



# Implementing a Care Pathway for small and nutritionally at-risk infants under six months of age: A multi-country stakeholder consultation

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## Abstract

Nutritional vulnerability under the age of 6 months is prevalent in low- and middle-income countries with 20.1% infants underweight, 21.3% wasted and 17.6% stunted in a recent review. A novel Care Pathway for improved management of small and nutritionally at-risk infants under 6 months and their mothers (MAMI) has recently been developed to provide outpatient care at large coverage. We aimed to investigate stakeholders' views on the feasibility of its implementation and to identify barriers and enablers. This was an early stage formative mixed-methods study: an online survey plus in-depth interviews with country-level stakeholders in nutrition and child health from different geographical regions and stakeholder groups. 189 stakeholders from 42 countries responded to the online survey and 14 remote interviews were conducted. Participants expressed an urgent need for improved detection and care for small and nutritionally at-risk infants under 6 months. Whilst they considered the MAMI Care Pathway feasible and relevant, they noted it was largely unknown in their country. The most mentioned implementation barriers were: community-specific needs and health care seeking barriers, health workers' lack of competence in breastfeeding counselling and the absence of a validated anthropometric screening method. Possible enablers for its implementation were: patients' preference for outpatient care, integrating the MAMI care pathway into existing maternal and child health programmes and the possibility of a local pilot project. Adaptation to the local context was considered crucial in further scale-up.

## KEYWORDS

community-based, implementation, infant feeding, infants under 6 months, malnutrition, MAMI, survey methods

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## 1 | INTRODUCTION

Small and nutritionally at-risk infants under the age of 6 months (henceforth infants  $\leq 6m$ ) and their mothers require nurturing, integrated care to survive and thrive (UNICEF et al., 2016; UNICEF, 2018). The burden of nutritional vulnerability is high in this age group as shown by a review of 54 low- and middle-income countries: 20.1% of infants were underweight, 21.3% were wasted and 17.6% were stunted (Kerac et al., 2021). Nutritional deficits in infants  $\leq 6m$  are associated with high mortality in the short term (Grijalva-Eternod et al., 2017) and poor health, growth and development in the long term (Grey et al., 2021). However, these infants and their mothers have received little attention in public health programmes, and current -predominantly hospital-based - care has reached few of those who need it (Kerac et al., 2015).

A novel Care Pathway for improved management of small and nutritionally at-risk infants  $\leq 6m$  and their mothers (MAMI) has recently been developed to bridge this gap (McGrath, 2021). This MAMI Care Pathway focuses on outpatient care for infants  $\leq 6m$ , who are clinically stable ('uncomplicated malnutrition') thus operationalising latest WHO guidelines (World Health Organization, 2013). It includes screening at community and primary care level, referral for complications and focused support including weight monitoring, breastfeeding counselling and maternal mental health support (see Online Supporting Information Supplement 1 for a summary of the MAMI Care Pathway). Previous qualitative research has revealed health workers' and caregivers' preference for outpatient care for this age group (van Immerzeel et al., 2019), although health systems must be strengthened to avoid it being perceived as second-best (Arafat et al., 2018). Pilot testing of the MAMI approach in Ethiopia and Bangladesh has shown early recovery of infants, preventing them from severe malnutrition and satisfaction with health workers and programme managers (Butler et al., 2018).

Although MAMI has recently been prioritised by stakeholders (Angood et al., 2021), the MAMI Care Pathway is globally at an early stage of implementation (MAMIGlobalNetwork, 2021). Implementing the MAMI Care Pathway on country level will require its integration into health systems and its uptake into local guidelines (MAMI Global Network & ENN, 2021). A recent appraisal of 71 country and NGO guidelines for nutritional care showed poor translation of WHO 2013 malnutrition guidelines into national protocols: 90% mentioned infants  $\leq 6m$  separately, while only 11% recommended outpatient treatment (Engl & Kerac, 2021). An earlier small-scale qualitative study identified barriers for uptake of the approach, interviewing stakeholders in three countries. Some barriers were technical (e.g., questions on milk supplements), others logistical (e.g., lack of qualified health workers) and epidemiological (e.g. lack of prevalence data) (Read & McGrath, 2018). Therefore, evidence from more settings on these barriers and enablers is required to inform future implementation and further global roll-out of the MAMI Care Pathway.

