improve intervention delivery and coverage. A total of 58 sessions were conducted in all the intervention villages.

Nutrition intervention

We created one demonstration center in each PHC area. The caregivers/mothers were invited to this demonstration center monthly for interaction and discussions on creating recipes for pregnant mothers and young children. In addition to these activities, we created a nutrition garden in households, wherever at least 200 square feet of space was available. Eighteen kitchen gardens were set up in the intervention villages. The Project team provided the seeds and saplings, whereas the household members sowed the seeds and maintained the nutrition garden. More preference was given to foods that were locally consumed.

Integrated MEL

Each child received the program for 24 months. To ensure the coverage and fidelity of the intervention, we analyzed intervention data weekly and tracked information on utilization and engagement, as well as the quality of interactions. Data on attendance, meeting schedules, and using the intelligent register application to give personalized feedback to parents were collected on a PC tablet application. Program supervisors used this application to monitor activity, give feedback and initiate discussions with the delivery team to improve the quality and coverage of the intervention (14).

Complementing the government's ICDS program

Every participant in the study was enrolled in the standard services offered by Anganwadi centers, where children under six

receive non-formal education, nutrition supplementation, and growth monitoring. Furthermore, the intervention group benefited from responsive parenting and enhanced nutrition initiatives delivered through home visits, group sessions, and community workshops. This intervention strategy synergizes with the existing components of the ICDS program, introducing an adaptable community-focused, responsive parenting curriculum for children under 2 years of age. The ICDS program's Anganwadi Workers played a supportive role, guiding the Balsakhi and aiding in addressing challenges related to intervention delivery.

Impact assessment

Outcome measurement

At recruitment, the study team collected household sociodemographic data and antenatal characteristics of pregnant women using the Government of India Demographic Health Survey (DHS) tool (9). Field staff received training and certification in completing DHS forms at recruitment and baseline data collection. We administered a battery of tools to assess child development outcomes at 12 months and 24 months of age. We chose assessment tools previously used in low-middle-income country settings (27). The study team adapted tools to the local context, translated them from English to Marathi (the local language), and back-translated them into English. Language experts validated the translated tools.

Developmental Milestones Checklist (DMC) is a reliable and sensitive tool for evaluating motor, language, and personal-social development (23, 24). We considered the gross score of DMC tool for the cognitive development of children under two years. Profile of Socio-Emotional Development (PSED) assesses children's social and emotional development through observation and parental reports (25). PSED tool was adapted to the local context and incorporated culturally and socially relevant items. The adapted home environment was assessed at baseline and the endpoint using the Infant-Toddler Home Inventory (26–28). The quality of mother–child interaction was evaluated using the Observation of the Mother–Child Interaction (OMCI) (29), and parent behaviors, parental knowledge, and skills for ECD were assessed using the Photostory approach and a parental quiz (17, 21). We used standard established protocols of WHO for anthropometric assessments (30).

The field staff who administered assessment tools received training and certification (17). The outcome assessors were masked to the intervention. Assessors also worked independently with the community volunteer and Anganwadi workers who delivered the intervention. To reduce familiarity with households and caregivers, the research team randomly rotated the assessor team across clusters. The assessors were instructed to refrain from inquiring about the families' intervention status. Additionally, inter-rater reliability testing was conducted to ensure data quality and consistency. The reliability coefficient for the Development Milestone Checklist (DMC) scale, Observation of Mother–Child Interaction (OMCI) tool, Profile of Socio-emotional Development (PSED), and Home Scale Coding (HSC) was 0.875, 0.691, 0.673 and 0.759, respectively. The

data team developed an XLS file for all devices and then imported those files to Open Data Kit (ODK). Data collection tools were then imported into an Android Tablet-PC. The app had in-built quality checks that monitored score distributions and missing values/data. Using a tablet PC for data collection, we trained evaluators in the ODK process.

At recruitment, we captured the household information and mothers' maternal characteristics using the Demographic Health Survey tool of the Government of India. At 12 months and 24 months, we assessed all child development outcomes (primary outcomes) – Physical, cognitive, language, and socioemotional development. We also evaluated mother–child interaction and home environment at 12 and 18 months of interventions.

Sample size

We aimed to detect differences of 0.3SD between the intervention and the control groups. The preliminary data from the study area calculated the child development score of 67 in the cognitive domain. We assume the Intra-cluster Correlation Coefficient (ICC) of child development as 0.02, with the average number of pregnancies per cluster per year as 30, resulting in the design effect 1.58. Hence, to detect the desired improvement of 0.3SD in development score in the intervention group, with 95% confidence and 80% power, a total sample size of 452 mother–child dyads. Based on the previous experience, we accounted for a 20% loss to follow-up. Thus, the final sample size is 542 from 21 clusters, 271 in each group. However, from an ethical perspective, we enrolled all eligible participants fulfilling the inclusion criteria from the intervention and the control clusters in the study.

Analysis

We used STATA version 14 for analysis. We compared household and sociodemographic data from the intervention and the control group to ensure the robustness of the randomization process and to examine the characteristics of participants lost to follow-up. We used the intention-to-treat analysis to compare the child outcomes between the intervention and control groups at 12 months and 24 months by a mixed effect regression model adjusted for cluster and assessors and controlled for potential confounders (mothers' education, child sex, wealth index, total family members). The mean child development scores for all domains are presented with a 95% confidence interval, considering $p < 0.05$ for the statistical significance. We also estimated the intervention's effect size at 12 and 24 months as 'Cohens d', as the difference in the adjusted mean between the intervention and the control group divided by the pool SD.

Registration

We registered the trial with clinical trial registry of India under the CTRI Number: CTRI/2017/05/008553 on 15/05/2017. The Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences (Deemed to be University) approved the trial vide letter with Ref no: DMIMS (DU)/IEC/2017–18/6306 dated 27.03.2017.

TABLE 1 Baseline characteristics of study participants in the intervention and the control arm.

	Total (*n* = 656)	Intervention (*n* = 326)	Control (*n* = 330)	*p* value
Maternal characteristics				
Age in years; Mean (SD)	23.94 (3.61)	23.79 (3.57)	24.08 (3.64)	0.288
Education				
Illiterate	18 (2.74%)	11(3.37%)	7 (2.12%)	chi2 = 6.06 *p* = 0.195
Primary (1–5)	24 (3.66%)	12 (3.68%)	12 (3.64%)	
Secondary (6–10)	295 (44.97%)	156 (47.85%)	139 (42.12%)	
Higher Secondary	203 (30.95%)	100 (30.67%)	103 (31.21%)	
Graduate and more	116 (17.68 5)	47 (14.42%)	69 (20.91%)	
Pregnancy duration				
1st Trimester	132 (20.12%)	68 (20.86%)	64 (19.39%)	chi2 = 0.21 *p* = 0.64
2nd Trimester	524 (79.88%)	258 (79.14%)	266 (80.61%)	
Gravida				
First	182 (42.99%)	150 (46.01%)	132 (40%)	chi2 = 5.68 *p* = 0.224
Second	294 (44.82%)	145 (44.48%)	149 (45.15%)	
Third	64 (9.76%)	26 (7.98%)	38 (11.52%)	
Fourth	13 (1.98%)	4 (1.23%)	9 (2.73%)	
Fifth	3 (0.46%)	1 (0.31%)	2 (0.61%)	
Total of live children; Mean (SD)	0.59 (0.65)	0.61 (0.68)	0.58 (0.65)	*p* = 0.576
Anaemia				
No Anaemia	173 (30.40%)	82 (29.82%)	91 (30.95%)	chi2 = 2.43 *p* = 0.487
Mild Anaemia	203 (35.68%)	96 (34.91%)	107 (36.39%)	
Moderate Anaemia	191 (33.57%)	95 (34.55%)	96 (32.65%)	
Severe Anaemia	2 (0.35%)	2 (0.73%)	0	
Father's characteristics				
Age in years; Mean (SD)	29.99 (4.13)	29.59 (3.63)	30.4 (4.54)	*p* = 0.012
Education				
Illiterate	21 (3.20%)	13 (3.99%)	8 (2.42%)	chi2 = 4.67 *p* = 0.322
Primary (1–5)	47 (7.16%)	23 (7.06%)	24 (7.27%)	
Secondary (6–10)	337 (51.37%)	175 (53.68%)	162 (49.09%)	
Higher Secondary	170 (25.91%)	82 (25.15%)	88 (26.67%)	
Graduate	81 (12.35%)	33 (10.12%)	48 (14.55%)	
Household characteristics				
Caste category				
Schedule Caste	52 (8.84%)	24 (8.11%)	28 (9.59%)	chi2 = 14.59 *p* = 0.002
Schedule Tribe	235 (39.97%)	141 (47.64%)	94 (32.19%)	
Backward classes	279 (47.45%)	123 (41.56%)	156 (53.42%)	
Open/General	22 (3.74%)	8 (2.70%)	14 (4.79%)	
Wealth index				
1st Quintile	110 (16.77%)	49 (15.03%)	61 (18.48%)	chi2 = 7.809 *p* = 0.099
2nd Quintile	122 (18.60%)	58 (17.79%)	64 (19.39%)	
3rd Quintile	143 (21.80%)	83 (25.46%)	60 (18.18%)	
4th Quintile	142 (21.65%)	75 (23.01%)	67 (20.30%)	
5th Quintile	139 (21.19%)	61 (18.71%)	78 (23.64%)	
Average family size; mean (SD)	4.66 (1.84)	4.86 (1.91)	4.47 (1.76)	*p* = 0.006
Below poverty line	286 (43.66%)	145 (44.62%)	141 (42.73%)	*p* = 0.626

Data are No (%); unless stated otherwise.

Results

Recruitment and engagement

We assessed 824 participants for eligibility and recruited 656 (79.61%) eligible women in their second trimester of pregnancy and their newborns. The intervention group had 326 (49.69%), and the control group had 330 (50.30%) participants at the enrolment. At 24 months, the study endpoint, 68 (10.36%) participants lost to follow-up.

Table 1 provides characteristics of study participants from the intervention and the control arm at enrolment. Study participants' sociodemographic characteristics were comparable between the two groups, except for the caste category. Most pregnant women were in the second trimester of pregnancy at enrolment. Maternal education, maternal age, stage of pregnancy, and pregnancy order were similar between the intervention and the control group. Household characteristics, wealth index, and poverty status were comparable in the intervention and control groups. The average wealth index score of participants from the intervention group (0.19, 95%CI 0.04–0.43) and the control group (0.18, 95%CI 0.07–0.45) was comparable ($p = 0.965$). At the endpoint, the mean wealth score was comparable to that at recruitment. Thus, the socio-economic status of the families was almost identical throughout the study period. Out of 656 newborns, 49.84% were boys, and 50.16% were girls.

Table 2 compares the baseline characteristics of study participants lost to follow-up and those who completed the intervention. Sociodemographic characteristics, other than maternal education, were comparable between those who lost to follow-up and those who completed the intervention.

Implementation milestones and quality

Home visits

We conducted 6,665 home visits throughout the intervention period. The preliminary review of first-quarter intervention data revealed that home visits were directive, 139 (23%) were family-centered. In 360 (69.62%) home visits, the average duration was less than expected, and 68 (11%) took more than 60 min. Despite rigorous training and certification, monitoring data and interactions in monthly meetings with the Balsakhi revealed low motivation and confidence to deliver interventions. Based on the findings and feedback, we re-designed the intervention delivery approach and introduced the community supervisors to retrain, handhold, and mentor the Balsakhi. We randomly supervised 1,670 (25%) home visits to ensure quality.

In the subsequent quarter, the indicator improved. Out of the total of 1,670 home visits supervised, 1,169 (70%) had interactive discussions, 1,458 (87.30%) used tools and other materials effectively during the session delivery, and in 295 (17.66%) home visits, male members from the household participated in the discussion and participation of male members increased from 4.3 to 32.65%. The coverage of the home visits also increased from 31.93% in the first quarter of intervention to 98.6% in the 6th quarter. Out of 294 households from the intervention group, 190 (64.63%) families received more than 75% of home visits, and 104

(35.37%) households received less than 75% of planned home visits (17). Data errors reduced from 270 to 140 per month on average.

Community workshops

In the intervention group, we conducted 25 toy workshops at the village level to support and train caregivers to prepare low-cost ECD play material from household items. The 295 participants trained to prepare and use a low-cost play material. Four demonstration centers were set up in each PHC area to demonstrate pregnant women and caregivers to prepare locally/socio-culturally acceptable recipes that meet mothers' and child's nutrition needs. A recipe book was prepared for complementary feeding and shared with the caregivers. 291 women/caregivers attended sessions in the demonstration center at least once.

Community meetings

We conducted 450 community meetings in the intervention villages over 24 months. Balsakhi (service provider) and outreach staff coordinated these meetings. Anganwadi workers, community members, mothers, and other care providers attended these meetings. These meetings allowed participants to reflect on their learnings, gaps, or challenges in service delivery and potential solutions.

Project staff monthly meetings

We held monthly meetings of Balsakhi (service providers) at each PHC. We conducted 65 Balsakhi meetings to share experiences and reflect on their learnings and challenges. The field supervisors presented the monthly coverage data to the stakeholders and discussed coverage gaps and opportunities to reach out to those who missed out in the previous months. The refresher training sessions were conducted during these meetings, whenever needed, to enhance the skills and competencies of the Balsakhi for conducting home visits. During these meetings, the collaborative re-design process associated with improved delivery indicators was agreed upon. The community and Project staff meetings helped improve the quality and coverage of the intervention. Another paper presents the data on improving the service delivery indicators (16).

Child and mother outcomes

The average weight gain for women from the intervention group was 9.01 (SD 3.74) kilogram weight, which was significantly more than the weight gain in women from the control group (7.67, SD 3.43) during pregnancy ($p < 0.001$). The intervention arm had a lower proportion of low birth weight newborns 68 (20.86%) than the control arm 88 (26.67%), but this difference was not statistically significant. However, the birth weight was significantly higher in the intervention arm 2.71 (SD 0.44) than in the control arm 2.61 (SD 0.45). Ninety-six percent of women started breastfeeding within 1 h of delivery and the exclusive breastfeeding rate was 89.80%.

Table 3 shows the statistically significant effect of the intervention on weight for height (WHZ) in children at 24 months. The effect was comparable for all other anthropometric indicators between the intervention and the control arm.

We observed a small effect on cognitive, language, motor, and socio-emotional development at 12 months. A difference in the mean child development outcome scores at 12 months between the intervention and the control group was not statistically significant

TABLE 2 Characteristics of study participants who lost to follow-up during the intervention at 24 months.

	Total (N = 656)	Retained (n = 588)	Loss to follow-up (n = 68)	p value
Maternal characteristics				
Age in years; Mean (SD)	23.94 (3.61)	24.02 (3.64%)	23.20 (3.23%)	0.076
Education				
Illiterate	18 (2.74%)	13 (2.21%)	5 (7.35%)	chi2 = 9.694
Primary (1–5)	24 (3.66%)	20 (3.40%)	4 (5.88%)	
Secondary (6–10)	295 (44.97%)	261 (44.39%)	34 (50.00%)	p = 0.046
Higher Secondary	203 (30.95%)	186 (31.63%)	17 (25.00%)	
Graduate and more	116 (17.68%)	108 (18.37%)	8 (11.76%)	
Pregnancy duration				
1st Trimester	132 (20.12%)	111 (18.88%)	21 (30.88%)	chi2 = 5.465
2nd Trimester	524 (79.88%)	477 (81.12%)	47 (69.12%)	p = 0.019
Gravida				
First	132 (40%)	112 (38.36%)	20 (52.63%)	
Second	149 (45.15%)	135 (46.23%)	14 (36.84%)	
Third	38 (11.52%)	35 (11.99%)	3 (7.89%)	chi2 = 6.937
Fourth	9 (2.73%)	9 (3.08%)	0 (0.00%)	p = 0.139
Fifth	2 (0.61%)	1 (0.34%)	1(2.63%)	
Anaemia				
No Anaemia	173 (30.40%)	159 (30.93%)	14 (25.45%)	
Mild Anaemia	203 (35.68%)	189 (36.77%)	14 (25.45%)	chi2 = 6.858
Moderate Anaemia	191 (33.57%)	164 (31.91%)	27 (49.09%)	p = 0.077
Severe Anaemia	2 (0.35%)	2 (0.39%)	0 (0%)	
Father's characteristics				
Age in years; Mean (SD)	29.99 (4.13)	30.06 (3.96)	29.44 (5.36)	p = 0.241
Education				
Illiterate	21 (3.20%)	17 (2.89%)	4 (5.88%)	
Primary (1–5)	47 (7.16%)	41 (6.97%)	6 (8.82%)	
Secondary (6–10)	337 (51.37%)	304 (51.70%)	33 (48.53%)	chi2 = 2.382
Higher secondary	170 (25.91%)	152 (25.85%)	18 (26.47%)	p = 0.666
Graduate	81 (12.35%)	74 (12.59%)	7 (10.29%)	
Household characteristics				
Caste category				
Schedule caste	61 (9.30%)	52 (8.84%)	9 (13.24%)	
Schedule Tribe	264 (40.24%)	235 (39.97%)	29 (42.65%)	chi2 = 4.806
Backward classes	304 (46.34%)	279 (47.45%)	25 (36.76%)	p = 0.187
Open/General	27 (4.12%)	22 (3.74%)	5 (7.35%)	
Wealth index				
1st Quintile	110 (16.77%)	94 (15.99%)	16 (23.53%)	
2nd Quintile	122 (18.60%)	113 (19.22%)	9 (13.24%)	
3rd Quintile	143 (21.80%)	126 (21.43%)	17 (25%)	chi2 = 6.257
4th Quintile	142 (21.65%)	125 (21.26%)	17 (25%)	p = 0.181
5th Quintile	139 (21.19%)	130 (22.11%)	9 (13.24%)	
Average family size; mean (SD)	4.66 (1.84)	4.47 (1.87)	4.68 (1.84)	p = 0.360
Below poverty line	286 (43.66%)	255 (43.44%)	31 (45.59%)	chi2 = 0.114 p = 0.735

Data are No (%); unless stated otherwise.

