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Empowering Communities to Screen for Pediatric Malnutrition is an Imperative Step for the Healthy Growth of Children: Perspectives on Nutrition Care in Urban Colombia

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Abstract

BACKGROUND

Child stunting remains a major public health challenge in under-resourced communities, where community programming is central to nutrition screening and follow-up. This qualitative sub-study of the CROSS (Colombia's potential Realized: an Observational Study for Stunting) study examined how caregivers, community health workers, and NGO staff perceive child nutrition screening processes in two Colombian cities. The aim was to identify key barriers and facilitators to effective growth monitoring and outline strategies to strengthen participation, quality, and sustainability for nutrition care within community programming centers.

METHODS

This qualitative descriptive study employed seven focus group discussions in Cartagena and Barranquilla with 54 participants, including caregivers (n=14), community health workers (n=30), and NGO staff (n=10). Discussions were transcribed and analyzed thematically using NVivo. Thematic analysis of 760 coded references revealed consistent patterns in experiences and practices surrounding child nutrition screening.

RESULTS

Three overarching themes emerged: (1) *Training and Implementation of Nutritional Screenings*, (2) *Barriers and Facilitators to Effective Practice*, and (3) *Integration and Sustainability*. Participants emphasized that combining weight, height, and MUAC with clinical observation and culturally sensitive counseling improved accuracy and family adherence. Barriers to nutrition care programming included limited training, lack of calibrated equipment, safety concerns, and fragmented coordination. Successful programs linked diagnosis to tangible support and strong institutional collaboration, fostering caregiver trust and program continuity.

CONCLUSIONS

Sustainable nutrition-focused quality improvement programs require balancing technical rigor with community acceptability and replicability. Standardized anthropometric practices, logistical reliability, and culturally relevant counseling—supported by multi-sectoral coordination and community engagement—are essential for long-term impact.

CLINICAL TRIAL NUMBER

Clincaltrials.gov, NCT06709001, registered November 26, 2024

WHAT'S KNOWN ON THIS SUBJECT

Stunting remains a persistent public health challenge globally and in Colombia, disproportionately affecting children in low-income urban communities despite national nutrition programs. Prior research has largely examined barriers and facilitators to nutritional screening and assessment within clinical or institutional settings, with limited attention to how these processes function in the community.

WHAT THIS STUDY ADDS

This study provides the first in-depth exploration of how caregivers, community health workers, and NGO staff collectively experience child nutrition screenings in urban community settings. It identifies practical, system-level strategies to strengthen growth monitoring, enhance caregiver engagement, and improve continuity of care in under-resourced communities.

1. Introduction

Child stunting—low height-for-age resulting from chronic undernutrition—remains one of the most pervasive public health problems affecting young children worldwide. Despite major global progress in reducing acute malnutrition, stunting continues to affect over 150.2 million children under five, contributing to long-term impairments in growth, cognitive development, educational attainment, and increasing vulnerability to chronic diseases later in life.[1,2] The persistence of stunting, even in countries experiencing economic growth, underscores how poverty, food insecurity, and structural inequities continue to constrain children's access to adequate diets, safe environments, and preventive health care. Compounding this, many low- and middle-income countries—including those in Latin America—are also witnessing a rise in childhood overweight, illustrating the double burden of malnutrition and the complexity of achieving balanced child nutrition under rapid social and food environment changes.[3,4] Regional estimates vary, and a recent meta-analysis highlights that the double burden of malnutrition impacts as much as 24% of the population.[5] Nutrition care (education and supplementation when indicated) for malnutrition presenting as undernutrition must be communicated clearly and nuanced, as diets must reflect adequate protein to support growth without excess carbohydrates and fat that may promote overweight and/or obesity.[6]