Our multi-country study aimed to investigate stakeholders' views on the feasibility of implementing the MAMI Care Pathway. Our objectives were to:

### Key points

- Country-level stakeholders in nutrition and child health perceived the MAMI Care Pathway a needed and potentially feasible approach for managing small and nutritionally at-risk infants under the age of 6 months.
- Implementation barriers were mostly predicted context-related: patients' access to care and health systems factors.
- More evidence is needed on the anthropometric measures to use for identifying nutritionally at-risk infants  $\leq 6m$ .
- Adapted to the local context, the MAMI Care Pathway has the potential to bridge gaps in maternal and child health care.

-identify stakeholders' perceptions on care for small and nutritionally at-risk infants  $\leq 6m$  and their mothers at the country level  
 -identify and describe enablers and barriers for implementing the MAMI Care Pathway approach, notably any evidence needs, contextual factors and potential key actors who might facilitate the implementation process.

## 2 | METHODS

### 2.1 | Research design and theoretical framework

Our formative study used mixed methods: a cross-sectional online survey for quantitative analysis and in-depth interviews with a subset of survey respondents for qualitative analysis. The CROSS checklist was used to report the study (Sharma et al., 2021). We used the PARIHS theoretical framework to identify potential enablers and barriers for implementation of the MAMI Care Pathway (Kitson et al., 1998). PARIHS has been applied in various settings in different phases of the implementation process, either explaining or predicting factors in implementing healthcare knowledge into practice (Bergström et al., 2020). We chose the most basic version of the framework because it depicts three dimensions - often overlapping - thus leaving room for emerging sub-themes in this formative research:

- “Evidence” refers to scientific research, data sources and experience with the guideline,
- “Context” refers to the socio-cultural setting and the health system in which implementation takes place, and
- “Facilitation” is defined as the dynamics or actors supporting implementation.

Kitson argued that all three dimensions should be equally favourable for successful implementation. To formulate the survey

questions, we used the Flottorp checklist for determinants of practice in addition (Flottorp et al., 2013). Its determinants were added to the PARIHS dimensions so to create sub-elements as shown in Figure 1. We created the online survey using the software “Online Surveys” (Jisc, 2021). The survey started with a brief explanation of the MAMI vision and the MAMI Care Pathway, followed by 12 multiple item closed questions based on the three PARIHS elements. We used Likert 5-point scales (Likert, 1932) and prioritising scales for responses with a possibility to add remarks in a text box (see Supplement 2 for the survey questionnaire). The questionnaire was translated into French and Spanish, piloted with two stakeholders and adjusted accordingly. The interview consisted of three questions according to PARIHS, asking for barriers and enablers in each of the dimensions in implementing the MAMI Care Pathway, using the survey questions as probes when needed.

## 2.2 | Data collection and sampling

Country-level stakeholders in nutrition and child health were invited to participate in the online survey from May 11 to June 11, 2021. The invitation was spread through the MAMI Global Network newsletter, members’ respective networks and other nutrition and child health online platforms. We aimed to include stakeholders from a minimum of three WHO geographical regions and three stakeholder groups (policymakers, programme managers and clinicians/researchers) for the sample to be representative (Salentine & Johnston, 2011). Based on an earlier stakeholder consultation using similar networks (Angood et al., 2015), we estimated to reach 100 survey respondents. Survey participants indicated their availability for a remote interview. Interview candidates were purposively selected from the survey respondents pool to represent a variety of geographic regions, stakeholder groups and opinions. We estimated 12–15 interviews to be sufficient for thematic saturation, in view of the formative character of the study, looking for general themes and views. Interviews were conducted by the principal investigator via Zoom, in



**FIGURE 1** Adapted PARIHS framework with Flottorp sub-elements.

English or French on a time convenient for the participant and lasted about 30 min. Interviews were audio recorded and transcribed.