TABLE 3 Comparison of anthropometric indicators in the intervention and the control group.

Developmental domain	Intervention arm	Control arm	p value
	n = 303 at 12 months n = 296 at 24 months	n = 293 at 12 months n = 292 at 24 months	
WAZ			
12 months	−1.51 (1.12; −1.63. −1.38)	−1.57 (1.03; −1.69 −1.45)	0.493
24 months	−1.73 (1.01; −1.85 −1.62)	−1.78 (0.92; −1.89 −1.67)	0.515
HAZ			
12 months	−0.94 (1.28; −1.08. −0.79)	−0.97 (1.33; −1.12 −0.82)	0.778
24 months	−1.37 (1.09; −1.49 −1.24)	−1.21 (1.07; −1.34 −1.09)	0.085
WHZ			
12 months	−1.36 (1.28; −1.51. −1.21)	−1.47 (1.2–1.61 −1.33)	0.286
24 months	−1.47 (1.13; −1.60 −1.34)	−1.66 (1.07; −1.78 −1.54)	0.033

Data are mean (SD; 95%CI). The analysis is adjusted for the cluster & assessors and controlled for covariates (maternal age, maternal education, wealth index, poverty status, caste category, gravida and maternal anaemia) by a mixed-effect model.

TABLE 4 Comparison of child development outcome, mother–child interaction and home environment scores in the intervention and the control group.

Developmental domain	Intervention arm	Control arm	Value of p
	n = 303 at 12 months n = 296 at 24 months	n = 293 at 12 months n = 292 at 24 months	
Cognitive			
12 months	56.91 (8.84; 55.91–57.91)	56.29 (10.1; 55.13–57.44)	0.239
24 months	70.18 (8.71; 69.18–71.18)	67.65 (9.70; 66.53–68.77)	0.001
Language			
12 months	9.03 (3.10; 8.68–9.38)	8.84 (3.38; 8.45–9.23)	0.117
24 months	18.25 (4.86; 17.70–18.81)	17.41 (5.35; 16.79–18.03)	0.002
Motor			
12 months	38.36 (6.63; 37.61–39.11)	38.34 (7.32;37.49–39.18)	0.042
24 months	53.36 (5.21; 52.76–53.96)	51.97 (6.01; 51.28–52.67)	0.046
Socioemotional			
12 months	20.29 (6.54; 19.55–21.03)	20.37 (6.98; 19.56–21.17)	0.443
24 months	21.47 (4.86; 20.88–22.07)	20.51 (5.62; 19.86–21.16)	0.031
Home inventory			
12 months	37.06 (4.61; 36.54–37.58)	35.65 (5.05; 35.06–36.23)	0.035
24 months	36.58 (5.21; 36.08–37.06)	35.61 (4.65; 35.07–36.14)	0.008
Mother–child interaction			
12 months	36.01 (7.34; 35.17–36.83)	34.54 (7.63; 33.66–35.42)	0.014
24 months	40.37 (5.42; 39.75–40.99)	38.2 (6.01; 37.50–38.89)	<0.001

Data are mean (SD; 95%CI). The analysis is adjusted for the cluster & accessors and controlled for covariates (maternal age, maternal education, wealth index, poverty status, caste category, gravida and maternal anaemia) by a mixed effect model.

($p > 0.05$). The effect sizes increased for cognitive (Cohens $d = 0.31$; 95% CI: 0.13–0.48), language (Cohens $d = 0.2$; 95% CI: 0.01 0.39), motor (Cohens $d = 0.27$; 95% CI: 0.11–0.43); socioemotional development (Cohens $d = 0.19$; 95% CI: 0.01 0.37) at 24 months compared to 12 months of intervention. The intervention had a statistically significant effect on child development outcomes between the intervention and the control arm at 24 months ($p < 0.05$; Table 4).

The intervention statistically impacted the home environment and mother–child interaction at 12 months (Figure 2). We observed moderate to mild but statistically significant effects on the home environment at 24 months (0.3, 95% CI: 0.05–0.43). The effect of the intervention was maximum for mother–child interaction at 24 months (0.4, 95% CI, 0.22–0.58; Figure 2).

The number of children with improved scores in the intervention group at 24 months was more compared to 12 months for the cognitive
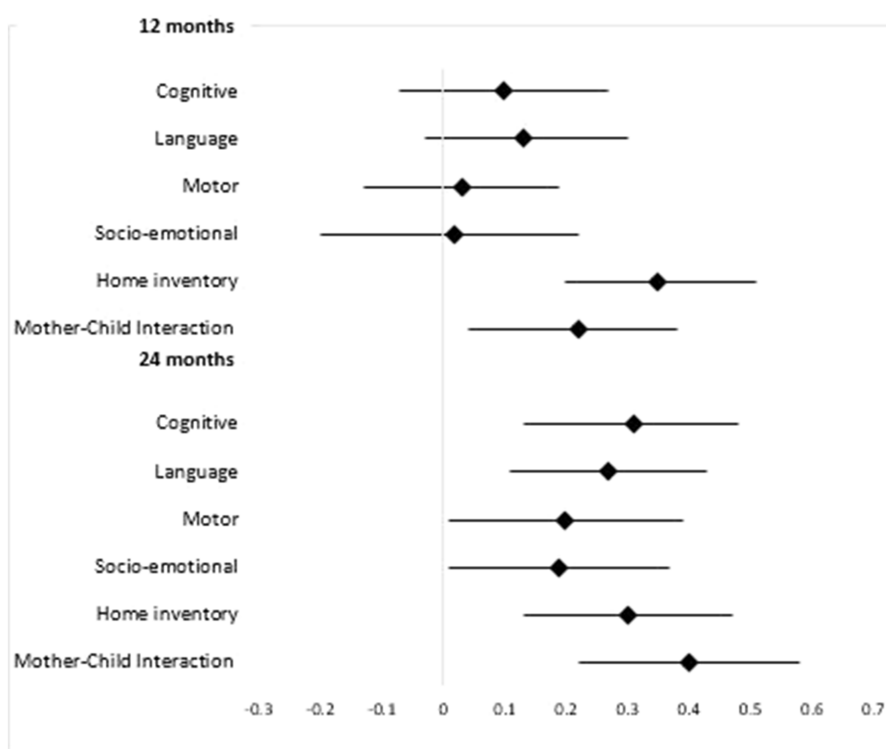
FIGURE 2
Effect size (Cohens *d*) with 95%CI of intervention on child development domains at 12 and 24 months.

domain (181, 61.15% versus 157, 51.82%, $p = 0.021$) and motor domain (224, 75.68% versus 139, 45.87%, $p < 0.001$). However, the difference was not statistically significant for language and socioemotional domains.

The lowest wealth quantile shows the maximum and statistically significant impact of the intervention on cognitive development (Cohens $d = 0.92$; 95% CI $= 0.53$–1.30), motor development (Cohens $d = 0.72$; 95% CI $= 0.29$–1.14); language development (Cohens $d = 0.79$; 95% CI $= 0.43$–1.16). The intervention had a lower effect on other wealth quantiles. Study participants below the poverty line as per the Indian Government's categorization had a statistically significant minimal to moderate effect size on cognitive (Cohens $d = 0.43$; 95%CI $= 0.19$–0.67), motor (Cohens $d = 0.19$; 95% CI $= 0.03$–0.42), language (Cohens $d = 0.25$; 95% CI $= 0.02$–0.49) and socio-emotional development (Cohens $d = 0.36$; 95% CI $= 0.10$–0.62) (Supplementary Table S1).

Discussion

Our study also demonstrated that the effectiveness of a responsive parenting program integrated with nutrition intervention significantly affected the development of children under 2 years of age and promoted a conducive home environment and mother-to-child interactions. The optimum growth and development of children under three may break the cycle of inequality and vulnerability and lay the foundation for achieving sustainable development goals (22, 31).

We co-created and implemented a responsive parenting and nutrition program delivered through community networks that included Government Anganwadi Centers for 24 months. The findings emphasized that community engagement, a theory-driven conceptual framework, and formative research are needed to design and implement complex interventions effectively. A paper by Bentley and colleagues also stressed a need to contextualize a program through an inclusive process and sustained stakeholder engagement to improve the quality of delivery (32).

Our program's key highlight was sustained community engagement. A 'Balsakhi,' meaning the friend of a child in the local language, delivered the entire intervention. Despite the well-conceptualized intervention, which draws upon the community's strengths and is contextually appropriate, we faced challenges in intervention delivery by the community volunteers in the initial stages. Quality of service delivery was a primary concern, and data revealed coverage gaps, including community volunteers' low motivation and engagement. Thus, we redesigned the implementation approach to motivate and engage service providers to deliver the intervention with fidelity. We appointed a community supervisor for handholding and mentoring community volunteers. Supervisors accompanied the community volunteers in at least 25% of the home visits. The implementation data revealed that the coverage improved over time and significantly improved the quality of intervention delivery. We presented the data in a separate paper, (16). We adopted a data-driven approach to improve coverage and quality of intervention delivery, and changes in practice developed out of the evidence shared across the network of stakeholders. Thus,

our study emphasized that engaging the remotest field staff, community members, and other stakeholders in the data review and decision-making process motivates and improves their engagement, creates an ecosystem that improves accountability and efficiency, and empowers everyone involved. If a community volunteer is mentored, supported, and monitored, they can deliver the complex integrated intervention in early childhood with the desired fidelity.

Our program included fortnightly home visits along with monthly group sessions. Our trial's frequency of contact with caregivers was similar to earlier studies from India (33) and Bangladesh (34, 35). However, it was less than earlier Jamaican trials, which reported weekly play sessions through home visits (36–39). Even though the group-based parenting education programs are practical and potentially cost-effective options (40), we decided to adopt a combination of methods, both the home visits and group sessions, based on the local context and caregivers' needs. Our approach of home visits to tailor the intervention to caregivers' specific needs, while group sessions facilitated peer learning through experience sharing, is supported by the evidence. Group sessions enable ECD culture across the community, and the home visit strengthens family processes (40, 41).

Our data showed a positive and statistically significant impact on the home environment and mother–child interaction. Mothers from the intervention group showed improved knowledge and skills for responsive parenting. Our study substantiates the findings of a systematic review that parenting interventions improve parenting knowledge, skills, parent–child interactions, and home environment are the critical pathways to bringing positive change in child development (42).

The intervention had a maximum effect on Cognitive development, followed by language, motor, and socio-emotional development. Our results were comparable to the systematic review by Jeong and colleagues, which included 102 studies from 33 countries, concluding that parenting interventions in the first 3 years of life improve a child's cognitive, language, motor, and socioemotional development and reduce behavioral problems (42).

We observed that these effects on child developmental outcomes increased over time. Assessing the impact of the duration of the intervention on child development outcomes was not the primary objective of this trial; however, our data highlighted that the intervention given for a longer duration, that is 24 months, shows more benefits than an intervention delivered over 12 months. A systematic review published in 2021 reported a lack of evidence on the effect of variable program duration on child development outcomes (38). Further study is needed to separate the influence of age at assessment from that of the duration of the intervention. It would be pertinent to enroll families for variable periods to explore the benefits over time and follow up a long-term cohort to understand how intervention benefits can be sustained beyond 24 months, even up until adolescence.

One of the limitations of our study is that we should have included nutrition supplementation. However, to avoid duplication of services offered at the Anganwadi Centers under the current ICDS program of India, we linked the beneficiaries to the Anganwadi Centers for nutritional supplementation. In previous studies, direct nutrition supplementation within a parenting intervention has shown significant benefits for 24 months of child age (34, 43). The integrated nutrition components in our study focused on information and practical ideas. The effective delivery of nutrition messages is essential, but more is needed. Nutrition-specific and sensitive interventions are needed, which include food security issues to improve feeding behaviors, the sufficiency and quality of complementary foods, maternal nutrition (preconception and during pregnancy), and birth spacing (45, 46). These issues were beyond the scope of this study. Another major challenge was that the families found difficulty maintaining vegetable gardens in April and May due to intense heat in the region and water scarcity. Our study suggests these actionable components require further contextualization to embed more firmly into local practices for sustainability and scalability.

Our program has several strengths. Despite the strong evidence from neurosciences and economics regarding the benefit of the intervention in the early years, most parenting interventions for cognitive and behavioral development are targeted at older children, at preschoolers (42–46). Our study recruited pregnant women, and the intervention continued till 24 months of the child's age, providing evidence of impact and engagement at the foundational stages of growth. Another strength of the study is an integrated intervention delivery through community-led channels. In resource-constrained settings, such an approach may be cost-effective. In addition to program-level advantage, available evidence suggests no significant loss in effect size when intervention is delivered in community settings through community volunteers (12).

In addition to the evidence of the combined effect of nutrition and responsive parenting programs on child development, our study has provided program and delivery level guidance to positively influence interventions' quality, engagement, and sustainability. The needs-based approach we employed guides the rapid re-design of delivery mechanisms, which was associated with acceptance by the community and led to a shift in responsibility and accountability at a local level (22). To further understand effective delivery mechanisms, rather than purely focusing on assessing responsive parenting in the mother, we recommend future studies that consider others in the support network for ECD (47), such as older siblings, grandparents, and other relatives, who can play a more prominent role on ECD in extended family or joint families structures.

The strength of our innovation is that it aligns with the recommendation of 2013 National Early Childhood Education and Care Policy of the Government of India, enhancing the potential for sustainable scaling. Our innovation was designed to address scalability and replicability, to establish self-sustaining village-level units that serve as models for neighboring communities, and to foster expansion. To ensure the sustainability and expansion of our program, we prioritized community engagement and ownership, engaging local stakeholders, parents, and community leaders in the design and implementation of our intervention. We optimized resource utilization by leveraging locally local assets and investing in capacity building, thereby reducing reliance on external funding. A robust monitoring and evaluation system built around shared accountability, ensures continuous assessment. Regular review of effectiveness and impact of the program enables data-driven adjustments to meet evolving needs. This comprehensive approach ensures our program's lasting impact and continued expansion of the

innovation, benefiting a wider population of children, their families and communities.

To conclude, our study emphasized the importance of developing a conceptual framework integrating a theoretical model with formative research for designing and redesigning a complex intervention. The study provides an evidence-based, responsive curriculum, with implementation strategies grounded in social learning theory that enhance caregivers' knowledge and skills for promoting early child development. Due to the pragmatic nature of the study, our intervention also has the potential to integrate within the existing Integrated Child Development Program in India.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Institutional Ethics Committee of Datta Meghe Institute of Medical Sciences (Deemed to be University) approved the trial vide letter with Ref no: DMIMS (DU)/IEC/2017-18/6306 dated 27.03.2017. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

ZQS and AG conceptualized the study and led the design as the primary author, analyzed data, and led the write-up. ST developed the data collection materials with inputs from ZQS, AG, and PH. PH and MNK oversaw the study, data analysis, and interpretation, and drafted the manuscript. PK and MP trained and supervised the data collection team. ST and AG oversaw the quality assurance. MP administrated the project work. SG, PK, PH, DS, and SC assisted with the write-up and participated in the study design, data analysis, and interpretation. All authors contributed to the article and approved the submitted version. All authors critically reviewed drafts of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1165728/full#supplementary-material

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Leveraging monitoring, evaluation, and learning to scale the Enabling Inclusion® program for children with disabilities in India and globally

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Introduction: Children with disabilities in low- and middle-income countries face many challenges and lack adequate services, including access to rehabilitation professionals. To address this lack of access, Amar Seva Sangam Ayikudy (ASSA), a non-governmental organization (NGO) in India, designed a technology-leveraged rehabilitation program called Enabling Inclusion® (EI®), and implemented it in one state (Tamil Nadu, India) before scaling it. The model is supported by the EI® app, which enables organizations to screen, assess and monitor progress of children with disabilities via rehabilitation specialists and community rehabilitation workers, and to provide family-centered, goal-based interventions. An extensive monitoring, evaluation, and learning (MEL) framework is embedded into the program. This paper explores how this MEL system supported the scaling of the EI® model, reaching additional beneficiaries nationally and globally.