In Colombia, stunting remains a significant and persistent problem among children aged 1–5 years, particularly in low-income urban communities.[7] National surveys have documented a slow decline in prevalence[8], yet disparities across socioeconomic and geographic groups remain stark. Studies have shown that children living in low income households are up to five times more likely to be impacted by stunting than those from wealthier families, reflecting the enduring influence of maternal education, household food insecurity, and inadequate sanitation on child growth.[9,10] Evidence from Antioquia and Bogotá in Colombia highlights that stunting in early childhood is associated not only with poor dietary intake and recurrent infections, but also with gaps in growth monitoring, caregiver knowledge, and follow-up care within local health systems.[11] And at the structures and systems level, stunting is

associated with losses in economic productivity, representing a barrier to the achieving the full potential of individuals and countries.[12–18]

Globally, UNICEF highlights the impact of nutrition supplements and fortified foods in locations where nutrient-poor diets prevail, aligned with global and national standards to improve nutrient adequacy.[19] Mirroring UNICEF's guidance, Colombia has implemented multiple initiatives—including the Growth and Development Program (Programa de Crecimiento y Desarrollo) and supplementation when indicated—to promote early identification, regular follow-up, and management of malnutrition for children under age five with supplementation when indicated.[20,21] However, many of these programs focus on acute presentations of malnutrition (wasting), and do not focus on chronic presentations (stunting) that are often reflections of structural socioeconomic challenges, rather than short-term nutrient inadequacy. This is confirmed in the literature among systematic reviews and meta-analyses that demonstrate the beneficial role of micronutrient supplements and oral nutritional supplements when implemented as part of locally and culturally targeted, multi-component nutrition-focused programs to prevent and treat stunting.[19,22,23]

Research indicates that implementation gaps, fragmented follow-up, and inconsistent caregiver engagement continue to limit the impact of these efforts, particularly in urban under-resourced settings.[24] A recent review highlights the importance of multi-faceted nutritional quality improvement programs that leverage screening, education, supplementation when indicated, and regular follow-up as imperative to the reduction of stunting among children in low- and middle-income countries.[25] The literature has long supported both community health workers (CHWs)' and healthcare professionals' identification of malnutrition and its risk[26–34], and a UNICEF-conducted review[35] highlights community members and caregivers as capable of nutrition screening.[36] Community-engaged[37,38] strategies for identifying malnutrition risk along with nutritional care are expected to improve both health and healthcare cost outcomes for children worldwide.[35] Thus, community programming led by local health services and Non-Governmental Organizations (NGOs) leverage their rapport in the community and play an essential role in nutrition screening, counseling, and referral, yet their effectiveness depends heavily on coordination, staff capacity, and family participation.

Previous literature has focused on facilitators and barriers of nutrition screening and care in healthcare systems or clinical settings, and has not focused on empowering community members to screen for malnutrition and refer to clinicians for appropriate assessment and follow-up .[39,40] However, less attention has been given to how nutrition screening and follow-up happen in everyday community settings, where technical measurements meet logistical difficulties, caregiver understanding, and the continuity of care. In these contexts, the effectiveness of nutrition screening depends not only on the accuracy of anthropometric measures, but also on how the results are explained to families, translated into concrete actions, and maintained over time. This qualitative sub-study fills a critical gap in the literature by examining the perceptions, barriers, and enabling factors surrounding child nutrition screening, follow-up, and care in the community. This study also extends the literature by drawing on

diverse perspectives across socioecological levels (interpersonal, organizational) impacted by the stunting crisis[25,41] (Table 1) by engaging caregivers, community health workers, and NGO staff across two urban settings, allowing for a nuanced, multi-level understanding of how nutrition screenings (conducted by community members) and/or assessments (conducted by clinicians) function in practice. Focusing on stunting prevention among children aged 1–5 years, the study aims to identify strategies to strengthen community-based growth monitoring systems, enhance caregiver engagement, and improve the quality and sustainability of early childhood nutrition programs in urban Colombia where socioeconomic inequities are pervasive.[7]

Table 1
Childhood Stunting and Its Risk: Socioecological Levels for Opportunities

Socioecological Level	Target/Leader
Individual	Child with Stunting/Its Risk
Interpersonal	Caregiver
	Community Health Worker
	Healthcare Professional
Organizational	NGO Programming + Staff
	NGO Leadership
Community	NGO Sites
	Neighborhood Environment
Structures + Systems	Ministry of Health
	Economy
NGO: Non-Governmental Organization	