## 2.3 | Data analysis

Survey responses were exported from the survey software to Excel (Microsoft Corporation, 2018) and Stata (StataCorp., 2019). We analysed using descriptive methods, looking at proportions as well as comparisons between different stakeholder groups or geographical regions. In-depth interviews were analysed qualitatively by the principal investigator using thematic analysis. PARIHS dimensions were used for a priority coding and sub-codes have been identified according to emerging recurrent themes. Sub-codes were merged when mentioned few times, for example, a quote on community health workers’ time and on community health workers’ capacity were merged into “community health workers potential”. Sub-codes were split up when mentioned often.

## 2.4 | Ethical considerations

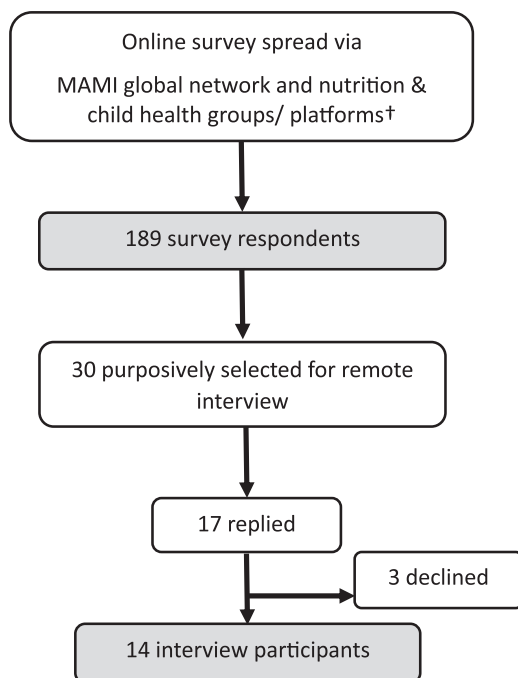
The study received ethical clearance from our institutional review board (ref. no 22824). Written consent from participants was obtained before both survey and interviews. The survey was filled out anonymously. Interview transcriptions were anonymised (removing names of persons and institutions). Data were stored with the principal investigator and uniquely shared between the research collaborators using encrypted files.

## 3 | RESULTS

### 3.1 | Survey and interview participants

189 country-level stakeholders in nutrition and child health participated in the online survey and 14 remote interviews were conducted (see flow diagram in Figure 2). Survey respondents were from 42 countries with the regions East Africa, West Africa and Southeast Asia most represented. 105 (56%) of survey respondents were female, most were above 40 years of age and one-third had more than 10 years of experience in their stakeholder role. 88 (47%) of respondents were working for a nongovernmental organisation (NGO), 58 (31%) for the government and 33 (17%) for a university or research institute. Interviews were conducted with experienced country-level stakeholders – mostly programme managers – from four geographic regions with an average interview time of 28 min. Characteristics of survey and interview participants are shown in Table 1.

Quantitative results are displayed in Figure 3 for Likert scale questions and in Figure 4 for ranking questions, both grouped according to the three dimensions of PARIHS. Interview results with themes, subthemes and quotes grouped by the PARIHS dimensions are displayed in Online Supporting Information Supplement 3.



**FIGURE 2** Sampling flow diagram online survey and interviews. †Emergency Nutrition-net (ENN), International Child Health Group (ICHG), Child Health task force, Scaling Up Nutrition (SUN) movement, Centre for Maternal, Adolescent, Reproductive & Child Health (MARCH centre), Child Health and Rights Information For All (CHIFA), Twitter.

### 3.2 | Evidence

Most (136, 73%) survey respondents were somewhat familiar with the MAMI Care Pathway. 142 (75%) considered it feasible and 166 (88%) relevant (Figure 3). Only 70 (37%) of stakeholders stated the MAMI Care Pathway to be known in the country they work. Interview participants repeatedly expressed the need for improved detection and care for small and nutritionally at-risk infants u6m in their country.