Methods: This paper describes ASSA's MEL framework and demonstrates its use for decision-making in the process of scaling. It also explores how collaborations with various government departments, NGOs, and private partners contributed to the scaling of the EI® model and technology.

Results: Scaling of the EI® program was achieved by (1) expansion of the program in rural Tamil Nadu (vertical scale-up) in partnership with the Tamil Nadu government and private partners, and (2) by licensing the EI® app and model to other NGOs in various states in India and globally (horizontal scale-up). Systematic examination of key program and performance indicators, as well as stakeholder feedback, informed decisions to modify the EI® app over time. This included further customizing to the needs of children and service providers, covering a greater range of age groups and contexts, and modifying service delivery models. Child functional independence, participation, and inclusion was further strengthened by mobilizing parent empowerment groups, community awareness programs, school advocacy, and entitlements from the government. Flexibility in the implementation model of the EI® app allowed for adaptation to local contexts and organizations, and facilitated its scale-up.

Conclusion: A dynamic, inclusive, and locally grounded MEL system, a flexible and collaborative approach, and an adaptive implementation model increased the accessibility of an early intervention and childhood rehabilitation program for

children with disabilities and their families throughout the state of Tamil Nadu, across India, and internationally.

Introduction

The protection of children with disabilities is enshrined in the UN Convention on the Rights of the Child (1), the Convention on the Rights of Persons with Disabilities (UNCRPD) (2), and the Sustainable Development Goals (SDGs) (3). The SDG target 4.2 requires that "all girls and boys have access to quality early childhood development, care, and pre-primary education so that they are ready for primary education," and SDG 3 seeks to "ensure healthy lives and promote well-being for all at all ages" (3, 4). The global commitment to move toward Universal Health Coverage (UHC) is one step in this direction, but the challenge is significant. Children with disabilities include those with long-term physical, mental, intellectual, or sensory impairments. Globally, nearly 240 million children living with disabilities are unable to realize basic rights, including access to early stimulation and nurturing care, and face stigma, discrimination, and exclusion from communities and schools (4), which limit their participation in society on an equal basis with their non-disabled peers (5–7). The challenges for children with disabilities in low- and middle-income countries (LMICs) are particularly pronounced, as low-resource settings early in life further predisposes children to adverse health and compromised developmental outcomes, yet children in LMICs also have the least access to public and private support services. Addressing those challenges requires early intervention and rehabilitation, as the early years are critical for child development and school readiness (8, 9), and requires a family and community participatory approach.

There is a growing body of evidence on the effectiveness of interventions for early childhood development; however, there is scant information on how to implement effective programs at scale (9, 10). Early childhood development (ECD) programs may be scaled to new groups in similar settings and to different populations in new settings (11). As the context changes with scaling, many factors that ultimately impact a program's effectiveness will also change, including the socioeconomic, cultural, and political context, as well as features of the implementing organizations and their partners (e.g., financial resources, social relations, and leadership) (12–14). Therefore, understanding the new contexts where scaling will happen is essential for scaling to be effective (15).

Monitoring, evaluation, and learning (MEL) systems can support organizations in understanding these new contexts and inform adaptation and delivery strategies (9). This paper explores how a responsive MEL system supported the scaling of the Enabling Inclusion® (EI) app and model by Amar Seva Sangam (ASSA), a non-governmental organization (NGO) in South India. This paper is a follow-up to Krishna et al. (16), which described the findings from a rapid-cycle evaluation of ASSA's early intervention program for children with developmental disabilities in South India.

Scaling contexts for Amar Seva Sangam's Enabling Inclusion® program

There are many barriers to the equitable provision of early intervention services in India. Research suggests that, until 2016, only 10% of the approximately 2.3 million children under the age of 6 with disabilities in India were accurately diagnosed, and even fewer were receiving appropriate rehabilitation (17, 18). The lack of public community-based child rehab programs hinders timely screening, diagnosis, and appropriate intervention (19, 20). Barriers include low awareness and high disability stigma, lack of rehabilitation centres and trained specialists, especially in rural or semi-urban areas, long distances, lack of transportation to urban centres, high costs, and long waiting times to urban rehab centres (21). Many of these barriers can be addressed by mobilizing community support and harnessing the power of connectivity through technology.

In this context, ASSA designed and implemented a technology-leveraged program and software application called the Enabling Inclusion® (EI®). The EI® app is designed to support rehabilitation specialists and community rehabilitation workers to screen and assess, and monitor progress of children with developmental disabilities, especially in rural areas, and to provide child rehab service providers (e.g., therapists, community rehab workers, NGO management, and caretakers) with a menu of evidence-based, family-centered interventions. The specific modules in the EI® app are: Child developmental screening, Rehabilitation and Environmental Assessments and Evaluations, Family-Centred Goal Setting and Intervention/Therapy Planning, Intervention Assignment, Scheduling, Monitoring, Awareness and Training Programs, and Dashboard and Reporting. Impact evaluation studies by Krishna et al. (16) and Muthukaruppan et al. (19) report a positive impact of the program, including improved service provider work satisfaction, improved program engagement, and school enrollment, decreased caregiver strain, and increased parent empowerment.

Given its potential to reach vulnerable children with disabilities and the findings on positive impacts, ASSA decided to try to scale the EI® app and model to new localities across India and globally. Its strategy to scale used a combination of 2 approaches: vertical and horizontal scale-up. According to UNICEF (22), vertical scale-up involves the expansion of an existing program or set of programs, where the benefit, value, or duration of the program is increased for some or all current recipients, new components are added, or new beneficiaries within the existing geography are increased (22, 23). Horizontal scale-up, on the other hand, refers to an expansion of an existing program, or set of programs, to increase beneficiaries from new geographies and communities (22).

Over its 40-year history, ASSA activities have primarily focused on sustaining and growing its activities through private grant

funding in one district (Tenkasi District) of Tamil Nadu. To facilitate vertical scale-up within Tamil Nadu, ASSA cultivated partnerships with the Tamil Nadu government to increase beneficiaries and community awareness and bring greater financial sustainability. Meanwhile, ASSA's approach to horizontal scale-up focused on licensing the EI® app and model to other NGOs in various states in India and abroad, as well as forming knowledge partnerships with government departments.

Methods

The MEL framework for the Enabling Inclusion® program

To support the process of scaling the EI® program, ASSA developed a Monitoring, evaluation, and learning (MEL) system based on the '5 aspirations of Measurement for Change' described by Krapels et al. (24), namely for the MEL system to be dynamic, inclusive, informative, interactive, and people-centered (24, 25). The MEL framework supports monitoring and decision-making at different stages of the program, from initial design through implementation and scaling, with ongoing adaptations of the MEL system and the program. In this section, we describe five features of the MEL framework: (1) a new organizational structure, (2) key program indicators, (3) key performance indicators, (4) stakeholder feedback, and (5) how MEL was used for decision-making.

A new organizational structure to support scaling

To support the scaling process and ensure quality, ASSA established a new organizational structure, building on its 40 years of experience providing child rehabilitation services in rural South Tamil Nadu. This new structure included a social enterprise and a centre of excellence.

The social enterprise, *Amar Seva Global Association* (ASGA) was established in 2020 to create awareness about the EI® program and establish new partners. ASGA is a non-profit company with the legal authority to license the use of the EI® app to other organizations globally. The primary objective of ASGA is to enable access to early intervention and rehabilitation services for children with disabilities globally through technology-based rehab solutions. The secondary objective is to generate revenue to fund the Amar Seva Centre of Excellence, allowing for greater financial sustainability for the centre.

A key component of ASSA's MEL framework is the *Amar Seva Centre of Excellence for Rehabilitation and Development of Children with Disabilities (ASCE),* which was established in 2021 to support the organization and partner organizations in the scaling process and ensure the quality of the innovation is maintained. The centre's vision is to develop an inclusive world where children, families, and communities are provided the resources that allow all children with disabilities to reach their full potential. The centre supports a collaborative ecosystem of stakeholders, including national-, state-, and local-government, NGOs, private sector, parents, children, and service providers. Its activities include partnership development, supporting MEL and scientific research activities, training of partners, co-creating solutions and ongoing technology development.

Key program indicators

As part of its implementation, the EI® program tracks a comprehensive set of indicators through the EI® app. It utilizes a standardized process flow and internationally validated tools for child development and parent outcome indicators [for details, see Krishna et al. (16)]. The app's data retrieval, reporting, and dashboard features provide important information to support decision making for all program stakeholders.

The program indicators collected include:

- Program staff and stakeholders using the app, including the number and type of service providers (i.e., program managers, rehab therapists, community workers, etc.).
- Demographic and socio-economic data of children and parents reached by the program, such as age and gender, socio-economic indicators (parental education and income), and home, family, community, and school environments.
- Child developmental screening information, including the type of screening instrument used and the impairments and disability diagnosis categories.
- The type of EI® intervention provided, such as physiotherapy, special education, speech, language, and communication therapy, and subclassifications under each type.
- Changes over time in validated child development scores in various domains of development, caregiver strain, and empowerment.
- Participant characteristics in the awareness programs and trainings, including the number, age, and gender of participants attending the sessions.
- Access by children to services, including therapy, education, assistive technology, and government benefits.

For further details, please see Supplementary Table S1.

Key performance indicators

The EI® app also produces key performance indicators by program sites, which include the percentage of completed service provider activities (therapy and non-therapy) and utilization rates of various EI® app modules. For further details, please see Supplementary Table S2.

Tracking these program and performance indicators allows the program implementers to understand who is being reached, by whom, with which services, and how active beneficiaries and other stakeholders (e.g., community members) are participating. It also allows for comparisons across program sites/implementation models, nationally and internationally. Some examples of the questions that can be answered using the EI® app are:

- What is the prevalence of children with delayed development from child screening programs?
- What are the types of impairment identified and the medical disability diagnosis of these children?
- What is the program adherence rate (achieved therapy visits divided by planned visits)?
- What are the development progression and trajectories of children receiving therapy in gross motor, self-care, mobility, language and communication, cognitive, social, personal, occupational, recreational, and academic areas of development?

- Do children have improved school enrolment, access to assistive technology, and social/government benefits?
- Do caregivers have a reduction in strain/stress, an increase in family empowerment, and improved interactions with their child?
- Do people in the community who attended awareness programs have improved knowledge, attitudes, and practices regarding childhood disabilities?

To improve outcomes, all EI® program teams are encouraged to reflect on the information generated by the app and set up rapid-cycle action and iterative program change on both an individual child, family, and programmatic level.

Stakeholder feedback

In addition to collecting specific indicators through the EI® app, ASSA also systematically gathers feedback from a variety of stakeholders, both through the app itself and outside the app. Using qualitative and quantitative methods feedback from NGO program managers, funders, service providers, beneficiaries, public sector policymakers, and the community in obtained. For example, feedback from children, caregivers, as well as service providers and program management, occurs through surveys built into the EI® app that have to be completed at regular intervals. Surveys are also administered to community members attending awareness programs. Formal focus groups and interviews are conducted regularly with all stakeholders. This feedback plays a critical role in the re-design and upgrades of the EI® app, and in rapid cycle action and iterative program changes more generally.

Integrating the information into a MEL framework for decision-making

Combined, the different components of the MEL system collect information across the results chain, from key inputs to key indicators and intermediate outcomes, including stakeholder feedback. To ensure this wealth of information is actually used to inform decisions, ASSA follows a structured approach that governs and guides its use for specific users. Specifically, the organization's MEL framework is broken down by use for: operational-, supervisory-, and management staff, and by its Board of Directors. This structured approach supports program staff and partners at all levels and roles to ensure the program is reaching those children that are targeted, with high quality of implementation, and make adaptations where necessary in the scaling process required in a specific context. The MEL structure guides decision-making on adaptations of the design of the EI® program, get buy-in from stakeholders, where and whom to reach, and how to ensure program effectiveness in new contexts with different partners.

Results

Scaling the EI® program

The Enabling Inclusion® innovation was launched by ASSA in 2014 with direct implementation of the program through private funders in one District of Tamil Nadu. It has grown since, both vertically in Tamil Nadu, and horizontally to new states and abroad. These are highlighted in Table 1.

TABLE 1 Amar Seva Sangam's Enabling Inclusion® scaling journey.

Vertical scale-up	Horizontal scale-up
Private partnerships (launched 2014) Initial pilot program-Tamil Nadu • 1 District	Licensed NGO partnerships (launched 2021) • 2 countries (India, Ethiopia) • 7 Indian states, 35 Districts • 13 NGOs
Tamil Nadu disability department (launched 2020) • 2 Districts	Tamil Nadu department of education (launched 2022) • 1 District with planned scale-up to all 38 districts in the state
Tamil Nadu department of health (launched 2021) • 1 District early intervention centre	

The EI® model's vertical scale-up involved the expansion of the program within the state of Tamil Nadu, supported by additional private funding and through funding and implementation agreements with two government departments (Disability Department in 2020 and Health Department in 2021). As part of the expansion, ASSA hires and trains service providers to expand the implementation of EI® programs in Tamil Nadu, thus reaching more children and families.

In March 2021, ASSA began expanding the program throughout India and abroad by licensing the EI® app and model to multiple Non-Governmental Organizations (NGOs). As of August 15th, 2023, the program has been adopted by 10 NGOs across five states in India (Tamil Nadu, West Bengal, Uttar Pradesh, Pondicherry, Assam, and Karnataka) and 3 institutions working in the Amhara region in Ethiopia. In addition to licensing to NGOs, horizontal scale-up was achieved through a partnership with the Tamil Nadu Department of Education consisting of a pilot project in one new district and a knowledge partnership to implement a state-wide solution to scaling early intervention and child rehabilitation services.

From initiating the EI® innovation in 2014 until the launching of ASGA and ASCE in 2020, the EI® program's MEL data found that a total of 55,729 children had been screened for delayed development, 1,136 children have been positively impacted with improved development and function, 1854 caregivers have been positively impacted by decreasing their strain and increasing their empowerment, and 43,056 community members attending awareness programs had improved knowledge, attitudes and practices with regards to child development and disability. The new scaling strategy launched in 2020 resulted in greater outputs. From the initiation of the program till August 15th, 2023, 234,289 children have been screened for delayed development, 8,294 children have been positively impacted with improved development and function through rehab services, 25,684 caregivers have decreased strain and increased empowerment, and 184,356 community members attending awareness programs have improved knowledge, attitudes and practices with regards to child development and disability.

Tables 2–5 show the demographic features of the children and families reached through the 4 scale-up programs (note: the Disability and Health Dept. partnership data are reported together as they are

TABLE 2 Child impairment distribution in the EI® program scaling partnerships.

	Tamil Nadu health and disability dept. partnerships (N = 2,973)	Private partnerships (N = 3,152)	Licensed NGO partnerships (N = 1,102)	Tamil Nadu education dept. partnership (N = 1,070)
Impairments	n (%)	n (%)	n (%)	n (%)
Physical	1,110 (37.3)	1,207 (38.3)	396 (36.0)	490 (45.8)
Cognition	415 (14.0)	1,061 (33.7)	294 (26.7)	398 (37.2)
Speech	874 (29.4)	495 (15.7)	192 (17.5)	35 (3.3)
Hearing	116 (3.9)	145 (4.6)	30 (2.7)	57 (5.0)
Behavioural	144 (4.8)	128 (4.1)	53 (4.8)	36 (3.4)
Vision	61 (2.1)	42 (1.3)	18 (1.6)	53 (5.0)
Other	253 (8.5)	74 (2.8)	117 (10.5)	1 (0.1)

operated in the same geographical area and by the same management team and fall under vertical scale-up).

The EI® program's MEL framework

In the next section, we present how ASSA's MEL framework contributed to the vertical and horizontal scale-up process.

MEL and vertical scaling

Vertical scaling involved collaborations with two Tamil Nadu government departments, and private partnerships.

Scaling with the department of welfare of the differently abled

ASSA's first vertical scale-up venture involved a partnership with Tamil Nadu's Department for Welfare of Differently Abled, also known as the Disability Department. The partnership was achieved by lobbying and highlighting the positive results of the pilot study using the EI® app and model in one district (Tenkasi) (16, 19). This department then decided to fund ASSA to scale up the program to two entire new neighbouring districts in Tamil Nadu – Tirunelveli and Tuticorin, through direct implementation with ASSA-hired service providers.