2. Methods

2.1 Study Design and Setting

This paper reports the qualitative sub-study of the CROSS study (Colombia's Potential Realized: an Observational Study for Stunting), which was conducted in under-resourced communities in Colombia–Barranquilla (population ~ 2.4 million) and Cartagena (population ~ 1.1 million), across six existing community centers with children's programming between December 2024 and July 2025. The CROSS study observed children aged 12–60 months from baseline, 3-, and 6-months and included malnutrition screening, referrals to healthcare professionals when indicated, and assessed health and economic outcomes. As part of the CROSS study, NGO staff were trained in anthropometric nutrition risk screening and research procedures; anthropometric growth measures included children's weight, height/length,

head circumference, and mid-upper arm circumference (MUAC). During the regular study visits, NGO staff used the MUAC z-score tape, anthropometric tools such as scales, stadiometers, and measuring tapes, dietary recalls of food group consumption, and other research survey measures to conduct study visits.

The CROSS study had 3 main objectives:

- Characterizing and comparing the clinical, epidemiological variables of children living in under-resourced communities aged 1 to 5 years with risk of stunting versus children aged 1 to 5 years without risk.
- Assessing the presence of stunting risk among children aged 1–5 years living in under-resourced communities.
- Gain caregiver, community health worker, and non-for-profit organization (NGO) staff insights and feasibility data on creating a nutrition screening and education program for stunting and its risk.

This work reports the third objective and qualitative sub-study results only. Quantitative results on the prevalence of malnutrition and its risk and the characteristics of children experiencing malnutrition/its risk versus those who do not will be reported elsewhere.

2.2 Study Participants and Recruitment

Participants included NGO staff and caregivers who implemented or participated in the CROSS study, respectively, along with CHWs engaged in pediatric nutrition and stunting prevention. Caregivers and NGO staff were recruited through purposive sampling based on their direct involvement in the CROSS observational study, while CHWs were purposively selected by the research team according to their professional roles and experience in child nutrition and stunting prevention and care efforts within the local community.

Seven FGDs were conducted across the two study sites, ranging from 60–90 minutes each, with 204 caregivers, 30 CHWs, and 10 NGO staff given the opportunity to participate. In Barranquilla, four FGDs were held: one with caregivers (n = 6), one with NGO staff (n = 10), and two with CHWs (n = 9 and n = 7). In Cartagena, three FGDs were conducted: two with CHWs (n = 8 and n = 6), and one with caregivers (n = 8) (Table 2).

Table 2
Focus Group Composition

Qualitative Sub-Study Cohort (FGD Code)	Barranquilla Participants	Cartagena Participants
Non-Governmental Organization (NGO) Staff	10	N/A
Community Health Workers (CHW)	16	14
Caregivers	6	8
Total by Site	32	22

2.3 Data Collection

FGDs were facilitated by trained researchers with training in public health (n = 1, female) and had a relationship with the participating NGO based in Colombia with experience in qualitative research. A semi-structured interview guide was developed for this study to allow questions to arise organically from participants' experiences and to encourage active engagement in shaping the direction of the conversation (Supplemental Material 1–2). Researchers were public health professionals supporting children in under-resourced communities within Colombia. Broad thematic areas and key prompts guided each discussion. All FGDs were audio-recorded and subsequently transcribed verbatim in Spanish for analysis.