*“So, they (at-risk infants) fall through the cracks of the system, they are missed most of the time.” (I2)*

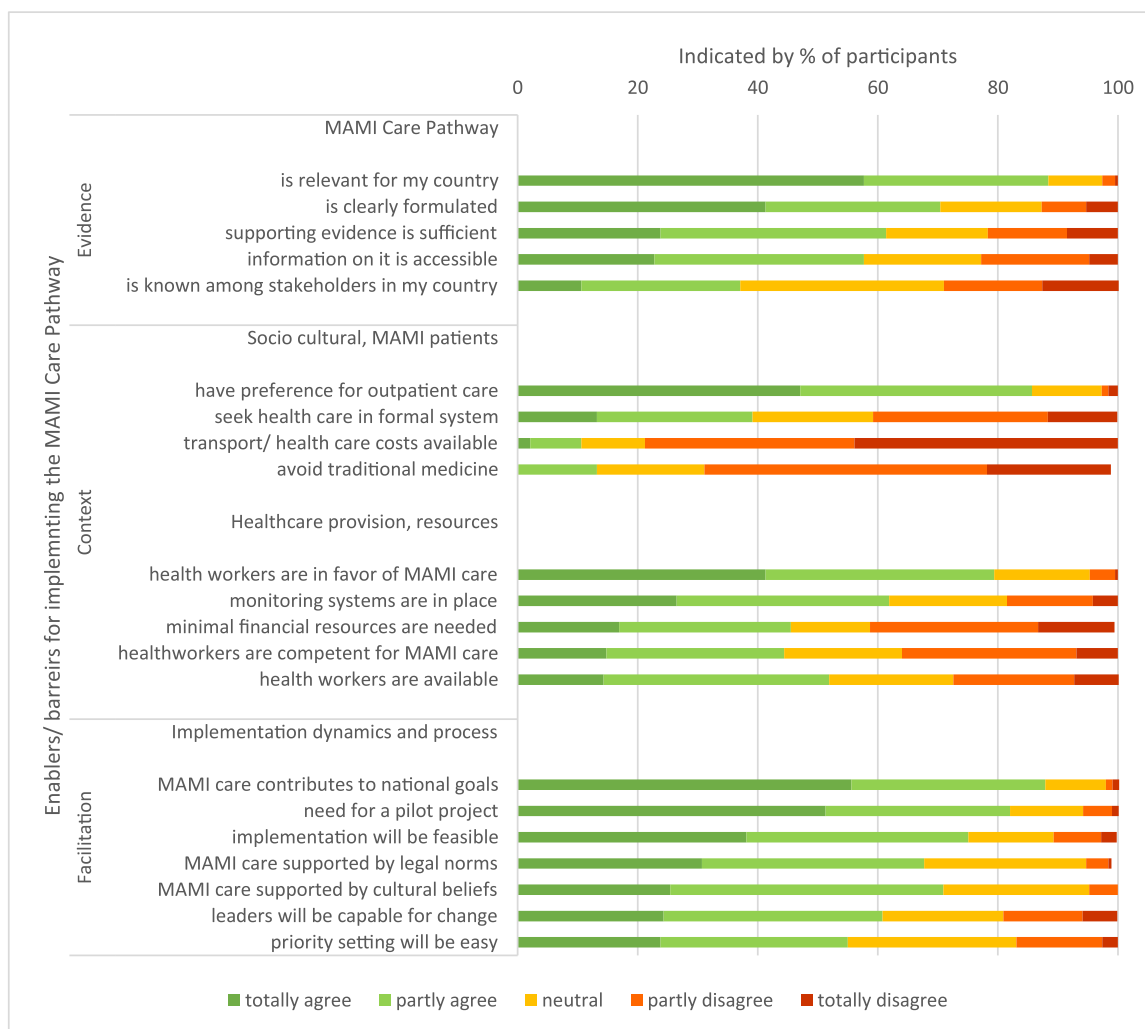
*“... but we are not able to identify at the correct time. So because of that, we are losing many children that we could have saved.” (I9)*

Respondents expressed the need for more evidence underpinning the MAMI Care Pathway, primarily on local prevalence of at-risk groups and anthropometric screening methods (Figure 4). Similar priorities emerged from the interviews, in particular the validity of the mid-upper-arm-circumference (MUAC) in this age group and its potential use for screening at community level. Provision of local prevalence data was indicated as a need to inform policymakers in decision making.