Based on the success of this two-district scale-up venture, underpinned by the information generated by the program's MEL system, the Tamil Nadu Disability Department launched a statewide program called the RIGHTS project. Funded with the support of the World Bank, it aims to strengthen the social protection systems and capability of the State of Tamil Nadu to promote inclusion, accessibility, and opportunities for persons with disabilities (26). The program has expanded on ASSA's initial focus of early intervention and child rehab to cover people with disabilities of all ages.

A key component of the RIGHTS project is the development of a centralized registry of children and adults with disabilities. All children in the registry must be provided a diagnosis and a unique disability ID (UDID) card in order to access government maintenance grants, health insurance, transportation support, reasonable accommodations in schools, as well as future rehab services to be provided as part of the RIGHTs project (26). One of the MEL's key performance indicators, access to social/government benefits,

revealed that only 18% of children in the 2 district scale-up program had obtained UDID cards in April 2021. ASSA subsequently conducted stakeholder consultation through a survey of parents, which revealed that 85% of parents either did not know what benefits would be derived from obtaining this card and/or did not know how to apply for it, and 40% cited that having a UDID card would lead to their child being negatively labeled. These MEL findings informed the decision to conduct a campaign to educate parents on the benefits of obtaining a UDID card, how to apply for a UDID card, and to de-stigmatize the process. Through these various efforts, the percentage of children with UDID cards improved to 48% by April 2022.

Based on the success of this rapid cycle action, the Tamil Nadu government is launching a similar campaign to have children with disabilities register for UDID cards state-wide prior to launching the RIGHTs program. In addition, they are in negotiation with ASSA to use the Enabling Inclusion® app solution for the state-wide scale-up program.

Scaling with the department of health-Tamil Nadu

Each district in Tamil Nadu has a District Early Intervention Centre (DEIC) operated by the Department of Health, where children under the age of 6 at risk for disabilities can be referred for assessments, further referral, and rehabilitation. DEICs are located in the District Government Hospital and have pediatricians and rehabilitation specialists hired by the State Health Department. Though nearly 600–700 children are assessed at these centres annually, only approximately 30 children (<5%) are able to come to the centres regularly to receive therapy services.

As part of its MEL efforts, ASSA conducted stakeholder consultation through interviews with the Tamil Nadu Department of Health, staff at DEICs, and parents of children seen at DEICs. The consultations highlighted the need for an integration of services with the EI® home-based model. Therefore, the MEL component of the EI® app was upgraded to include a module that would capture additional data required by DEIC staff and a mechanism to facilitate further referral and follow-up and the EI® software solution.

The EI® app was piloted in one (Tenkasi) DEIC starting in February 2021. Prior to the integration of the EI® app, there were no referrals of children from the Tenkasi DEIC to any home-based program. From February 2021 to July 2023, 1836 children were

TABLE 3 Child diagnosis distribution in the EI® program scaling partnerships.

Diagnosis	Tamil Nadu health and disability dept. partnerships (N = 2,973)	Private partnerships (N = 3,152)	Licensed NGO partnerships (N = 1,102)	Tamil Nadu education dept. partnership (N = 1,070)
	n (%)	n (%)	n (%)	n (%)
ADHD	95 (3.2)	73 (2.3)	48 (4.4)	6 (0.6)
Autism	197 (6.6)	245 (7.8)	156 (14.2)	52 (4.9)
Blindness	16 (0.5)	5 (0.2)	11 (1.0)	7 (0.7)
Cerebral palsy	679 (22.8)	865 (27.4)	245 (22.2)	201 (18.8)
Developmental delay	32 (1.1)	20 (0.6)	45 (4.1)	0 (0)
Down syndrome	119 (4.0)	93 (3.0)	47 (4.3)	26 (2.4)
Dwarfism	4 (0.1)	1 (0)	1 (0.1)	5 (0.5)
Hearing impairment	133 (4.5)	160 (5.1)	39 (3.5)	67 (6.3)
High risk baby	0 (0)	0 (0)	51 (4.6)	0 (0)
Intellectual disability	219 (7.4)	656 (20.8)	164 (14.9)	380 (35.5)
Low vision	43 (1.4)	95 (3.0)	8 (0.7)	39 (3.6)
Mental illness	4 (0.1)	34 (1.1)	6 (0.5)	0 (0)
Multiple disability	119 (4.0)	56 (1.8)	34 (3.1)	122 (11.4)
Muscular dystrophy	26 (0.9)	51 (1.6)	2 (2.0)	24 (2.2)
Other	225 (7.6)	38 (1.2)	48 (4.4)	26 (2.4)
Specific orthopedic Disability	187 (6.3)	125 (4.0)	73 (6.6)	98 (9.2)
Specific learning disability	51 (1.7)	166 (5.3)	12 (1.1)	3 (3.3)
Speech and language disorder	687 (23.1)	443 (14.1)	107 (9.7)	9 (0.8)
Spina bifida	18 (0.6)	25 (0.8)	3 (0.3)	1 (0.4)
Spinal cord injury	2 (0.1)	1 (0)	2 (0.2)	1 (0.1)
NA	117 (3.9)	0 (0)	0 (0)	0 (0)

TABLE 4 Age and gender distributions of children followed by EI® program scaling partnerships.

	Tamil Nadu health and disability dept. partnerships (N = 2,973)	Private partnerships (N = 3,152)	Licensed NGO partnerships (N = 1,102)	Tamil Nadu education dept. partnership (N = 1,070)
Age range* (years)	n (%)	n %	n %	n %
0–2	553 (18.6)	95 (3.0)	162 (14.7)	13 (1.2)
3–5	1,034 (34.8)	522 (16.6)	357 (32.5)	53 (5)
6–8	931 (31.3)	727 (23.1)	271 (24.6)	236 (22.1)
9–12	439 (14.8)	925 (29.3)	175 (15.9)	421 (39.3)
13–18	14 (0.5)	699 (22.2)	126 (11.5)	340 (31.8)
19–21	0 (0)	93 (3.0)	7 (0.6)	7 (0.7)
>21	0 (0)	91 (2.9)	2 (0.2)	0 (0)
Gender				
Female	1,169 (39.3)	1,194 (37.9)	396 (36.0)	468 (43.7)
Male	1804 (60.7)	1958 (62.1)	704 (64.0)	602 (56.3)

*Age on August 15, 2023.

TABLE 5 Family demographics of children followed by EI® Program scaling partnerships.

	Tamil Nadu health and disability dept. partnerships (N = 2,973)	Private partnerships (N = 3,152)	Licensed NGO partnerships (N = 1,102)	Tamil Nadu education dept. partnership (N = 1,070)
Family income level (Rs/Year)*	n (%)	n (%)	n (%)	n (%)
0–15,999	129 (4.3)	312 (9.9)	216 (26.5)	27 (2.5)
16,000–49,999	430 (14.5)	379 (12.0)	108 (13.3)	220 (20.5)
50,000 – 300,000	2,367 (79.6)	2,409 (76.4)	437 (53.7)	670 (62.6)
>300,000	47 (1.6)	52 (1.6)	53 (6.5)	15 (1.4)
NA	0 (0)	0 (0)	286 (26.0)	139 (13)
Father's education				
Illiterate	163 (5.5)	361 (11.5)	76 (8.9)	
Anganwadi	13 (1.0)	41 (1.3)	0 (0)	
1-12th standard	2,254 (75.0)	2,240 (71.1)	498 (58.0)	NA
Diploma	222 (7.5)	204 (6.5)	63 (7.3)	
Undergraduate	221 (7.4)	208 (6.8)	156 (18.2)	
Postgraduate	100 (3.4)	98 (3.1)	65 (7.6)	
Mother's education				
Illiterate	128 (4.3)	522 (5.6)	86 (10.0)	
Anganwadi	8 (1.0)	38 (1.2)	3 (0.3)	
1–12th Standard	2,186 (73.0)	2072 (65.7)	559 (65.2)	NA
Diploma	165 (5.5)	251 (8.0)	33 (3.8)	
Undergraduate	318 (10.7)	149 (4.7)	117 (13.6)	
Postgraduate	168 (5.7)	522 (16.6)	60 (7.0)	

*India household income distribution: 0–15,999 (below poverty line)16,000–49,999 (low income), 50,000–300,000 (middle class), >300,000 (high income), source: PRICE's ICE 360 pan-India surveys https://www.ice360.in/ice360/. NA = data not available.

assessed by DEIC staff using the EI® app, of which 659 (36%) were referred to ASSA's home-based early intervention program. This pilot program demonstrates how NGO and Government services can be integrated and can act as a model for scale-up throughout Tamil Nadu and other states in India.

Scaling with private partnerships

Through partnerships with corporate funders and funding agencies, ASSA has directly implemented the EI® app in the Tenkasi district since 2014.[1] This private funding has sustained different scale-up programs, including a home and centre-based early intervention program, school-age child rehab program, and a special needs school. The conception of each of these programs was guided by the MEL-generated stakeholder feedback, including feedback from funders, service providers, and beneficiaries.

For example, a recent ASSA MEL study has shown that caregivers enrolled in the EI® program report experiencing reduced strain and increased family empowerment (19). Another ASSA's MEL study highlighted that parents who reported greater strain and less empowerment were also those parents who had fewer peer connections

and community supports. Stakeholder feedback indicated the need for greater parent-peer support, community integration, social inclusion, and the ability to advocate for their children (16). Rapid cycle action was taken to form parent empowerment groups within the home-based early intervention program to respond to these parents' needs. These groups consist of 14 to 18 parents of children with developmental disabilities living in similar geographical areas. They are led by parent leaders and supported by community rehabilitation workers (CRWs) and rehab specialists providing care for those children. The monthly group meetings aim to promote peer connection among parents, gain knowledge on disability rights and resources, and promote child and family community inclusion and parental advocacy. Parent social media groups via WhatsApp were also formed to supplement these parent groups.

A study examining the outcomes of the EI® Program parent groups[2] and parent social media groups[3] has been conducted and is pending publication. The study reveals the benefit of these groups in

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1 These funders include Grand Challenges Canada, Handi-care Intl, Kal and Viji Raman Foundation, Azim Premji Foundation, Standard Chartered Bank, Voltas, and UTI Bank.

2 Proctor K, Patel M, Krishna D, Venkatachalapathy N, Brien M, Langlois S. A capacity-building intervention for parents of children with disabilities in rural South India. (2023) (under review).

3 Coutinho F, Ogourtsova T, Saxena G, Krishna K, Brien M, Venkatachalapathy N. A case series of tele-rehab health coaching interventions in rural India. (2023) (under review).

promoting peer support and community integration. Based on these results, ASSA will seek to incorporate strategies to encourage peer group support, community integration, social inclusion, and the ability to advocate for their children as crucial elements of its scaling strategy.

MEL and horizontal scaling

The following section describes how the MEL framework supported the horizontal scaling of the EI® program to other states in India and abroad.

Scaling with NGO partnerships

ASSA facilitated a significant horizontal scale-up, by licensing the EI® app and model to other NGOs, and providing training, technology implementation, onboarding, and support services. Its integrated MEL activities played a crucial roll in the process.

The initial design for scaling with partner NGOs included an EI® program training using a 5–7 day Train-the-Trainer workshop. The goal of the workshop was to have project leaders train their own service providers in the use of the EI® software and model. ASSA's MEL-generated data revealed improved outputs and outcomes for the children and families reached via horizontal scaling, including more children with disabilities reached, improved child development, and increased parent empowerment. Despite the improved program indicators, two key elements of the MEL framework, stakeholder feedback, and key performance indicators, revealed gaps in the scaling efforts. Formal feedback indicated that the app's users (service providers) did not fully understand the app's various modules and how to use the modules. Feedback also revealed that the app's design, initially conceptualized for a home-based model, had challenges when implemented in school- or centre-based programs. In addition, many NGOs had school-age children, which they wanted to be covered within the model and app, while the EI® app modules initially covered preschool children only till age 6.

Partner NGO feedback was supported by analyzing the completion rate of the various EI® app module activities across the various program sites. Detailed analysis of this indicator showed that some modules in the EI® app were not being used at all or minimally used by partner NGOs. Feedback from partner service providers revealed that some of the assessments and modules were too time-consuming to complete within their organization's workflow, particularly for school- or centre-based services.

Several salient rapid-cycle action changes were implemented to respond to feedback from NGO partners. ASSA enhanced the EI® app training program, revamped support services, and upgraded the EI® app. For example, realizing that the train-the-trainer model was inadequate, ASSA started offering direct in-person training of service providers at the partner organization location, allowing ASSA trainers to fully understand the local context and adapt the training accordingly. Furthermore, the EI® app was upgraded to render it fully customizable to the needs of each partner NGO. For example, NGOs now have the flexibility of customizing existing assessments, changing assessments to locally used tools, and creating reports tailored to their needs. The EI® app was also upgraded to cover intervention protocols from birth to 25 years of age, providing children with disabilities a continuous follow-up from birth to early adulthood within the EI® model. Finally, a 24 h technology help desk was set-up to respond to issues faced by users of the EI® app and to fulfill customization requests.

Following these changes, the number of children reported to be enrolled and impacted has increased (a key program indicator), the completion rate of the modules has increased significantly (a key performance indicator), and feedback from NGOs revealed that the EI® app use was better understood, as well as more culturally and contextually appropriate to their setting (stakeholder feedback). ASSA intends to continue its horizontal scaling through NGO licensing and partnerships, using its MEL framework to facilitate program and technology adaptations.

Scaling with the department of education-Tamil Nadu

Samagra Shiksha (SS) is the Indian central government program to promote the education of all children (including minorities, socially disadvantaged, and children with disabilities) in Tamil Nadu and is operated by the Tamil Nadu Education Department. Through public sector advocacy that relied significantly on the findings from the MEL-generated evaluation studies, ASSA established a line of communication with Tamil Nadu's Education Department, presented the EI® solution, and held more in-depth discussions. This networking led to a formal partnership between this Department and ASSA. As part of this agreement, workers in the SS program, including special educators and physiotherapists, integrated the use of the EI® app as part of their regular child rehab and education services across two early intervention centres, ten-block resource centres, 452 government schools, and 561 government-aided schools and their home-based programs in 1 district.

ASSA instituted the MEL framework, gathering stakeholder feedback through meetings with Department of Education policymakers, children, and parents of children receiving services with the program. ASSA recognized that the SS program is established with special educators as the key educational and therapy services provider for children with disabilities, while physiotherapists provide consultative services. Essential changes to the original EI® app were deemed necessary as it was developed for a multidisciplinary approach involving community rehabilitation workers and a team of rehab specialists (physiotherapists, special educators, speech trainers/ therapists, and occupational therapists). The MEL-generated feedback from the SS Program indicated that there would not be enough rehabilitation providers to conduct all the assessments, evaluations, and intervention planning for the various domains of development contained within the EI® app.

To address this concern, ASSA designed a new version of the EI® app with a transdisciplinary approach that integrates therapeutic disciplines for a holistic developmental perspective of the child. The Functional Independence Measure for Children (WeeFIM) (27) was added to the EI® app to facilitate this new transdisciplinary approach. The WeeFIM, a comprehensive validated measure, evaluates all functional aspects of child development (27). ASSA developed corresponding interventions, goals, and strategies within the EI® app, covering all developmental domains that special educators address as part of each child's individualized education plan. Parents are empowered to learn these interventions and integrate therapeutic strategies into a child's daily life.

The Department of Education used the EI® app as a pilot in one district to facilitate their learning. However, their scaling goal will involve the creation of their own app that is owned, operated, managed, and supported by the Education Department. While ASSA initially intended for a state-wide scale-up of the EI® app, it quickly realized that in order to scale the impact of its innovation, it needed to be flexible in its approach. Sharing the learnings and co-creating solutions could result in a more significant impact. Therefore, as part

of the agreement with the Education Department, ASSA has agreed to be a knowledge partner in the department's inclusive education strategy via participation in their project management unit (PMU). This PMU is tasked with creating an inclusive education app and a system to scale early intervention, child rehab, and integrated inclusive education services to children with disabilities across the entire state of Tamil Nadu. ASSA will use the pilot in the Tenkasi district with SS workers and learnings from other scale-up programs to co-create this solution as knowledge partners with the Tamil Nadu Education Department. This knowledge partnership will lead to significant scaling in the horizontal scale-up vector.

Scaling and children being reached

In the process of scaling, the distribution of children being reached by the program has varied across implementation sites. For example, there is variation in the age of children reached as different EI® programs targeted different age groups. Another variation is seen in terms of the demographic features of families enrolled in the NGO partnerships compared to the private and government partnerships (Disability/Health department and Education department). NGO partnerships reach more families below the poverty line (26% compared to 3–10%), as well as lower mother and father education levels. This can be explained by the fact that the state of Tamil Nadu, where private and government partnerships were implemented, has higher average income and education levels, as compared to the other five Indian states where NGO partnerships were implemented (28).