Following each session (maximum 2 hours), researchers (n = 5) completed daily debrief forms, and the team held weekly debriefing meetings, accompanied by memo writing by the principal investigator. These activities were used to monitor the progress of data collection; review completed interviews and reflect on emerging insights. Through this iterative process, the principal investigator determined the point at which data saturation had been reached, understood as the point when no new relevant insights appeared regarding nutrition screening practices, follow-up processes, and the perceived barriers and facilitators across the different participant groups.[42,43]

2.4 Data Analysis

The FGD data were analyzed using inductive thematic analysis[44,45] among two researchers (one with expertise in public policy and qualitative analysis, and the other in public health)) whom coded the transcripts, documenting each coding scheme along with its central meaning, revisions, and illustrative examples that clarified code parameters. Throughout the analysis, attention was given not only to repeated themes, but also to tensions, contradictions, and contextual factors that shape participants' experiences with nutrition screening and follow-up in different settings and roles. NVivo 15 software was used to organize, store, and visualize the data throughout the analytic process. After coding, relevant excerpts (N = 760) were grouped into categories, refined into themes, and synthesized into broader conceptual patterns.[46,47] Themes were developed through iterative coding and consensus among researchers (n = 2) made up of dietitians, NGO staff, and public health researchers. Results are presented in accordance with COREQ guidelines for reporting qualitative research (Supplemental Material 3).[48]

2.5 Ethical Considerations

Written informed consent was secured from all participants prior to data collection. Ethical approval was obtained from Comité Corporativo de Ética en Investigación de la Fundación Santa Fe de Bogotá (Reference: CCEI-17012-2024).

3. Results

Three overarching themes emerged from the analysis: (1) **Training and Implementation of Nutritional Screenings**, which explores staff education and rollout processes; (2) **Barriers and Facilitators to Effective Practice**, focusing on challenges and supports encountered; and (3), **Integration and Sustainability**, examining long-term adoption and ongoing improvements (see Table 3). These themes reflected shared experiences across stakeholder groups and underscored the collective need for clear assessment protocols, supportive operational conditions, and stronger inter-institutional alignment to ensure high-quality child nutrition monitoring within existing community programming.

Table 3
Themes and Representative Quotes

Theme	Subtheme	Representative Quote	Respondent Information
1. Training and Implementation of Nutritional Screenings	**1A. Training and Standardization**	Training is needed in the parameters for height—removing shoes and the diaper, following norms.	CHW, Barranquilla (R14)
		Teach parents to take height themselves so they understand the process and its importance.	Caregiver, Barranquilla (R46)
	1B. Effective Use of Anthropometry	The evaluation works better when it integrates the anthropometric record—weight, height, and MUAC—with clinical observation and dietary counseling.	NGO Staff, Barranquilla (R24)
	1C. Value of MUAC	Measuring with the tape is easier than others, like skinfolds, which require more expertise and limit diagnoses.	CHW, Cartagena (R37)
		Measurement through the tape helped identify that not every tall and thin child is undernourished; the clinical eye has become sharper.	NGO Staff, Cartagena (R24)
2. Barriers and Facilitators to Effective Nutrition Care Programming	**2A. Operational Challenges**	Office instruments are needed for the functioning of the project… growth and development charts and assessment scales.	CHW, Barranquilla (R6)
		Equipment is not always calibrated, which creates discrepancies.	CHW, Cartagena (R31)
	2B. Family and Community Barriers	"Parents struggle because of transportation and costs… sometimes they cannot bring children in."	Caregiver, Barranquilla (R37)
	2C. Institutional Gaps	"Care crosses several institutions, but for families it feels like many separate doors. Procedures with the EPS do not flow, which delays referrals and treatments."	CHW, Barranquilla (R5)
	2D. Conditions that Enable Change	"There are positive experiences of finding severe undernutrition and making timely referrals so children recover."	CHW, Barranquilla (R8)

CHW: Community Health Worker; NGO: Non-Governmental Organization

Theme	Subtheme	Representative Quote	Respondent Information
		When we identify a child at risk and give support right away—like counseling or referring them that same day—the mother feels accompanied. That motivates her to continue with the process.	CHW, Cartagena (R41)