**TABLE 1** Participant characteristics survey and interviews

	Surveys N (%)	Interviews N
WHO geographical regions (no countries)		
Region of the Americas (6)	14 (7)	2
African region - West (11)	49 (26)	4
African region - East/central (12)	48 (25)	3
South-East Asia region (5)	35 (19)	4
Western Pacific region (3)	10 (5)	1
Eastern Mediteranian Region (5)	20 (11)	0
Global	13 (7)	0
Sex		
Male	84 (44)	8
Female	105 (56)	6
Age		
<30 years	19 (10)	1
31–40 years	62 (33)	3
41–50 years	65 (34)	5
51–60 years	28 (15)	2
>60 years	15 (8)	3
Educational level		
Undergraduate	32 (17)	1
Masters	111 (59)	6
Post-master	46 (24)	7
Type of organisation		
NGO	88 (47)	4
Government	58 (31)	2
University	33 (17)	3
UN agency	26 (14)	4
Private	18 (10)	1
Type of stakeholder		
Programme manager	112 (59)	7
Clinician/academic	63 (33)	4
Policy maker	14 (7)	3
Years of experience		
<2 years	25 (13)	0
2–5 years	53 (28)	0
5–10 years	47 (25)	10
>10 years	64 (33)	4

*“Under the age of 6 months, they are not always included in the surveys. So ...it's hard to know the prevalence of how many children are malnourished or how many children need support” (I15).*



**FIGURE 3** Survey results: Enablers and barriers for implementing the MAMI Care Pathway within PARIHS dimensions.

*"So, evidence generation I think, is really important because that's the only way you can change mindset or change policy, by having the numbers." (I6)*

### 3.3 | Context

Most stakeholders (163, 86%) viewed patients' preference for outpatient over hospital care as an enabling factor for implementation. Barriers were expected on access to care, notably health care seeking in the informal sector by 163 (86%) and a lack of means and transport by 149 (79%) of respondents. Interview participants – speaking from experiences in MAMI pilot projects or other, related interventions – predicted some access barriers such as sociocultural habits, geographical barriers and a lack of trust in the health system. Specific social or mental health needs of the mother emerged as a potential barrier to access MAMI care. Examples were refugee communities, single mothers or mothers having drug problems. Community practices were indicated as highly influential on infant care, forming possible

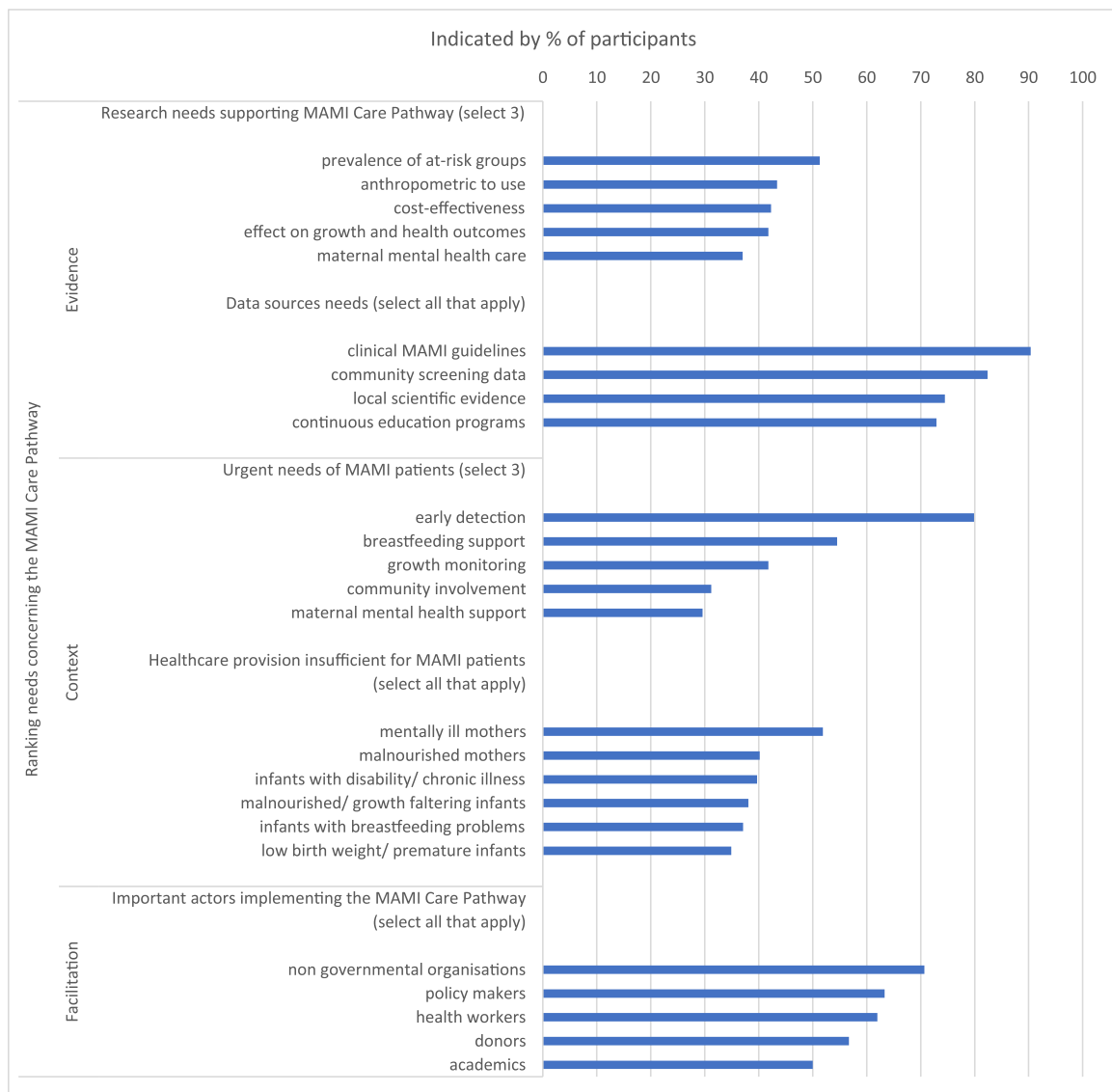
barriers to MAMI care, but, when considered, potentially playing an enabling role.