Across all programs, the percentage of boys receiving intervention (ranging from 56 to 62%) exceeded girls. Our findings revealed that more boys were receiving interventions as compared to girls. This is, in part, following the overall sex ratio in India which is skewed towards males. Data also suggests that the prevalence of childhood disabilities is higher in boys as opposed to girls (29). Furthermore, various studies report that access to healthcare services is not equitable among boys and girls (across the life cycle). This inequity often stems from patriarchal practices within families and could potentially also be reflected in our findings (30).

The MEL framework also indicates that the EI® programs may not be reaching families in the lowest income level. While the majority of Indian households are low-income (31), the majority of households reached across the 4 categories of the EI® programs were middle class (54%–79%). While equitable accessibility is at the heart of the EI® model including providing services free of cost to families, the data shows that despite the EI program efforts, lower-income families may have less access to child rehabilitation services. This could be due to economic factors (time spent engaged in therapy means time away from income-earning opportunities) or lack of awareness of the benefits of therapy. Strengthening initiatives to address families' socio-economic status through livelihood, self-help groups and parent empowerment group may be needed in parallel to providing child rehab services to reach more low income families.

Finally, we can also use ASSA's MEL data to compare the distribution of children and families reached by the program to (inter) national data on children with impairment and disabilities. While the Global Burden of Disease Study revealed that the most common impairment identified among the pediatric population globally is visual impairment, followed by hearing impairments, intellectual disability, and autism spectrum disorder (10), across all the different EI®

programs in India, the most common primary impairment was physical impairment followed by cognitive impairment. Though vision and hearing interventions are in the app, there is more emphasis more on physical and cognitive intervention in the app. A strengthening of vision and hearing intervention within the app and model could allow for a greater reach of children with vision and hearing impairments.

Discussion

This paper describes how MEL contributed to a sustainable multidimensional scaling of ASSA EI® program, which leverages technology to provide developmental services to children with disabilities and their families. The scale-up involved the expansion of EI® implementation in rural Tamil Nadu (vertical scale-up) in collaboration with the Tamil Nadu government and other funders, as well as licensing of the EI® app and model to other NGOs throughout India and internationally and through knowledge partnership with a government department (horizontal scale-up) (32). In the process, ASSA sought to achieve impacts at scale in terms of human resources, accountability, responsibility, collaborative engagement with all stakeholders, and scope (33, 34). These scale-up efforts were guided by an extensive MEL system involving continuous examination of key program inputs, outputs, activities, program and performance indicators, outcomes, and extensive stakeholder feedback, and acting on the learnings generated through rapid cycle responses (35).

The MEL experience and the 5 measurement for change aspirations

ASSA's MEL system has been critical to achieving the sustainable multidimensional impact at scale of the Enabling Inclusion® (EI) Model and App. This section describes how the EI® program's MEL framework embodies the "*5 aspirations for Measurement for Change*", described by Krapels et al. (24), that aim for a MEL system to be dynamic, inclusive, informative, interactive, and people centered.

The EI® program's MEL system's *dynamic* approach allowed the flexibility and adaptability of design and implementation strategies, including making the EI® app customizable, introducing a transdisciplinary model, and expanding coverage of services to children of all ages. These adaptations were driven by an *informative* MEL system, including key program and performance indicators and stakeholder feedback, each providing complementary data points to guide rapid cycle actions and decision-making.

The MEL system's *inclusive* approach resulted in an ongoing family-centered approach and stakeholder consultation with families of children with disabilities, leading to the formation of parent groups and initiatives to increase access to government benefits such as disability cards, grants, and services. The MEL system's *interactive* approach allowed ASSA to observe, track, and utilize interactions with children, families, and service providers and responses while honoring and respecting relationships, resulting in parent empowerment groups and parent social media groups. This *inclusive* and *interactive* approach and the resulting initiatives will be critical to the future scale-up implementation strategy.

The MEL system's *people-centered* approach allowed successful scaling by measuring whether families with different

circumstances and characteristics have been included in the program. Scaling within Tamil Nadu was a successful outcome following government consultations, collaborative meetings, and agreements, leading to funding commitments and knowledge partnerships that will be critical to multidimensional scaling. NGO scaling focused on extensive consultation with and feedback from NGOs; this led to program modifications, including revised training, strengthened support services, and an upgraded, customizable app to make the model more contextually relevant. This *people-centered* approach was essential as each NGO and government has a critical understanding of the unique context of the communities they work in and direct working relationships with people in those communities.

All five measurements for change aspirations (*dynamic, informative, inclusive, interactive, and people-centered*) led to adaptations to the EI® Model to address varied contexts, including different service delivery agents (e.g., health, rehabilitation, and educational workers in various settings), different types of users (governments, NGOs), different modes of service delivery (centre-based, home-based, mobile clinic, school-based), different target groups (e.g., various children age groups- pre-school, school-age to adolescence), and differences in socio-economic and cultural settings.

The multifunctional EI® app underwent 'adaptations for scaling and because of scaling'. Fidelity to the original design was maintained and focused on the impact outcomes in improved child development and caregiver well-being and access to inclusive education. Flexibility in the implementation model solidified scale-up as the family-centered EI® app was developed to be adaptable to local contexts and organizations while remaining an efficient child development and rehab solution (36, 37).

Recommendations and conclusion

Monitoring, evaluation, and learning is at the centre of the EI® program, supporting accountability, buy-in, and informing decision making at all levels, and throughout program design, implementation, and adaptation to new contexts. The adaptive implementation framework of the EI® program, guided by the flexible MEL model, was crucial for achieving both vertical scaling in the state of Tamil Nadu, and horizontal scaling to new States in India and abroad. In the process of scaling, children from different ages, living in different contexts, and with different needs and resources, were reached by different types of service providers. The MEL generated information allowed the EI® program to be adapted to these different contexts. ASSA's MEL approach, guided by the *5 aspirations of Measurement for Change*, provides lessons that may be beneficial to scaling early interventions in other contexts.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: data is available upon request. Requests to access these datasets should be directed to MB, researchassociate@amarseva.org.

Author contributions

DK, SS, FC, MB, LH, JL, and NV contributed to the conception and design of all components of the article. DK, SS, MB, and NV contributed to the design of the MEL system and facilitated the rapid cycle evaluation actions described in his paper. MB and FC conducted a literature review and the first draft of the manuscript. DK, LH, and JL wrote sections of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1165034/full#supplementary-material

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Integrating father involvement into early childhood initiatives delivered at scale: key considerations

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Early child development (ECD) interventions, usually centered around the mother, exclude fathers from contributing to childcare. Research shows that a father's involvement in childcare can have a positive impact on the child's growth. In this light, a trial was conducted in rural India wherein a new program component aimed at enhancing fathers' engagement in early child was incorporated into an existing childcare intervention. The paper highlights the learnings drawn from the trial to present pathways to change, that is, strategies needed to embed father involvement as a component within the intervention ecosystem.

KEYWORDS

childcare, early child development, father, father involvement, ECD intervention childcare, ECD intervention

Current advances and future directions in the field

The first trial in rural India to enhance fathers' engagement in early childcare was carried out by The Institute for Financial Management and Research-Leveraging Evidence for Access and Development (1, 2). The intervention added outreach to parents to the existing Integrated Child Development Services (ICDS). ICDS is the nationwide flagship program supporting children under the age of 6. It is a classic female-centric welfare program where the mother is the primary recipient, and the program is implemented by an exclusively female cadre called the Anganwadi worker (AWW). Since its inception in 1975, the program has undergone various changes in design but is yet to carve out a space for fathers to engage in their child's development.

Without an active component to involve fathers, the program loses out on the opportunity to nurture the idea of family as a unit of care, and excludes men from meaningfully contributing to their child's development. Research shows that fathers' active involvement in childcare has a positive impact on the child's cognitive, physical, social and emotional development (3). On the other hand, child development is adversely affected by fathers' emotional unavailability, anger, and physical and verbal hostility, especially physical aggression toward the mother (4).

Interventions engaging men and boys can usher positive changes in gender role attitudes, gender-based violence, quality of relationship, and equitable division of household responsibilities (5, 6).

However, evidence of impact alone cannot guide the changes in behavior required to shift a system of practice. In addition to a shared understanding of whether it works or not, awareness of effective processes and of the pathways to change are equally important to the success of any intervention. In addressing sexual and reproductive health and rights intentional and explicit promotion of gender equality and gender-transformative programming is required (7). According to Ruane-McAteer et al. (7), interventions require a closer examination of the aims,

the theory of change, and whether there is explicit attention to issues of male privilege, power and position in relation to women. Simply put, it is not just about what to do, but also how to do it and how to remain effective over time.

The major challenge of evidence of impact not directly translating to improved implementation is a universal problem. While it is well established that a father's positive engagement in physical-emotional-nurturing care can contribute to a child's holistic development (8–10), this knowledge has not consistently driven implementation design. Child development interventions continue to exclude fathers and do not address the gendered difference in caregiving and parenting practices. To change this dominant narrative, more intentional activities need to be implemented, carefully monitored, and evaluated to provide the shared learning that drives transformational change.

In view of this body of evidence, the LEAD initiative centered on engaging both parents in childcare through information technology, group activities, and incentives delivered through the network of AWWs (1). The complexity of community-based development projects, with multi-stakeholders and interest groups, demands constant reflection and adaptability to circumstances to make meaningful change. In this paper, we take forward our exploration of the evidence to landscape father involvement in the childcare paradigm in India. We reflect on the experience of the LEAD initiative and endeavor to understand the efforts of other practitioners as we critically evaluate potential next steps in scaling the integration of fathers into the ICDS, and other similar programs.

Authors' perspectives

Reflections on the current system of practice

We use the Measurement for Change (M4C) framework (11–13) to guide our retrospective on outcomes and process. The M4C framework draws attention to aspects of design and information utilization that have guided effective delivery. These have been labeled as *Dynamic* (responding to the feedback loop), *Informative* (the triangulation of sources), *Inclusive* (the collaborative-co-creative process), *Interactions* (awareness of intended and unintended consequences), and *People-Centered* (going beyond the average to understand and address variability in outcome). Within this framework, the review involves exploration of the assumptions of our initial design vis-à-vis requirements for scaling of the model. This process is guided by learnings from existing studies and reflections gleaned from discussions with intervention practitioners.

Informative

In our reflective process, we sought experiences and insights from practices promoting father involvement in India. We did not find any published literature, but were able, through our networks, to gather the evidence of practitioners who have integrated fathers into early child development (ECD) initiatives. One source was Ashoka University, who had undertaken the Cognitive Science Research Initiative to explore the relationship between mother–child interaction and cognitive development in at-risk infants (14). The attendance of a few fathers in the study sessions revealed positive interactions between fathers and their infants and highlighted differences between maternal and paternal interactions (Madhavi Maganti personal communication).

Other interventions such as the Daddy Cool campaign, a CSR initiative implemented in the urban slums of Lucknow, used radio and social media targeting to improve the engagement of fathers in ECD activities (15). Within the ICDS too, there have been local level improvisations to include fathers in household chores and child nutrition, through public meetings and home visits (16). Whether part of a more experimental design or community-based outreach, these initiatives were perceived to have made a discernible change in the interactions between families and children. However, information was drawn largely from anecdotal evidence. The lack of more rigorous or systemic data amounts to a missed opportunity to gather evidence that could advocate for specific strategies and changes to policy and practice. These missed opportunities are all the more important in the light of the evidence of the multilevel impact that fathers can have on child development outcomes observed in the IFMR-LEAD intervention (2).

Inclusive

LEAD intended to provide a template for scaling father involvement strategies through the ICDS platform. To create this template, we documented the responses to the pilot across the network of partners and actors in the system. It was important to gather evidence from multiple perspectives to address the fit to the Indian context of engaging fathers in interventions on nurturing care. The questions asked focused on understanding the current state of fathers' engagement in rural areas; areas of childcare where the fathers' role can be leveraged; and effective strategies to influence cultural norms surrounding fathers' role in childcare. Strategies to engage fathers and other family members in the overall improvement in ECD outcomes were then developed in collaboration with participants and incorporated into the template.

Interactions

To examine influences upon the scaling of the LEAD initiative and the framing of policy to support this, we mapped the reflections from invested communities, and the interactions between the network of participants (program staff, IFMR-LEAD, funders, health care workers, rural communities and, most important of all, the ICDS program). Evidence from the literature from India indicates that any such intervention is likely to clash with the patriarchal structure of society as patriarchal models of masculinity predominantly shape fatherhood and continue to dominate the structure of the working environment and the design of support services for nurturing care (17). Hence, father's involvement in childcare is not affected by situational factors like the mother's employment status (18), but is rather determined by gender role expectations, perception of the peer group, and the fathering that they received (19). Even in urban India where desire and demand for greater involvement by fathers is rising, their role as providers take precedence, with working hours keeping fathers from participating in shared activities with their children (8). As a result, childrearing remains primarily a mother's responsibility, while fathers' roles remain limited by their social and professional environment. To address the root of the issue, societal pressures, more positive and inclusive messages to provide the space for behavior change were framed, which present interactive parenting and the family as an effective secure unit for providing childcare.

People-centered

Through our reflection, we have found navigating competing priorities within and between actors in the implementation system

to be a major challenge. The success of a specific intervention is strongly influenced by the importance accorded to the proposed change against competing challenges. Given that the ICDS program is already considered successful in tackling undernutrition and is delivered by a complex mechanism, there was an obvious reluctance from the practice community perspective to introduce additional changes to the existing intervention. This resistance to change came from competing choices in terms of value systems and the goals of research. The question then becomes how important is the change in the overall scope of changing lives and improving interventions, and how visible the improvements are to those invested in policy design. Clear and memorable data that informs the wider picture and details practical experiences can play a crucial role in the advocacy process as well as in guiding policy makers and the practice community. Most importantly, the pilot underscored the need for adopting an attitude of being continually adaptive to the interests of the community of practice and the community of intervention.

Dynamic

So far, the ICDS program appears to have been successful in reducing undernutrition and growth failure among women and young children, especially in the rural areas of India (20). Yet gaps are emerging, even in the relative success of the nutritional components (21). Moreover, not only is there scant evidence to prove the efficacy of the impact upon more holistic ECD outcomes (22), but there have also been no evaluations of the various programmatic components. Questions remain unanswered on how service efficiency can be achieved and how to ensure durable change across all components of child development. In light of the changing landscape of ECD requirements, the program needs to be continuously responsive to emergent challenges, as well to new evidence that can improve program design and enhance effectiveness.

Driving sustainability

In this section, we turn to the LADDERS elements, *Leadership, Alignment, Data, Demonstration, Evaluation, Replication,* and *Sustainability* (23) to reflect on the activities required to build a sustainable process for integrating father involvement strategies into the ICDS public programs.

When we reflect upon the *Leadership* required to drive the integration process the key gatekeepers are the senior officials in the Government departments through which the centrally envisioned ICDS programs are implemented. System readiness has been observed to target fathers directly in a nutrition initiative, Poshan Pakhwada, with the adoption of the slogan of "Men for Nutrition" (16). The attention on engaging fathers for improving only the nutritional indicators misses the opportunity for a sustained engagement strategy across holistic nurturing care. Nevertheless, it indicates a gradual shift toward an awareness of the importance of engaging the father. To continue this process, information must particularly reach the high-level decision-makers in the Women and Child/Social Welfare Departments at the state level.

Targeting the leadership alone to support the process of change will, however, be insufficient to create lasting change. To overcome the challenge of competing goals *Alignment* across the system requires adaptive processes throughout, with the entire system collaborating around common goals and objectives. Including fathers in outreach and information strategies seems like a small component in the entire umbrella of ICDS activities, yet integration requires multiple

additional activities for it to work successfully. Each activity needs to be accepted and integrated into the existing implementation process, with training and supervision seamlessly linked at multiple levels. An inclusive process of monitoring, evaluation, and learning will play a central role in this integration.

Another influence on system transformation is managing the variations found across contexts. Many of the maternal child health projects in India follow a hub and spoke model, centrally designed and monitored but with the state in charge of the implementation. Successful *Replication* across different sites, however, depends on the ability to adapt to, and through, local contextual knowledge, while in turn providing the model for innovations adopted centrally. The LEAD project, for example, was run in the state of Tamil Nadu, which has historically initiated many innovations in social welfare, including the ICDS supplementary nutrition project later rolled out at the national level. In response to the evidence of the LEAD project, other states, including New Delhi and Haryana have shown a willingness to adopt the integration of father involvement strategies into the ICDS. The transfer of knowledge to guide design, therefore, needs to use information that is accessible, drawn from multiple sources, and which flows in multiple directions.