CHW: Community Health Worker; NGO: Non-Governmental Organization

Table 3
Themes and Representative Quotes continued

Theme	Subtheme	Representative Quote	Respondent Information
3. Integration and Sustainability	**3A. Multi-Sector Coordination**	Linking with universities makes training continuous, not just a one-time event.	CHW, Barranquilla (R15)
		Coordination with schools reinforces habits in daily care.	CHW, Cartagena (R8)
	3B. Community Engagement	Parents need clear awareness of the seriousness of undernutrition—it can even lead to death.	NGO Staff, Barranquilla (R24)
	3C. Local Targeting for Community Needs	Mobility must adjust to the geography and risks of the territory… in island or river areas several means of transport are required… in urban areas, for child safety reasons, transfer by car is prioritized and motorcycles are discouraged when there is road risk or public order issues.	CHW, Cartagena (R37)

CHW: Community Health Worker; NGO: Non-Governmental Organization

3.1 Training and Implementation of Nutritional Screenings

3.1A Training and Standardization

Participants underscored the need for ongoing training and standardization to ensure accurate and consistent measurements across teams and settings (Table 3). Health professionals in Barranquilla emphasized that proper technique—including removing shoes and diapers and maintaining correct posture—was essential for reliable anthropometrics measurements: “Training is needed in the parameters for height [and weight] —removing shoes and the diaper, following norms” (CHW, Barranquilla, R14). Caregivers also expressed willingness to be involved in the process, noting that

learning to measure their children's height/length improved understanding and shared responsibility. As one caregiver shared, "Teach parents to take height[/length] themselves so they understand the process and its importance" (Caregiver, Barranquilla, R46).

3.1B Effective Use of Anthropometry

Participants emphasized that nutrition screenings were most impactful when anthropometric measures—weight, height, and mid-upper arm circumference (MUAC)—were combined with systematic clinical observation (Table 3). This integration improved accuracy and provided a clearer and more credible rationale for counseling families. Several participants described this approach as giving structure to the encounter and making explicit for families what is done in each step and why.

3.1C Value of MUAC

Across groups, use of MUAC was consistently described as easy to use, fast, and practical, especially for teams with varied levels of training, and across diverse community settings (Table 3). Participants noted that MUAC was particularly helpful for identifying children at elevated risk when triangulated with weight-for-height or clinical signs. As one CHW explained, measuring with the tape "is easier than other [techniques]" and increases confidence in frontline screenings (CHW, Cartagena, R37). Additional professionals working with children with malnutrition echoed this sentiment that with "measurement through the tape helped identify that not every tall and thin child is undernourished; the clinical eye has become sharper" (NGO Staff, Cartagena, R24). Conversely, participants expressed frustration that when using the MUAC tape with other measures, "There [were] on some occasions incompatibilities between the data that the tape gives and those of weight and height; in that case one does not know which is the reliable data and there are doubts about in which risk level to classify them." However, participants shared that "When that happens, observation [was] done and they are [appropriately] referred to a nutritionist or pediatrician." (NGO Staff, Barranquilla, R27)

3.2 Barriers and Facilitators to Effective Nutrition Care Programming

3.2A Operational Challenges

Participants identified multiple operational barriers, including poorly calibrated equipment, inconsistent measurement techniques, staff turnover, and scarcity of materials (Table 3). These issues undermined reliability and sometimes generated conflicting results across indicators, creating uncertainty about appropriate nutritional risk classification.

3.2B Family and Community Barriers

Families and community agents described difficulties attending screenings due to transportation costs, neighborhood insecurity, and competing caregiving demands (Table 3). Caregivers also cited deeply ingrained food habits and limited household resources as obstacles to adopting recommended dietary changes, such as the "belief that, instead of breast milk, children should be given bottles, rice water,

plantain porridge" (Community Health Worker, Cartagena, R37) and the "wrong perceptions of nutrition such as confusing weight with good nutrition" (Caregiver, Barranquilla, R47).

3.2C Institutional Gaps

Participants shared that limited coordination between community programs, health facilities, and governmental institutions led to fragmented referral pathways and delays in follow-up. Participants noted that inconsistent communication across institutions reduced families' trust and disrupted continuity of care (Table 3).