*"... we work with refugees who might have other needs, you find that some are single mothers, these are mothers who have left their countries to come into a new country: they do not have a support system." (I15)*

*"It needs a tribe to raise a child". (I12)*

*"Traditionally, there are grandmothers and there are mothers-in-law and all who are there will take care of all these things (breastfeeding counselling)." (I13)*

Concerning the health system, over half of survey respondents viewed current MAMI detection and care in their country as insufficient, for various nutritionally at-risk groups (Figure 4). Maternal mental health care was marked insufficient by 151 (80%) of the respondents. Prioritising healthcare needs for at-risk infants and their mothers, early detection was marked as most urgent, followed by breastfeeding



**FIGURE 4** Survey results: Ranking needs within PARIHS dimensions.

support and growth monitoring. 149 (79%) of respondents estimated that healthcare workers will be favourable to the MAMI approach. Leadership and monitoring systems being in place were viewed as an enabler by the majority (117, 62%) of respondents.

As possible barriers, many stakeholders mentioned health workers' lack of competence (106, 56%) as well as time (91, 48%) to provide MAMI care. Interviewees clarified that many health workers are trained in MAMI care elements such as growth monitoring, but there is less emphasis on this age group. A lack of competence was identified in breastfeeding counselling.

*"It is not only how well trained they are, but also how passionate they are about it (breastfeeding)." (17)*

Interviewees described in various ways the potential of community health workers in MAMI care, being close to the

community, knowing its needs and forming a bridge to health services.

*"They (community health workers) are the change makers at community level." (110)*

Concerning cost as a barrier for implementing the MAMI Care Pathway, 87 (46%) stakeholders considered that only minimal resources would be needed. Interview participants explained that implementation could be less costly when making use of the existing structures and (community) programmes. Because MAMI care would be time-consuming, some pointed out that care should be subsidised.