Demonstration speaks to the need to learn through doing, and the ability to build in changes in the process. Incentivization is an example of a strategy that has been used successfully to promote the immunization of children in resource-poor settings. The addition of monetary incentives has enhanced immunization rates (24), while a regular supply of immunization services (25), and the use of SMS reminders (26, 27) have also improved delivery processes. Upgrading and extending the information system through the use of tablets, audiovisual communication and incentives can induce interest among the service providers and the target communities. Decisions on what will support delivery and what incentive will be most valued must directly include those who are targeted by the strategy, as monetary incentivization may not be sustainable, and should not be assumed to be universally valued. This suggests that indicators of program success need to broaden in range and scope, and careful advocacy is needed to use this knowledge to engage partners in the process.

To address *Sustainability,* additional components should be both acceptable and empowering to the last-mile worker and targeted families. With centralized design there is limited scope for drastic design change, yet the reality is that the project relies mainly on the last-mile worker, and success depends heavily on incremental change at that level to be sustainable. The key is for any additional activities to demonstrably support overall implementation without placing additional hardship on the last mile, the Anganwadi workers, who are hugely burdened and underpaid. A key ingredient of success is keeping staff motivated to continue to address challenging activities, such as mothers' gate-keeping behavior, alcoholism among fathers, and rapidly changing phone numbers. The efforts made need to build an increasing professionalism. Progress must be monitored and documented, and learning loops developed within each geographic cluster or state. The feedback loop should circle back to the Government to enable necessary changes within the intervention ecosystem.

Monitoring and Evaluation (M&E) of the ICDS is currently focused on the impact of nutritional supplementation, which is comparatively easy to evaluate using low-cost nutritional outcome measures among children. Information on the effective integration of additional components will inevitably make the process of evaluation more complex, requiring a focus on indicators of behavior change. Moreover, evidence derived from practice is more difficult to capture in the existing

top-down monitoring and evaluation system. *Data and Evaluation* are, therefore, the most challenging elements of system change and adaptation to context, but vital to drive effective decision-making.

Data and Evaluation is not just about the "what" and "how" of collecting information, but also about using it (28). Information systems need a significant redesign to be responsive to questions that arise as system transformation proceeds. Expanding the data system from M&E to MEL or MERL (monitoring, evaluation, research, and learning) requires these systems to be integrated into the implementation process and tied to an effective communication strategy.

Conclusion

Childcare has long been considered a woman's role, and this "Culture of Maternalization" has also been responsible for keeping fathers out of child development interventions. These reflections are a call to action to not only leverage fathers' engagement in childcare interventions but also to implement with consideration for all the moving parts of a new strategy and the adoption of a constant reworking of that strategy.

Our reflections highlight the dynamic nature of the implementation of a new strategy within an existing intervention ecosystem. The inclusion of behavioral change components at the community level is vital, but it must also be recognized that outcomes may be slow to achieve and difficult to perceive or measure. Therefore, tracking and monitoring too must be feasible enough to occur over an extended period of time. To make this process sustainable, we need to strengthen the networks and collaborations between Government agencies, existing ICDS staff, and external implementation and research partners. Technical assistance will be equally vital for training of staff, re-development of apps and modules to suit the state contextually, as well as for gathering and sharing the learnings from the project.

To ensure replicability, the strategies adopted need to be highly adaptive and sensitive to contextual factors. Across contexts, low attendance by fathers and a strong influence of societal gender norms will need to be intentionally addressed (29). Successful replication will also require micro-strategies that can adapt to change. The multiple components of ECD should be introduced into programmatic evaluation, while also moving beyond external evaluation toward data utilization that builds shared accountability and responsibility within the implementation system

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by IFMR Human Subjects Committee (dated September 26, 2017). Written informed consent was provided by all participants, the parents in the study. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

PH was employed by Identitea.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Measuring for change/Mobile Creches

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Introduction: Research spanning decades across fields such as psychology, education, and neuroscience consistently highlights the crucial role of social–emotional skills in various aspects of personal, academic, and professional development (1–3). The fact that UNESCO recognises social–emotional learning (SEL) as essential not just for meeting its educational objectives but also for accomplishing the Sustainable Development Goals highlights the crucial role robust social–emotional development plays in establishing sustainable societies. Whilst various studies highlight the importance of SEL, there is limited attention on how organizations can contribute to building such development by consciously including SEL in their work practice.

Process/methods: Our case study presents the process of integrating SEL into organizational practice over a period of 9 months. The selected constructs of SEL were determined by the organisation's needs and values. The Measurement for Change approach was used to frame and implement the intervention, with interactive discussions being the key methodology. Data were collected via surveys, reflective sharing, and observations.

Results: A shift in the selected constructs of SEL was recorded, with data highlighting individual differences.

Conclusion: The process of co-design and continual reflective practice was key to achieving change within the subset of the organisation rather than the specific content of the materials used.

Introduction

Mobile Creches (MC), with its vision for a 'just and caring world for every child', runs Early Child Development programmes for marginalised children aged under 8 years in India. One of MC's latest collaborative projects led to the revision of its Early Childhood Care & Education program. The curriculum focused on strengthening and promoting social–emotional learning (SEL); MC runs training programs with parents, frontline workers, and trainers with the objective of creating a more responsive environment for the children. It was during these training programs that the participant team training the various stakeholders recognized a gap in their own social and emotional wellbeing and the programmes they were delivering. It was realized that to enhance the social–emotional competencies of children, much more must be done at the organisational level rather than

just revising the children's curriculum. This surfaced a need for creating a safe space to establish the required social–emotional support throughout the organisation [(1), p. 58–73]. As Klitkou et al. (2) highlighted, governing change toward greater sustainability requires changing the focus of intervention from incentives for changing individual behaviour to creating conditions conducive to the change of socially shared practices. Heckemann et al. [(3), p. 744–753], in their reviews, found that socio-cultural architecture, responsive carer, and strategic vision are core dimensions that characterise the emotional intelligence of nurse leadership. For our case study, these dimensions would translate into the ecosystem (see Figure 1), the core team within this case study, and its Theory of Change (Supplementary Appendix 1). Not only is EI integral in predicting individual performance but it is also core to strong leadership and success [(4), p. 9–18]. Working as a team, the core team would work toward creating a team atmosphere in which its norms would build its emotional capacity to influence other groups of people [(5), p. 80–90, 164]. Framing the Theory of Change, upskilling members within this, and emphasising their participation through shared responsibility in the process aim to strengthen the development of the organisation (6).

The dialog around adopting an approach sensitive to SEL and an emphasis on upskilling educators on SEL structured pedagogy has gained attention in the last few years. Integrating SEL into the list of dynamic Sustainable Development Goals by UNESCO has also pushed for such conversations and efforts [(7), p. 54–60]. There are an increasing number of studies underlining the importance of providing a socio-emotional conducive environment from early childhood and into the workplace, as well as calling for educators to possess this competency [(8), p. 250–262]. However, there has been little focus on how organisations can consciously include SEL in their work practice to model its importance when working with children.

This study highlights the relevance of incorporating socio-emotional coaching within the entire ecosystem around children, an ecosystem inclusive of all the stakeholders within and outside of the organisation, as seen in Figure 1. The case study presented focuses on an SEL-focused intervention trialled within a subset of the MC organisation. The outcome of this would then inform the next phase of the intervention in building the social and emotional competencies of an extended subset of the organisation. MC has national and state offices. This study took place in MC's national office in New Delhi, India.

Context

MC's key programmes include childcare services, both directly and through partnering with civil society organisations and the state government, enhancing community engagement, and delivering parenting programmes. Through its extensive networking with local, national, and international organisations, MC also advocates for child-centred policies with the government. MC has reached out to 870,000 children, mainstreamed 100,000 children in formal schools, trained 6,500 women as childcare workers, run 800 day-care centres, partnered with over 250 builders, networked with over 100 non-government organisations (NGOs) and influenced key policies, laws, and programmes. Currently, MC has 150 members.

Key programmatic elements

In developing the programme, MC has partnered with Saving Brains, a knowledge platform of Grand Challenges Canada, and
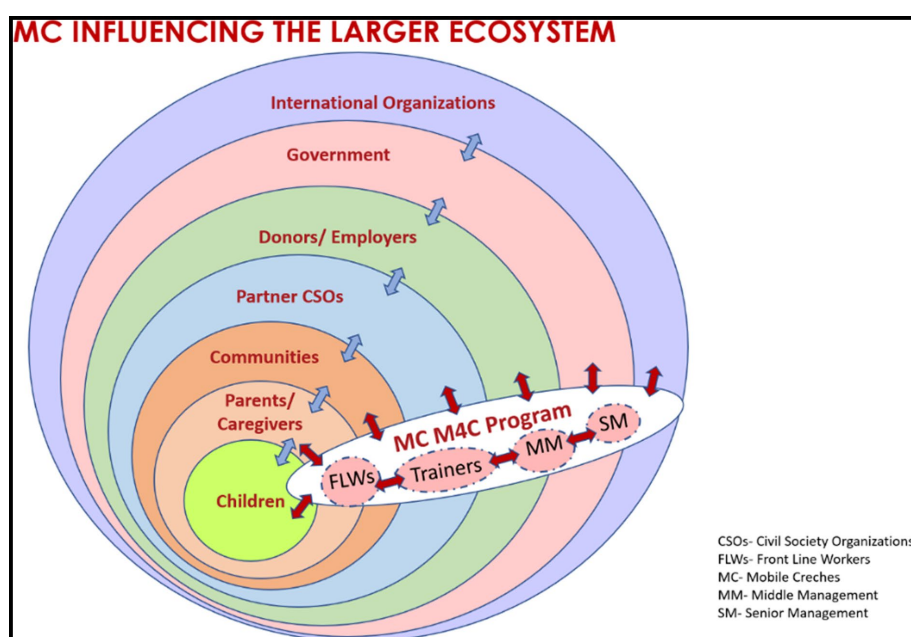

FIGURE 1
Showing how Mobile Crèches interacts with its ecosystem of various stakeholders in promoting its vision of 'just and caring world for every child.' The perforated boundaries and two-way arrows highlight its continual interaction with the stakeholders.

worked with subject experts. Through a series of reflective and collaborative practices, MC created a framework based on the social–emotional needs of the organisation and its programmes. The goal was to promote practice and an environment that fostered the social and emotional wellbeing of all the stakeholders to complement their knowledge of the training programmes. Once achieved, the entire system would stimulate a ripple effect, enhancing the experience of the children at the heart of the MC program. This would be the start of a transformation process across the whole system. Doolittle and Jones [(9), p. 5] and Humphrey et al. [(10), p. 3] emphasise that SEL skills are closely linked to societal values. As seen in Figure 1, MC consciously incorporated the Measurement for Change system (M4C). M4C is an integrated monitoring, evaluating, and learning system that evaluates and strengthens the capacity to make decisions for effective sustainability [(11, 12), p. 1]. The system advocates for the process to be dynamic, inclusive, informative, interactive, and people-centred. MC used this approach so that the process of design and engagement could be contextualized and driven by the needs and values of the organisation. There was explicit intent to focus on all five aspirations throughout the process.

A core team of four members was created as the initial step. This team, with support from the subject experts, developed a Theory of Change (Supplementary Appendix 1), established internal consensus, and identified five key SEL constructs. These were accountability, integrity, respecting boundaries, empathy, and vulnerability. They were identified from our personal and collective experiences and meaning in our context Anziom et al. (13). An internal review of the culture of the organisation, at the beginning of the year, had also highlighted gaps in the identified indicators. These constructs also resonate with the clustering of competencies in emotional intelligence [(14), p. 611].

Figure 2 shows the development of our SEL organisational framework. It shows the process of change over time, highlighting its responsive nature. The process started in July and ended in March. The planning phase was 2 months, and the implementation phase was 7 months. From the initial core team of four members, we expanded to 14. The size of the team grew from 3 to 9.4% of the total members in the organisation (150) by the end of the intervention. In the initial planning phase, core team members were identified based on the criteria that they should have had a prior understanding of SEL. The four members were part of MC's implementation programmes from the onset, which included childcare services and capacity building programmes. However, there was an exception of one member who was from the fundraising and communication department. He was added as a core team member due to his zeal and passion for the subject. Three new members were invited to join this core team in the middle of the planning stage. These new members were directly working with the SEL curriculum and implementation of childcare services. This team started measuring themselves against the five constructs. During this process, the collective group identified that two of the seven members were unable to meet the requirements of the meeting times due to overcommitment on their part. A mutual agreement was reached for these two members to opt out temporarily and join the next intake of participants that would then form the expanded team. This led to a five-member core team at this point.

Each construct was defined by indicators made up of key behaviours that the team used to assess and monitor progress. The tracking was done after each session via a self-analytical survey. This was then translated to how the group was progressing as a whole. A copy of the final self-analytical survey can be found in Supplementary Appendix 2.
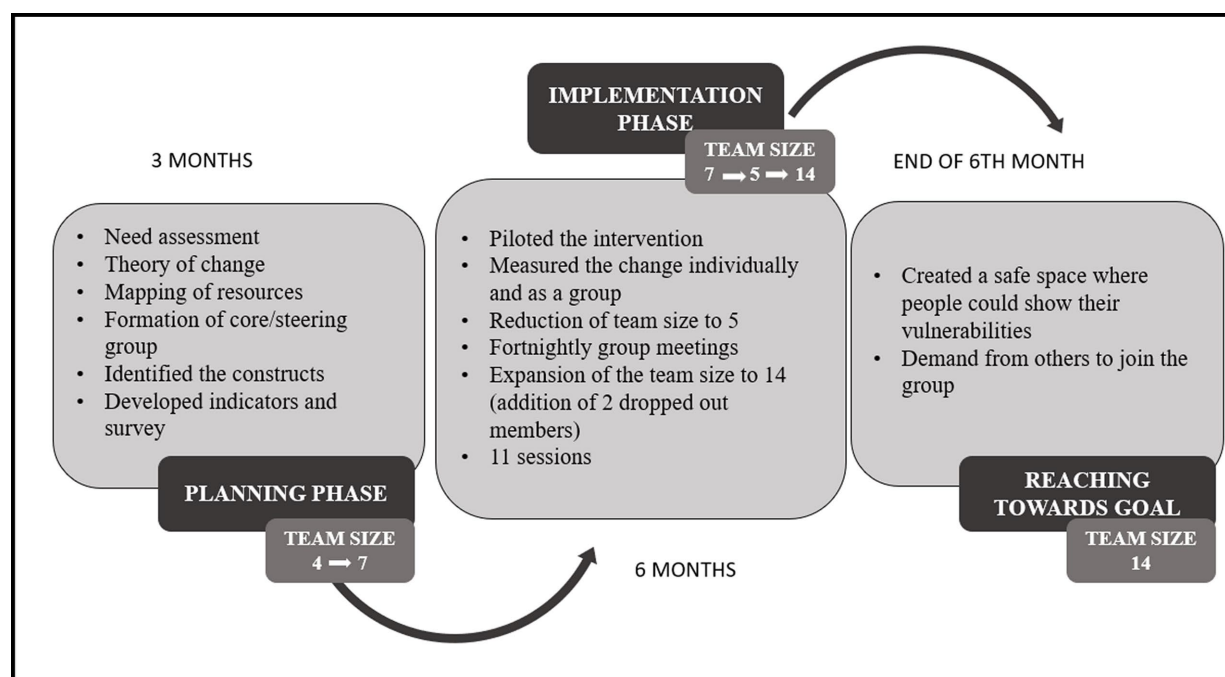

FIGURE 2
The process of change—development of a cell organizational framework.

Reflective discussions and tracking of these indicators in the following 2 months highlighted the need to remove one construct, vulnerability, and condense the number of indicators being tracked. Vulnerability was seen to be an outcome achieved through changes in the other constructs. The group collectively realized that a vulnerable space would be created if all four constructs were achieved. Brené Brown's study on vulnerability contributed to the group's perspective on vulnerability. In the past, vulnerability was equated with weakness. However, today, it is seen as a crucial attribute of leadership. A recent study showed that individuals willing to show their vulnerabilities had higher emotional intelligence, were happier, more interpersonally skilled, and mentally tougher [(15), p. 1–2]. The team found fortnightly meetings more efficient, with a focused number of indicators to review and discuss. Another realization that came forth whilst discussing the achievements and shortcomings was that the interpretation of the indicators differed significantly. Consequently, close-ended statements with simplified language for all indicators were developed. The team also stated the addition of an underlying guiding principle to contextualize the framework of the monitoring and evaluation process. This was to track the team's progress with the best interest of the organisation in mind, signifying the rights and responsibilities of all members. The continual interactive process was crucial in strengthening the monitoring and evaluation process, enhancing the reliability of the data collection. Details of the final four SEL constructs, with their respective indicators, can be found in Supplementary Appendix 3. The ranking and analysis of the results were recorded in an Excel sheet, allowing ongoing monitoring and evaluation of progress toward the identified goals.