3.2D Conditions that Enable Change

Despite barriers, participants described positive experiences when screenings were accompanied by timely support—such as actionable counseling, rapid referral to dietitians or pediatricians, snack distribution, or vouchers (Table 3). These supports strengthened motivation, trust, and sustained engagement. A CHW highlighted that "there are positive experiences of finding severe undernutrition after which it has been possible to refer urgently to children who have recovered" (CHW, Barranquilla, R8). A caregiver echoed this sentiment with frequent following that "the experience of the calls every 15 days is positive… this shows that the program is available, [and] attentive" (Caregiver, Cartagena, R37).

and even reminds them to give the medicines to the children

3.3 Integration and Sustainability

3.3A Multi-Sector Coordination

Participants strongly advocated for more coherent coordination among health services, early education centers, government programs, and community organizations (Table 3). "Positive changes are observed in the children as a product of the help of different actors: family, daycare

center, and Foundation" (Caregiver, Cartagena, R54). They emphasized that unified protocols, standardized criteria, and shared referral routes were essential to extending coverage and ensuring timely care for children with malnutrition. Participants emphasized that without this coordination, screening efforts risk remaining disconnected from effective care and follow-up.

3.3B Community Engagement

Engagement with parents, grandparents, and community leaders were viewed as critical for building trust and increasing participation (Table 3). Participants noted that community buy-in facilitated adherence to recommendations and helped families recognize the value of repeated screenings.

3.3C Local Targeting for Community Needs

Participants highlighted the need for flexible, context-sensitive strategies in neighborhoods affected by violence, mobility restrictions, or food insecurity (Table 3). Light, mobile approaches—such as portable

equipment, simplified forms, and home-based counseling—were seen as key to maintaining reach and continuity in these settings.

4. Discussion

This qualitative sub-study offers new insight into how child nutrition screenings and assessment are carried out in under-resourced urban communities in Colombia and highlights the system-level factors that either support or hinder high-quality care. Three interconnected themes emerged—**training and implementation**, **barriers and facilitators in practice**, and **integration and sustainability**—each pointing to areas where improvements could meaningfully strengthen growth monitoring and follow-up in under-resourced settings (Table 4). These findings suggest that community-based nutrition screening does not work as a single technical action, but rather as an ongoing component of a process shaped by relationships, available resources, and the strength of care pathways over time.

Table 4
Recommendations for Strengthening Child Nutrition Assessment and Follow-up in Under-Resourced Settings

Theme	Key Recommendation	Description
1. Training and Implementation of Nutritional Screenings	**Strengthen Routine Training and Skill Checks**	Provide regular refresher training, simple competency assessments, and standardized measurement tools to reduce inconsistencies in anthropometry.
	Engage Caregivers During Screenings	Explain each step clearly and involve caregivers (e.g., teaching them how to measure height) to build trust and shared responsibility.
	Improve Communication and Counseling Quality	Offer simple, actionable guidance during screenings to help families understand results and follow recommended practices.
2. Barriers and Facilitators to Effective Practice	**Address Operational Constraints**	Ensure calibrated equipment, sufficient materials, and consistent staffing; streamline workflows where possible.
	Reduce Family-Level Barriers	Provide transport support, safe screening locations, mobile outreach, and context-appropriate nutrition guidance to improve attendance and adherence.
	Pair Screenings with Immediate Supports	Offer timely counseling, snacks, vouchers, or rapid referrals to increase engagement and continuity of care.
3. Integration and Sustainability	**Strengthen Multi-Sector Coordination**	Clarify referral and counter-referral pathways across health services, ICBF, early education centers, community programs, industry, and research organizations.
	Enhance Community Engagement	Involve parents, grandparents, leaders, and CHWs to reinforce local ownership and acceptance of repeated screenings.
	Target Nutrition-Focused Quality Improvement Programs for Community Needs	Use portable equipment, simplified documentation, and cluster- or home-based approaches in areas affected by violence, mobility restrictions, or food insecurity.