*"The main thing is that most manageable case are managed within community level, which is actually required because this will save lots of resources." (19)*

*"Infants are not very good clients. They take time and they do not bring in much money in general" (I5).*

### 3.4 | Facilitation

There were mainly enablers in the PARIHS facilitation dimension with 166 (88%) of survey respondents considering the MAMI Care Pathway to contribute to country goals and 155 (82%) who would wish a pilot project. 85 (45%) doubted if the MAMI Care Pathway would easily be set as a priority by policymakers, thus forming a barrier (Figure 3). Integration of the MAMI approach within already existing maternal and child health programmes, was brought up as a potential enabler to the implementation process by most interview respondents.

*"So instead of bringing it (the MAMI Care Pathway) alone, since there's already something going on, it would be good to find a way of integrating." (I2)*

Respondents provided concrete examples from experiences in their country of where the MAMI Care Pathway would fit in. Vaccination clinics were mentioned as providing an important screening opportunity (I1, I6, I14). Linking the MAMI Care Pathway to a community nutrition programme was suggested by several interview respondents, adding MAMI elements to continuous education (I2) or introducing MAMI detection to current activities (I10). Integrating the MAMI Care Pathway to hospital-based programmes for high risk infants was mentioned by a clinician from South America (I11). Moreover, another stakeholder expressed a preference to introduce the MAMI Care Pathway at community level first, re-enforcing prevention (I9). Both fragile, as well as stable settings, were mentioned in possible ways to integrate the MAMI Care Pathway (I15, survey remark).

*"Infants all come to vaccination clinics, there is a window of opportunity there." (I6).*

*"I think we already have a system of community health care that is in place. So what I feel is, maybe we could do some pilot because some of the components are still missing in our protocol" (I9).*

Prioritising actors who would likely be in favour of the implementation, NGO's were marked first, closely followed by government policymakers (Figure 4). Sub analysis of the stakeholder groups showed similar results for all groups.

*"Probably external funding and NGO programmes will need to pilot this care, as has often happened with innovations" (I9).*

*"Involving government structures and local researchers from the start is essential for sustainability" (I1).*

The infant formula industry was not viewed as facilitator in implementation, although its influence on caregivers and healthcare providers should be taken into account. Community leaders were mentioned as potential facilitators.

*"Religious leaders are well placed in advocating health behaviour. Breastfeeding is an issue they would easily promote because it is natural." (I13)*

## 4 | DISCUSSION

In this study, country-level stakeholders in nutrition and child health from 42 countries expressed the urgent need for improved detection and care for small and nutritionally at-risk infants u6m. They considered the MAMI Care Pathway as relevant and potentially feasible, but largely unknown in their country. Potential barriers for its implementation were predominantly contextual, notably community-related barriers to access to care, and health provision barriers such as a lack of competence among health workers. The need for a validated anthropometric screening method and more prevalence data were viewed as barriers. Integration of the MAMI Care Pathway into existing programmes and structures and a possible local pilot project were the most mentioned enablers.

Embedding research in nutrition and child health programme planning has recently been recommended by UNICEF, to identify barriers in an early stage and improve implementation and uptake of interventions (Jackson et al., 2021). Various theoretical frameworks have been used in implementation science, some specific to nutrition interventions (Sarma et al., 2021). A stakeholder consultation is a recommended tool for shaping and continuous correction of the intervention. In this study, we used the three PARIHS dimensions to display enablers and barriers for implementing the MAMI Care Pathway and to explain their interaction and interdependency.

Most implementation barriers in our study were predicted in the "context" dimension of PARIHS, concerning social-cultural as well as health provision factors. These factors are known to highly determine the implementation fidelity or sustainability of nutrition interventions (Sarma et al., 2021). Evaluation of the Integrated Management of Childhood Illness (IMCI) guideline implementation, for example, showed most prominent weaknesses in community involvement (Boschi-Pinto et al., 2018). Specific insights from implementing the integrated Community Case Management (iCCM) programme in Ethiopia showed contextual -here called demand side- barriers similar to our study, such as knowledge and beliefs around childhood illnesses and new-borns well as healthcare and transport costs (Miller et al., 2021). Miller argues that many of these contextual barriers can be solved at the supply side, for example by improving service availability, building trust with health workers, and involving community key stakeholders. Community health workers need to play a key role in overcoming these barriers, noted our respondents, although they need more recognition and facilitation from policy

makers (Sacks et al., 2018). A lack of competence and focus on breastfeeding counselling among healthcare workers was viewed a barrier for MAMI Care Pathway implementation in our study. Although breastfeeding practices are known to be much influenced by the community, healthcare workers responsibility in breastfeeding support is highly underestimated in many countries (Kinshella et al., 2021). Fortunately, the MAMI Care Pathway provides an approach to address this gap. Interview respondents rarely mentioned maternal mental health problems as related to feeding problems or a barrier to seeking care. More context-specific insights are needed to address mental health care needs in the MAMI Care Pathway (Rahman et al., 2008).