In the implementation phase, nine more members from varied departments joined the team, including the two who had opted out earlier. This now made up a 14-member team. Each head of department nominated a minimum of one member from their department to join the group. Here, it is imperative to point out that the executive director of MC supported this intervention and was kept in the loop at every phase of the development. The objective was to reinforce the practice and broaden the environment that fosters the social and emotional wellbeing of all the stakeholders. We intentionally sought to include members of diverse religions, backgrounds, and gender. In India, the caste system still dictates much of life, including where you live, work, and who you socialize with Sahgal et al. [(16), p. 96–107]. Kaul [(17), p. 10–43] reminds us of the Indian experience in relation to contact theory. It states that the more time people from diverse backgrounds spend with each other, the more understanding and harmony increase. The intention of being inclusive was to strengthen the understanding, applicability, and reach of the intervention.

Each new member was taken through an exploration exercise. Reflective questions and scenarios were used to get a shared understanding of their existing levels and understanding of socio-emotional skills. The purpose of this was to build on and from their current understanding and to inform them how the following sessions would be designed. An orientation session detailed the SEL framework with the four constructs, their importance, and their role in driving the desired change. During this time, the team built a shared understanding of how every indicator is aligned with the four SEL constructs. There was an extensive discussion on how each SEL construct can be demonstrated amongst all the team members, as

well as with the others in their respective professional departments. This was to ensure that there was a common understanding of all the indicators within each construct, assuring the alignment of measuring and practicing the social–emotional skills. The interactive nature of the sessions directed the choice of topics for the future weeks, ensuring individual responsibility. The objective here was the intentional application of positive social–emotional skills. Apart from using PowerPoint presentations, role plays, and videos to stimulate discussions on these topics, some unique situational questions were given to the participants to encourage reflective thinking while connecting such situations to their own personal life situations.

Results

Data were collated from systematic observations in the workplaces and captured in notes during our group meetings, core group reflections, and surveys. We found that these methods of collecting, managing, and interpreting data were feasible in our context.

The five core team members collected data both during the 11 SEL sessions and from discussions with the wider team members during interactions within the workplace. Members shared how they have become more aware of analysing their own actions and their peers' responses with reference to the SEL constructs. They were able to identify their mistakes, one of the indicators of integrity, and acknowledge them for themselves and within their group with the objective of rectifying it. The sharing of personal stories highlighted essential insights into personal reflective practice as well as providing opportunities to engage with one another's learning.

Insight 1: One experience shared was about how a member could not ignore and move on while a child, living on the pavement, was getting beaten up by her mother. She stated that the change in her was that previously, she would not have gone on to interact with that parent and child. Having learned about the potential impact on brain functions from positive and negative adult–child interaction, she felt empowered to do so. This member was from the expanded team and was working in the accounts department.

Insight 2: Three members from the administration, finance, and front desk department, respectively, and also from the expanded team, shared that they had developed an interest in understanding why an individual reacts and responds in the way they do. They had started watching informative videos and reading articles to further forge an understanding of SEL independently.

During the focus on integrity, various tools, including meditation, journaling, and painting, were used to bring awareness. With a session focused on respecting boundaries, an emphasis was placed on practicing 'Stop, Think and Act' for conflicting and difficult situations. During the session, members reflected on a recent conflict situation where they experienced strong emotions, both positive and negative. They labelled their emotions and identified the reasons, however big or small, that contributed to that feeling.

Insight 3: One member had become aware of her daughter's expressions and behaviour while scolding her. She reported instantly changing her own behaviour and intentionally managing the way she then spoke to her daughter. This member was working in the accounts department.

Insight 4: While sharing their responses, the members voiced that they were able to share their workplace issues within the group because they felt comfortable and assured that each member was striving to build a socially and emotionally sensitive approach. The sessions and space also helped them resolve conflicts with the fellow team members, keeping the shared vision at the core.

A disruption toward the end of the intervention, the third wave of COVID-19, replaced the in-person sessions with virtual ones. Further interruption was caused by the demand placed on the team members. The stretch between looking after sick family and attending other online operation meetings reflected in inconsistent attendance. However, the observation was that when members did join, they shared gratitude toward having this collaborative and safe space.

In addition, each member completed the self-analytical survey after each session. At the end of each session, the 14 surveys were analyzed by the core team. The team looked at how each member scored each indicator. The number of members who marked as having met the criteria (marking agreed or strongly agreed) was added and converted to a colour based on a rubric presented in Table 1. A rubric was designed to quantitatively represent the data, made up of three broad categories—red, yellow, and green (Table 1). When less than 40% of the team, that is, no more than five people, demonstrated the practice of the behaviour, the progress tab was marked red. Yellow indicates that 40–75% of people (between six to 10 members) were successful at practicing a behaviour, and green when over 75% of the people (11 or more members) demonstrated this practice. The practice of each behaviour was colour-coded 11 times, over the period of the 11 sessions. At the end of 11 sessions, the number of red, yellow, and green were added within each construct and converted into percentages. This is presented in Table 2.

Triangulation of the different sources of data enabled the team to evaluate the impact of the reflective and learning process.

Table 2 shows that not all four constructs were achieved at the same level. Integrity showed the most improvement. The most improved indicator within this construct was the ability to not discuss a disagreement or shortcoming concerning any colleague in their absence. Within the construct of empathy, the listening skill improved and remained constant after the initial two sessions.

Discussion

The findings from the case study indicate that there was a positive shift in the practice of social–emotional skills for the team. The premise of the SEL-focused intervention trialled within a subset of the MC organisation arose from the need to promote a practice and environment that fostered social and emotional wellbeing. This was in response to addressing the gap between the organisation's training program focusing on providing a responsive environment for the

children and their own social and emotional wellbeing. According to Bicchieri (18), cited in Randolph et al. [(8), p. 250–262], the social field must also shift, and this happens only when there is collective action for social change and social sanctions to reinforce and maintain the desired changes. With the upskilling of individuals in modelling social–emotional skills, this was the start of the process of the desired system change. The design and application of the intervention framework was directly informed by the needs and values of MC, a core aspiration of M4C. This is also in line with that stated by Boyatzis et al. (19). He stated that an intentional change process must begin with a person wanting to change, and the Intentional Change Theory provides a framework to understand that in a sustainable way.

The reflective insights shared by the members highlighted intentional practice and awareness of their behaviours. The interest in learning more about SEL, as reported by three members, and the appreciation of the safe space created point toward being open to change. The findings also reflected an increase in the level of engagement with and empowerment by using the social–emotional skills Suleman et al. (20). Randolph et al. [(21), p. 207–211] confirmed, although it was in a school setting, that safe settings lead to building and sustaining positive learning environments. The shift here highlights the work of Salovey and Mayer [(22), p. 190] and Mayer and Salovey [(23), p. 433] on emotional intelligence. This is the ability to be aware of emotions and to be able to regulate them toward oneself as well as others (24).

The period of study also showed the team's strength in the construct of integrity. Suleman et al. (20) showed that emotional intelligence is a central variable in contributing toward an organisation's productivity, of which integrity is a core construct. Going forward, the team can continue to practice the way it does to sustain this construct. Data on the other three constructs, accountability, respecting boundaries, and empathy, suggest more integration in practice. Having said this, one of the reasons why accountability was impacted was the lockdown due to COVID-19. One behaviour under this construct was practiced in less than 40% of the team for a significant chunk of time. The indicator was to take responsibility to attend the meeting on time and, in case of absence, make sure to inform and share the needful information with the team. However, feedback from the group, when they met virtually, continued to highlight the appreciation of the safe space created.

Whilst the data identified integrity as the team's strength, the individual members exhibited trust as central; the experience of being in a safe space is proposed to have reflected in the commitment toward the practice of integrity. Another observation was that although the participants engaged positively during the sessions, they did not necessarily always demonstrate the behaviours from the four constructs consistently in the wider systems they were part of. This could be suggestive of various reasons. First, individual safety and confidence to roll out similar conversations with their wider teams. The other could be the difference in the physical environments where the meetings were held. It would be interesting to observe the participant's confidence over a longer time or the 'action confidence' [(25), p. 154134462094081]. This is the participants' relationship to taking action and the way this changed over the course of their participation in the learning process. In aspiring toward a transformative change, the data tracked over time would

TABLE 1 Rubric to show how the data were quantified.

Red (less than 40%)	Yellow (Between 40–75%)	Green (more than 75% people)
Less than or equal to 5 people	Between 6 and 10 people	11 or more people

TABLE 2 Progress of the constructs.

Constructs	Progress − percentage of the 3 broad categories over the 11 sessions		
	Red	Yellow	Green
Accountability	27%	52%	21%
Integrity	0%	33%	67%
Respecting boundaries	9%	52%	39%
Empathy	9%	47%	44%

be informative in making decisions on the next stage, an important element of the M4C process.

The continual reflective process when designing the framework with the constructs was made inclusive. Feedback from the core team members and establishing a shared understanding of what indicators to settle for and the details within each highlighted the interactive nature of the exercise. The willingness to discuss, modify, and revisit the framework over the initial weeks pointed to the dynamic nature of how feedback was used to come up with the final list of constructs and its respective indicators. Whereas the team acknowledged the limitation of rating individual progress on each indicator when observed outside of the session setting, the practice of discussing the observations as a team must be noted. Every member's input was taken, leading to a positive engagement, as confirmed by the members.

Klitkou et al. (2) emphasised the benefits of combining qualitative and quantitative methods to gain a richer understanding of interconnected social practices. Whilst this can be a time-consuming exercise, it is imperative to set the stage before rolling out the intervention to the larger ecosystem. The adoption of an interactive approach in monitoring and evaluating the data provided a framework that was reflective of the core team's needs and context. The ability to participate in this decision-making process enhances the intervention to be more sustainable (12).

Whilst every effort was made to make the team of 14 members inclusive, having members from varied departments, it was noted that some of the senior management team prioritized other operational meetings during the session times. This gave the perception of the intervention being less important. Chastukhina (26) found that emotionally intelligent leaders apply their social capacities to influence and motivate others and ensure long-lasting relationships with their teams. Since the inclusion through diversity in caste systems, religious practices, gender, and departmental systems was considered in the initial intervention cycle, it is proposed that the future cycle includes more members from the senior leadership team. The objective of this would be to enable systemic change and the aspiration of being inclusive to be met [(11), p. 1]. This would also facilitate the systemic practice of socio-emotional skills across the organisation, heightening its impact and reach to the stakeholders outside of the organisation. Feedback from the current case study already suggested a change in the quality of conversations and, therefore, the dynamics of relationships with all those they interacted with.

The results from the 11-week intervention already show a shift in the chosen SEL constructs, some more and some less. The time taken to realize this shift at the level of creating a responsive environment

for the children may take time. However, the importance of successfully establishing this culture change within the ecosystem will not only show us what can change but, most importantly, how we can consciously create a sustainable change. Monitoring and evaluating the intervention with the M4C approach allowed the team to continually reflect on the why and how of the measurement. The current case study was limited by its sample size, but it was important to establish a framework and a process of integrating SEL into organisational practice at a smaller scale at first. As Druskat and Wolff [(5), p. 81] highlighted, creating an upward, self-reinforcing spiral of trust, group identity, and group efficacy requires a team atmosphere in which the norms of the group build its emotional capacity. This group then adopts an ambassadorial role in developing the capacities and confidence of the other members of the ecosystem. For our next phase, the plan is to build monthly 2-h sessions for the entire office staff, which make up 40% of the organisation. This includes members from the team of trainers and middle and senior management (refer to Figure 1). These meetings would follow the same approach to engage members in socio-emotional activities with the objective of enhancing their capacity. This newly trained team would then build the capacity of the frontline workers within their scheduled monthly sessions in the office. It is hoped that the journey of transitioning to scale will give further insights to the team that will continue to inform the decision-making process and be inclusive, people-centred, and interactive. Our recommendation from this case study is to use our process. However, it is important to use local values embedded in one's context and establish needs to drive it toward a sustainable change.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Acknowledgments

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2023.1165642/full#supplementary-material

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Monitoring, evaluation, and learning: the key to building effective partnerships with government to improve maternal and child health in the Rakai and Kyotera Districts of Uganda

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This article emphasizes the significance of the Monitoring, Evaluation, and Learning (MEL) system within Babies and Mothers Alive (BAMA) Foundation in building effective sustainable interventions at scale. The foundation aims to enhance the availability of high-quality reproductive, maternal, and newborn care services within the government health sector. The distinguishing characteristic of the MEL system is its integration of organizational learning as a strategic approach to inform the development of dynamic program designs. To do this, it has been necessary to identify crucial requirements through open data exchange with all pertinent stakeholders. This paper demonstrates that our approach to evidence-based learning in a diverse population of locally-based actors and stakeholders, gives voice to the community-based health practitioners and patients that is necessary for transformative maternal health delivery systems. The act of sharing data has presented several possibilities for enhancing current initiatives and extending the reach and scale of our partnership model. We trace the development of the core components of learning and decision making, and reflect on the transition of the program to scale using the LADDERS paradigm. The application of our model of practice has been associated with the increased financially viability and the potential for the sustainable scaling of the program intervention.

Organizational background and goals

Since 2004, the Babies and Mothers Alive (BAMA) Foundation has been on a journey of learning. As public health physicians, one Ugandan and one American, BAMA's founders began with a question, how could we best improve the quality of reproductive, maternal, and newborn health systems in rural populations in Uganda. As obstetrician gynecologists, with extensive experience throughout sub-Saharan Africa, we shared a frustration with externally led interventions, characterized by top-down decision-making and driven by short-term funding cycles, that fail to generate sustainable solutions. Over the course of our long involvement in community participatory programming we have

found that the ultimate experts on how to best strengthen health systems are to be found among the people using the services, who are rich in ideas, experience, and local knowledge. As a locally-led NGO, we are not just another program led by "outside experts" but rather our role is to build, gather and share knowledge, putting power and resources in the hands of those who already hold the solutions. In this paper we discuss the central role that information sharing has played in the process of engagement across multiple partners.

The 20-year journey with the communities of Rakai and Kyotera in Uganda has progressed through cycles of innovation and consolidation, with our health interventions designed to dramatically improve access to quality health care services within the government sector. The documentation of these activities, and of their successes, has enabled the organization to attract the support of government and international aid sources, creating the feasibility to undertake even more ambitious programming.

Building trust and establishing relationships, by raising awareness in local communities and by providing supportive supervision for health service staff, has also been key to building a sustainable system. In 2015, we launched our comprehensive maternal and newborn health program (MNH) as a fully integrated partnership with the Rakai and Kyotera District government health systems in the central region of Uganda.

The MNH program recognizes that the quality of health delivery services is almost entirely determined at the district government level. Within this system, while public-NGO partnerships can be a key to the implementation of effective, evidence-based health interventions, there is a need to take a longer term, more flexible approach to implementation to be able to sustainably scale to other regions. From the beginning therefore, program design has been defined by the need: for a long-term commitment, moving beyond the more traditional 2–5 year granting process; and for policies that support contextualized responses to localized influences. All of our health interventions have responded to needs identified at the community level, are in full alignment with Ministry of Health priorities, and thus our achievements have been accomplished through the collaborative efforts of BAMA staff and local partners.

In reflecting on our progress toward making a transition to scale we have used the LADDERS model as a guide (Figure 1). This is a dynamic paradigm for planning, implementing, and evaluating sustainable change in learning health systems (1). The acronym stands for Leadership, Alignment, Data, Demonstration, Evaluation, Replication and Sustainability. The relationships between all seven of these key components to sustainable systems change are non-linear and constantly in flux in a dynamic process. We have presented them in the order that most appropriately fits our process.

Data

Building an integrated data system

Deeply rooted within our communities, our staff recognized from the outset the importance of establishing systems that fostered communication and learning among all program stakeholders and beneficiaries. The collection and analysis of data, informing program design and day to day decision making was paramount.

In order to be effective, both in terms of program design, as well as our implementation strategy, the program needed access to accurate and timely data, on health outcomes, measures of access and utilization of health services, as well as qualitative data reflecting the experience of both beneficiaries and those in the health delivery system. In line with the Measurement for Change approach (2–4), building a rigorous Monitoring, Evaluation and Learning (MEL) system is foundational to the success of these partnerships, and of integrating into the government system. Sharing information and learning has also influenced the shift toward shared responsibility and shared accountability across multiple partners.