CHW: Community Health Worker; ICBF: Instituto Colombiano de Bienestar Familiar

First, participants described a strong belief in the value of accurate anthropometry paired with clinical observation. While these practices are widely recognized as core components of nutrition screening,[49] what is striking in this study is the emphasis placed on *how* the measurement process is experienced by caregivers.[37,38] Families responded more positively when each step of the screening was explained

clearly and when they were given opportunities to participate—for example, by learning to measure their child's height/length. This suggests that caregiver engagement is not only a communication task but also a practical strategy to strengthen co-responsibility, develop rapport, and trust.[50,51] At the same time, participants identified persistent gaps in training and standardization, leading to inconsistent measurements and uncertainty in risk classification when measures such as the MUAC, weight, and height do not correspond with one another. These findings point to an urgent need for regular skill reinforcement, simple competency checks, and standardized tools that make accuracy achievable even in crowded or mobile settings to ensure both accuracy and trust with the community.[35] A recent innovation, the MUAC z-score tape[52], may support this need. With added age and sex z-scores for nutritional risk categories to detect both undernutrition and overnutrition malnutrition risk forms, the MUAC z-score tape builds upon the historical MUAC tape that only detects undernutrition and does not have age and sex specific thresholds. The MUAC z-score tape has successfully been used in community settings for nutritional risk screening,[27,53] and may support concordance across anthropometric measures when determining nutritional risk status.

Second, the study reveals a landscape shaped by complex operational and family constraints. Participants described challenges with equipment, shortages of materials, insecurity in certain neighborhoods, and the high cost of transportation — each of which can interrupt follow-up long before clinical needs are met. Importantly, caregivers framed these barriers not as isolated obstacles but as conditions that shape day-to-day decisions about seeking care. This suggests that improvements in nutrition screening will require more than technical adjustments; they must be paired with practical support that reduce the real costs families face. Positive experiences—such as receiving timely counseling, snacks for children, or streamlined referrals—demonstrated that when support is immediate and tangible, engagement increases, and follow-through improves.[54]

Finally, participants highlighted that sustainability depends on stronger alignment across the institutions responsible for child health and nutrition. Fragmented referral pathways, unclear follow-up responsibilities, and inconsistent communication across agencies and sectors disrupted continuity of care and eroded family trust. At the same time, participants emphasized that community knowledge—particularly from caregivers, local leaders, community health workers, and early childhood centers—is essential for designing strategies that fit the realities of neighborhoods affected by violence, mobility restrictions, and food insecurity.[55,56] Flexible and mobile approaches, such as portable equipment, simplified forms, and clustering screenings near where families live, were viewed as promising strategies to maintain reach while reducing risk and cost.[25,27,53,57–59]

Community programming through NGOs provides the needed established rapport and relationships with families in the communities they live in and serves to leverage this type of nutrition-focused care, such as through a nutrition-focused quality improvement program. By co-designing community-engaged research[37,38] via multi-sector partnerships such as with NGOs, industry, and research organizations per UN Sustainable Development Goal[60] recommendations, the strengths of each entity are leveraged to

provide comprehensive and sustainable pathways to care through nutrition-focused quality improvement programs. The experiences of caregivers, NGO staff, and CHWs provided in this sub-study highlight the unique strengths and opportunities for improvement to design and deliver nutrition care within the communities where families live.[25,56] Integral components include WHO and UNICEF recommended regular nutrition screening, caregiver education, supplementation when indicated, and routine, frequent follow-up, while also integration of implementation outcomes such as fidelity and feasibility to support growth and nutrition outcomes.[25,56,61–65] These findings propose that community-engaged[37,38] nutrition-focused QIPs provide an opportunity to translate epidemiological evidence into real-world strategies to reduce pediatric undernutrition in under-resourced urban settings.[61,65]

Dietitians and pediatricians have an essential role in bridging facility-based services with community-based growth monitoring efforts. Sub-study participants frequently noted that timely referrals, responsive follow-up, and clear communication from healthcare providers were foundational for trust and adherence. Clinicians can support this process by ensuring that referral pathways are clearly communicated to families,[66] reinforcing the interpretation of anthropometric findings during clinic visits,[67] and coordinating directly with community health workers to maintain continuity of care.[68] They are also well-positioned to advocate for standardized screening protocols, provide periodic training or supervision to frontline teams, and help validate clinical findings when measurement inconsistencies arise.[69] In doing so, clinicians can act as anchors within a fragmented system, helping families navigate care while reinforcing the importance of early detection and follow-up for nutrition-related concerns.