The dimension "evidence" highlighted the need for more scientific data on the anthropometric method to use in assessment of infants  $\leq 6$  months and this was re-echoed in an earlier stakeholder consultation (Angood et al., 2015). Currently, weight for length Z-score is the WHO standard for detecting malnutrition in infants  $\leq 6$  months (World Health Organization, 2013), but recent research showed weight for age Z-score (WAZ) and/or MUAC to better define them (Grijalva-Eternod et al., 2021; Hoehn et al., 2021). While specific MUAC cut-offs for this age group are a domain of study, WAZ is already widely used for growth monitoring. Believing that infants are breastfed, and no specific treatment is needed, this WAZ data is often underused, contributing to the large invisibility of this health problem. The MAMI Care Pathway makes treatment more accessible, which can urge policymakers to investigate the burden of nutritional vulnerability in their country, using existing screening data such as WAZ. Additionally, other criteria, such as feeding problems, need to be adapted to the local context to improve case definition.

Finally, within the "facilitation" dimension, our study emphasised the importance of integrating the MAMI Care Pathway into existing structures and making use of resources in place. A study assessing the integration of nutrition-related programmes showed improved outcomes of the primary programme when well-integrated (Salam et al., 2019). The authors recommended better integration of finances and supplies in view of programme cost-effectiveness, also mentioned by our interview respondents. Field experience with the MAMI Care Pathway in Bangladesh and Ethiopia has provided some practical implementation lessons (Butler et al., 2018; Rana et al., 2020). Our study participants shared country-specific suggestions where the MAMI Care Pathway could bridge gaps in maternal and child health programmes and reinforce existing care for nutritionally vulnerable infants  $\leq 6$  months. Evidently, the MAMI Care Pathway is not a one-size-fits-all guideline and stakeholders will need to continuously be involved in local evidence generation and its adaptation to the context.

We recognise the limitations of our study. First, this study was conducted at an early stage of global scale-up of the MAMI Care Pathway, therefore stakeholders' views about implementing the MAMI Care Pathway were often hypothetical and not based on experience. However, to best develop an approach like MAMI, it is vital to get feedback and stakeholder views at all stages of development, not just at the end. Thus, this study provides formative information towards better future work, which would indeed then

focus on real-life experience. The relatively small sample size of 189 stakeholders did not allow us to analyse responses pooled per geographical region or stakeholder groups. However, this data does provide a baseline so that larger future surveys can do this. Finally, an online survey is vulnerable to sampling bias: the online platforms might be more attended by those already interested in the subject. However, the participant characteristics show a rich diversity of stakeholders and the interviews mitigated this downside by bringing more nuance to the survey findings.

## 5 | CONCLUSION

Stakeholders in nutrition and child health from various parts of the world viewed the MAMI Care Pathway as a potentially useful tool to better manage often overlooked small and nutritionally at-risk infants under six months of age. Further implementation would be enabled by adaptation to local community needs and integration into existing structures and resources. A reliable anthropometric screening method is urgently needed for detection and scale-up.

### AUTHOR CONTRIBUTIONS

Tabitha D. van Immerzeel, Louise T. Day, Marko Kerac, and Carlos S. Grijalva-Eternod designed the study. Tabitha D. van Immerzeel conducted the research with Indou Deme/Ly, Maty Diagne and Amanda E. Murungi, and Tabitha D. van Immerzeel wrote the paper and all authors reviewed several drafts.

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### CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

### DATA AVAILABILITY STATEMENT

Fully anonymised data presented in this study are available on request with the corresponding author.

### INFORMED CONSENT STATEMENT

Informed consent was obtained from all participants in our study.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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