While all government facilities collect mandated health data, the quality of this data did not allow for reliable estimations of maternal and perinatal mortality. The cycle of data collection, utilization and system adjustments was also lacking. *In our first year of implementing the BAMA Program in 2016, we assessed the quality of data by measuring the variance between the existing data records at the health facility level, and the actual data after our rigorous assessment of data quality through cross checking of individual patient records, birth logs, operating theater records etc. The data reviewed covered the full spectrum of the maternal and newborn care provided in the health facilities, maternal and neonatal assessments, time and mode of delivery, among others.*

Therefore, from the outset, we committed to strengthening government health data systems and establishing methods to establish quality services through on-going learning. In 2015 we performed an extensive survey across 24, expanding to 48, district health centers, assessing the utilization and quality of reproductive, maternal, and newborn health services. Subsequent quarterly Data Quality Assessments, performed at all partnering health facilities have demonstrated dramatic improvements in data quality. Through rigorous cross checking of medical records, we have measured variance in the Health Management Information System (HMIS II) records. In 2015, only 50.3% of cases in maternal registers were accurately reported. Since 2020 we have maintained an accuracy rate of over 95%.

Data is collected electronically and synced to our integrated data warehouse, which in turn is linked the government's Health Management Information System (HMIS II). Our data collection and analysis process begins at the health facility level, where BAMA trained health center and hospital staff routinely record client information in paper-based medical records and clinical logbooks. BAMA staff perform data quality assessments, collecting and validating this data on a regular basis using laptops, mobile phones, and tablets. Data collected by field and district health staff is regularly crosschecked for accuracy and evaluated for data variance at the facility and program level. All project data collected is analyzed routinely using statistical analysis and visualization packages, including Stata 13, Power Bi and MS Excel. We use the Atlas.ti software program to locate, code, and annotate qualitative data.

The creation of an integrated data warehouse requires a long-term commitment from, and to, facility level staff. Single step training is insufficient, and on-going mentoring to create joint evaluation of data quality has been crucial. These activities are both time consuming and labor intensive, a factor not always reflected as a priority in program funding. BAMA has been

FIGURE 1
LADDERS model (used with permission).
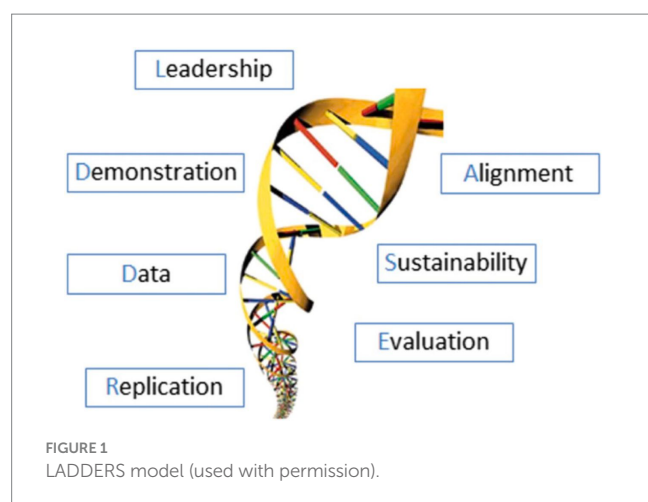
fortunate to have received unrestricted funding from its US-based partner affording the freedom to invest the necessary capacity building systems to continue to generate high quality health data systems. Our integrated data system allows regular analysis of data in real time and the creation of infographics, allowing clear dissemination of our program outputs and impacts to Ministry of Health, District Health Teams, stakeholders, and our funders. *Sharing our progress in improved health outcomes at multiple national forums and Ministry of Health Technical Working Groups has promoted the dissemination and adoption of key innovations in the BAMA Program model. For example, our Maternal Newborn Obstetric Complication Survey or MNOCS, which BAMA designed and implemented, has now been integrated into the national Health Management Information System (HMIS), supporting the measurement of Case Fatality Rates, which are then used to inform decision making and where to invest time and resources to improve quality of care.*

We have also utilized focus groups and interviews to systematically engage health workers, beneficiaries, community members and partners in formative research through on-going discussions on an individual and group level. The BAMA staff who facilitate this dialog are counselors, midwives, physicians, and social workers, who are grounded in relationships of service and trust. Utilizing a Rapid Cycle Learning approach, we are able to remain flexible and respond to changing conditions in the field.

Demonstration

Using information to build trust

Beginning with very modest resources, the information system has built up information on progress. It has tracked the achievement dramatic improvements in health outcomes. From 2015 through to the present we have seen (5):

- 74% decrease in maternal deaths at 48 partnering health centers and hospitals.
- 44% decrease in perinatal deaths at 48 partnering health centers and hospitals.

- Case Fatality Rate (CFR; the percentage of women dying from major obstetric complications) was reduced from 1.7% to 0.3%.
- 66% reduction in complicated abortions.
- 70% reduction in life-threatening hemorrhage both during pregnancy and postpartum.
- 38% reduction in obstructed labor.
- Reduction in the Decision to Delivery interval (DDI) for the performance of caesarian interventions from 124 min to under 40 min.
- Increase in facility deliveries from 9,522 to 16,071 per year.
- 27,373 women transported from village to health center and 3,229 women receiving emergency referral transport.
- Time for referral has been reduced from 3 ½ h to just 34 min since June 2021.
- 2,240 newborns admitted to our three recently constructed NICUs, in 2019 92.3% were discharged alive. In 2023 the survival rate increased to 97%.

The data system used, tracking all major life threatening complications through the BAMA-designed Maternal, Newborn, Obstetric Complication Survey (MNOCS), has provided detailed evidence of progress and success. This approach also now been integrated into the health data systems by the national Ministry of Health. The shared ownership of the health system, with its integrated information and learning process, has built trust in the BAMA-district government partnership and strengthened our advocacy at the Ministry of Health for increased investment, as well as for adoption of innovations in the health system.

The BAMA Maternal and Newborn Health Program is designed around the 3-Delays model (6). The vast majority of preventable maternal and newborn deaths in limited-resource settings can be linked to one or more of these 3-delays.

- First Delay: The delay in the decision to seek skilled maternal and newborn care.
- Second Delay: The delay in reaching skilled maternity and newborn care once the decision is made.
- Third Delay: The delay to receive quality care once reaching a health facility.

The health data collected by BAMA staff and government Health Information Officers informs decision making in identifying and addressing barriers to obstetric care in our resource limited communities (7). Our data has enabled us to monitor and respond to all three delays by increasing demand for and utilization of antenatal care, institutional obstetric and newborn care, barriers to reaching care due to limited transportation options, and the quality of care provided at government-funded health centers and hospitals.

This model, and reductions observed in indicators such as institutional maternal and perinatal mortality, and case fatality rates, illustrate the pathway to the achievement of dramatic improvements in access to quality care, supporting our theory of change that increasing skilled attendance saves lives. The skills we have fostered in health facility staff, however, go beyond direct health care to include the effective use of data systems.

Improved skills in reporting and analysis enables local health leaders to design a rapid response to health delivery bottlenecks.

Alignment

Re-design in response to emerging evidence

From its initiation, the BAMA Program was designed to partner with local communities and district health systems to address the 1st and 3rd delays. The Mama Rescue Project is a transportation initiative, nested within the comprehensive BAMA Program to address the 2nd delay, barriers to skilled attendance at delivery due to lack of access to transportation from village to health facility. It uses a simple mobile phone app, linking women in labor to motorcycle taxi drivers. It also connects women in need of emergency referral to automobile taxis. We have transported over 27,000 women in just 2 years, while reducing referral times from 3 1/2 h to just 34 min. Limited resources had initially prevented us from addressing barriers to transportation. In 2017, a small proof of concept was performed in the Kasese District of Uganda to evaluate this innovative IT solution. A close evaluation of the pilot led to many valuable lessons.

While BAMA was involved in the initial design, Mama Rescue was launched as an independent stand-alone project and ultimately suffered from a lack of full partnership with the district health system. By nesting Mama Rescue within a comprehensive maternal health partnership with government, implemented by an organization with deep roots in the communities served, BAMA was able to leverage years of trust to build a broad base of community support.

Mama Rescue now facilitates rapid referral of women with life threatening complications of pregnancy. Additionally, this application allows health center midwives to enter vital clinical information that ensures that referral hospital staff are maximally prepared and delays in comprehensive emergency obstetric and newborn care are reduced. We are able to track referral times and appropriately respond to delays in a timely fashion.

From the onset of the BAMA Program, our needs assessment took note of the high rate of adolescent pregnancy (births per 1,000 women age 15–19), 21% in our districts and the lack of adolescent-friendly maternal and reproductive health services in Rakai and Kyotera. In response, the Mama Ambassador Program (MAP) was initiated, employing monthly peer support parenting groups to improve early childhood development and mental health for adolescent mothers. As with all BAMA Program innovations, we gathered data. To support an evaluation of proof of concept we measured child development and maternal mental health. As the data was collected it became clear that over 20% of young mothers recruited into the program reported themselves as survivors of sexual and gender-based violence (SGBV). This then became a major focus of our expanded MAP, with the hiring of a full time SGBV counselor, a clinical social worker, and engagement with district and legal authorities to improve survivor support services.

The original MAP was centralized with peer support groups occurring at two district hospitals. Feedback from our local partners, as well as the mothers themselves, revealed that limiting our support groups to the district hospitals created barriers to access. As we scaled the MAP, we expanded services to 10 health centers, bringing the groups closer to our beneficiaries and extended families. Data collected on the prevalence of SGBV, as well as forced marriage, guided our program design decisions as we scaled the MAP, expanding male engagement, as well as outreach to extended family, civil society, and the legal system.

As we are in constant communication with these close partners, we receive regular feedback on program implementation, as well as the evolving needs of our beneficiary communities. This was especially critical during the lockdown phases of the COVID pandemic, where we were forced to make dramatic changes in our Mama Ambassador Program, rapidly shifting from a peer-support group to home visit model for over 400 adolescent mothers and babies. [See: our video SMILING THROUGH THE STORM: FINDING SILVER LININGS IN THE MIDST OF THE PANDEMIC (8)].

Using data for program design and decision making has shaped other projects within our comprehensive BAMA Program. The My Pads Program was launched in 2011, as an after-school sexual and reproductive health (SRH) educational program for adolescent girls and young women, with a focus on menstrual health and hygiene. Our data had already directed us to gaps in our existing model, where at risk out of school girls and boys were being ignored. Discussions with school and political leadership also exposed the limitations in delivering a comprehensive SRH educational program in a primary school setting. This has led to the re-design of My Pads into a more holistic three-tiered model, with both in-school and out of school peer groups targeting both adolescent women and men, linking them to youth-friendly SRH services at partner health facilities.

The importance of leveraging the strength of the government health system through trusted relationships with both government and community partners has been a key lesson in the journey toward sustainability. *What distinguishes the BAMA partnership model is the full integration of BAMA program interventions into the government health delivery system. BAMA's core implementors are not our own staff, but rather a highly motivated corps of BAMA-trained government employed Mentor Midwives and Physicians and Community Health Workers who are empowered as Mama and Papa Ambassadors. Initially, District Health Teams and health providers were skeptical and defensive, as they confronted the reality of major gaps in access to quality of care that led to high levels of maternal and newborn deaths. Ultimately, it has been the trust built over years, and the fact that we work as colleagues rather than outside experts that has led to our successes to date. What is required to build this trust is the willingness to commit long term to our government partners, not limited by grant funding cycles, and to engage fully in a learning journey with the partners and beneficiaries who ultimately are the source our success.*

Leadership

Learning with our partners

Our Monitoring and Evaluation staff is comprised of five local data scientists. In sharing the messages they produce they are joined by a corps of faith-based, civil society and cultural leaders as champions for reproductive health and rights. Backed by local evidence, these champions support the outreach and communication with our beneficiary communities.

All of our program interventions involve dynamic community outreach, affording our staff ample opportunities to engage with women, adolescents, extended families and community leaders in an active and on-going dialog regarding their needs and the most effective means to address them. Over the past 8 years this outreach network has further been supported by 150 government Community Health

Workers who have been trained as Mama and Papa Ambassadors. Working at the village level these ambassadors are personally connected to thousands of families and serve as a conduit for key information facilitating various interventions such as counseling and referral.

Over the past 8 years, since we launched our health partnership with district government and the Ministry of Health, we have continuously engaged our partners in knowledge sharing which informs program design and implementation. We participate in monthly Ministry of Health (MoH) Technical Working Groups through which we engage key Reproductive, Maternal, Newborn, Child, and Adolescent Health (RMNCAH) stakeholders. We present our projects at inception and receive feedback on priorities, approaches and the results frameworks. This is followed by monthly performance reviews and progress reports to the MoH.

The district level biostatisticians are part of the team. We conduct onsite, health facility feedback meetings as well as similar meetings at district level. Feedback from these engagements directly inform course changes in our implementation strategy to support maximum impact.

Evaluation

How has MEL informed our transition to scale strategy?

Since 2015, we have learned that a trusted NGO-District government partnership can support transformative change in the access to, and quality of, reproductive, maternal, and newborn health services, serving the most vulnerable populations in Uganda. Core to our success has been our longstanding relationships to district governments and the rural communities we serve, but this reliance on deeper, locally focused relationships comes with resource/funding challenges. Government and institutional funders often seek larger organizations with national or international scope but without the relationships and contextual knowledge that has contributed to our success. We have come to realize that scaling the BAMA model will require a pathway built on expanded partnerships with government and other NGOs that share our mission and vision, supporting the integration of key components of program interventions.

Sustainability

The proposed transition to scale strategy

The three corner stones are seen to be:

I Expand the BAMA Program to our neighboring districts in the Masaka Region: Our initial goal (3-years) is to expand to the two adjoining districts of Masaka and Masaka City, followed by scaling to the entire Masaka Region of nine districts serving a total of 2,218,286 people. Directly overseeing this expanded BAMA Program implementation will allow us to adapt our model to support sustainable integration of our core interventions into the existing government health system, our ultimate goal.

II Identify potential NGO partners in Uganda working in reproductive, maternal, newborn, and child and adolescent health (RMNCAH) and development: Babies and Mothers Alive

has a long history of high impact partnerships with national and international NGOs who are aligned with our mission. The establishment of a network of RMNCAH NGOs will support the dissemination our BAMA core innovations, and extend and expand the reach of our program. Through such partnerships, and the establishment of an RMNCAH Stakeholder network, we will support NGO-government collaboration, promoting BAMA integration into the government health system.

III Integrate BAMA and its data systems into the district and national health system: In building the BAMA Program in full partnership with district government and the Ministry of Health, we participate in multiple forums at the national level overseeing maternal, newborn, reproductive, and adolescent health. Our senior staff are respected thought leaders. We"ll leverage our success to date, encouraging the adoption of key components of our program model. For example, we have already seen our Maternal and Newborn Obstetrics Complication Survey (MNOCS) integrated into the government health data system.

Replicability

Taking context into account

In the next stage of our innovation process, it is evidence from our four currently partnering districts that will guide the initial design of new adopting districts. However, as they will represent a diversity of contexts and demographics, results in these second-stage districts will need to be reviewed to ensure the program remains fit for purpose.

This cycle of design, review and re-design will be carried over to set the stage for a third-phase of Uganda wide spread of those interventions that have demonstrated sufficiently compelling cost benefit justification and a robust scaling approach.

Discussion and conclusion

Working to be catalyst for transformational change requires a dynamic learning process that is on-going, and not static. BAMA's partnership model is built on fostering a learning environment with our many stakeholders and the families we serve.

Investing resources, both financial and human, in our MEL process has greatly impacted the design, implementation strategy, and ultimately, the success of our comprehensive program interventions. It has also strengthened our relationships with partners and stakeholders, providing an organizational structure that promotes on-going communication and trust. Our partnership model is built around this learning process, a model acknowledged as integral by other implementing organizations (9–11).

We have experienced challenges in our MEL journey over the past 8 years that have placed limitations on our progress. Like many locally based NGOs working in limited resource settings, our constraints in funding define the time available for full engagement in monitoring, evaluation, and learning. Often, we find our staff and partners struggle to meet the ambitious program targets and benchmarks that we establish in order to address critical gaps in health care delivery negatively impacting our communities. We continue to engage with

our donors, both governmental and institutional, to broaden their funding for these activities which have proven so vital for successful design and implementation of our programs. We also see the value of strengthening our qualitative data process so that we can more formally collect and analyze this essential learning. Finally, our focus on cost effective program implementation has limited our efforts in designing research studies that can definitively prove our model's effectiveness. Instead, we have focused on building systems that builds collective use of data to improve responses to need.

Use of a reflective framework that the LADDERS paradigm provides has guided our focus on what is happening and what is not happening. The biggest limitation to the design of successful work planning is investing adequate time for review and reflection. We hope to be more successful in the future in making this a priority, especially regarding nurturing our staff and partners. In this process, the intentional use of MEL systems plays a major role. With respect to Leadership and Alignment, we have yet to design clear indicators that assess the integration of our program interventions into the government system. Adequate investment of time and resources in our on-going engagement with government partners will be crucial to developing these indicators that will define the success of the Replication and Sustainability of the BAMA Program as we scale to new districts. Always acknowledging what we have yet to learn has kept us open to new discoveries and the willingness to test novel approaches to achieve our shared goal of quality health care for the women and children of our communities.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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