This sub-study offers several notable strengths. It draws on diverse perspectives impacted by pediatric malnutrition by engaging caregivers, CHWs, and NGO staff across two urban settings, allowing for a nuanced, multi-socioecological[41] level understanding of how nutrition screenings and assessments function in the community. The use of in-country trained qualitative researchers ensured cultural and contextual sensitivity throughout data collection, while systematic analytic procedures— including iterative coding, team debriefings, and consensus among researchers —enhanced the rigor and credibility of the findings. Importantly, the sub-study captures the voices of those closest to the impact of malnutrition and implementation of screenings, assessments and nutrition care, offering grounded insights into operational and structural factors that are rarely visible in solely quantitative evaluations.[70] By integrating perspectives across sectors and levels of the health system, the study provides actionable, context-specific recommendations that are directly relevant for strengthening child nutrition monitoring efforts in under-resourced environments. Future studies will need to quantify benefits such as nutrition-focused quality improvement programs that measure the impact of nutrition screening and care with appropriate nutrition supplements when indicated on health, clinical, and economic outcomes to support children's and nations' full potential.[35]

This study has several limitations. First, demographic information was collected only for caregivers and NGO staff and not for all participant groups. Nonetheless, caregivers and NGO staff were purposively recruited based on their direct involvement in CROSS activities, and CHWs were selected for their

professional experience in child nutrition and stunting prevention, ensuring that all participants had relevant, first-hand expertise. Second, because data were gathered in two urban communities, the findings may not capture experiences in rural or other regions of Colombia. However, including two distinct urban settings and multiple stakeholder types enhances the breadth and transferability of perspectives. Third, self-reported experiences may be subject to recall or social desirability bias. To minimize this, facilitators emphasized that there were no “right” or “wrong” answers, used iterative probing to clarify responses, and triangulated themes across groups to strengthen credibility.

5. Conclusions

Taken together, these findings highlight the need for a more integrated, multi-socioecological[41] level approach to child nutrition care in urban Colombia. Partnerships[60] integrating routine screenings, education, supplementation when indicated, and regular follow-ups,[25] are imperative to improving the health of children. Strengthening the quality of measures, expanding operational supports for families, and building clearer referral and counter-referral pathways across institutions may meaningfully improve continuity of care.

Equally important is the need to design nutrition-focused quality improvement programs that target community needs and elevate the role of caregivers, NGO staff, and CHWs as partners in the process. Investing in these areas offers a path toward more responsive, equitable, and sustainable nutrition monitoring systems that better support the growth and development of young children in under-resourced settings.[60,71] By focusing on the everyday lived experience of the participants, this study highlights that strengthening child nutrition monitoring requires not only better measurements, but also systems that can sustain care, trust, and follow-up over time.

6. Declarations

6.1 Ethics Approval and Consent to Participate

The study strictly adhered to the latest version of the World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects, along with any local regulations regarding human subject research. The study protocol was reviewed and approved by Comité Corporativo de Ética en Investigación de la Fundación Santa Fe de Bogotá (Reference: CCEI-17012-2024). Written informed consent was secured from all participants prior to data collection.

6.2 Consent for Publication

Not Applicable.

6.3 Availability of Data and Materials

The datasets generated and/or analyzed during the current study are not publicly available to preserve participant privacy but are available from the corresponding author on reasonable request.

6.4 Competing Interests

ARS and CSF were employees of Abbott Laboratories at the time of this qualitative study.

6.5 Funding

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6.6 Authors' Contributions

All authors conceptualized the study, and all authors were involved in the study design. ARS led manuscript development. All named authors critically revised and edited the manuscript for its content and have read and approved the final manuscript.

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