


The building blocks of community health systems: a systems framework for the design, implementation and evaluation of iCCM programs and community-based interventions

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ABSTRACT

Introduction Almost all sub-Saharan African countries have adopted some form of integrated community case management (iCCM) to reduce child mortality, a strategy targeting common childhood diseases in hard-to-reach communities. These programs are complex, maintain diverse implementation typologies and involve many components that can influence the potential success of a program or its ability to effectively perform at scale. While tools and methods exist to support the design and implementation of iCCM and measure its progress, these may not holistically consider some of its key components, which can include program structure, setting context and the interplay between community, human resources, program inputs and health system processes.

Methods We propose a Global South-driven, systems-based framework that aims to capture these different elements and expand on the fundamental domains of iCCM program implementation. We conducted a content analysis developing a code frame based on iCCM literature, a review of policy documents and discussions with key informants. The framework development was guided by a combination of health systems conceptual frameworks and iCCM indices.

Results The resulting framework yielded 10 thematic domains comprising 106 categories. These are complemented by a catalogue of critical questions that program designers, implementers and evaluators can ask at various stages of program development to stimulate meaningful discussion and explore the potential implications of implementation in decentralised settings.

Conclusion The iCCM Systems Framework proposed here aims to complement existing intervention benchmarks and indicators by expanding the scope and depth of the thematic components that comprise it. Its elements can also be adapted for other complex community interventions. While not exhaustive, the framework is intended to highlight the many forces involved in iCCM to help managers better harmonise the organisation and

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Community health interventions, such as integrated community case management (iCCM), are considered highly effective programs with the potential to reduce mortality in underserved areas.
- ⇒ Such interventions are influenced by elements beyond the normal indices designed to plan, guide and measure them, which generally do not consider interactions and effects at lower levels of implementation.
- ⇒ Failure to account for these factors can produce suboptimal outcomes and compromise overall program effectiveness.

WHAT THIS STUDY ADDS

- ⇒ We developed a practical systems framework that can be used in the design, implementation and evaluation phases of community-based programs, applied here to iCCM.
- ⇒ It accounts for context and stakeholder dynamics, and considers their interactions with program architecture, local policy, supply chain and health information processes, and community mobilisation among other areas, and supports these with a menu of critical questions.

evaluation of their programs and examine their interactions within the larger health system.

BACKGROUND

Integrated community case management (iCCM) is a strategy designed to provide children in remote areas of low- and middle-income countries (LMICs) with access to life-saving care directly in their communities.¹ The program integrates traditionally vertical

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE AND/OR POLICY

- ⇒ This framework aids planners and program managers of integrated community-based programs to account for more than broad-based measurement criteria when developing and rolling out their interventions.
- ⇒ Greater coordination and communication between high-level program stakeholders and local actors are needed to avoid fragmentation, ensure contextualised implementation, promote sustainability and engender local ownership.

interventions for childhood illnesses such as pneumonia, malaria and diarrhoea into one care package in which a trained community health worker (CHW) provides diagnostic and treatment services in designated catchment areas.² It is touted as both an economical and sustainable strategy towards the attainment of the Sustainable Development Goal (SDG) to reduce child mortality, and is globally promoted by policy-makers and health and development organisations.^{3 4} Currently, almost all sub-Saharan African countries are implementing iCCM in some form.⁵

For iCCM to optimise its programmatic potential, it is generally recognised that many systems influences must coalesce to ensure scaleable implementation and equitable coverage.^{6 7} Quality and consistent supervision of CHWs, an enabling policy environment, a comprehensive community mobilisation campaign, continuously available commodities, among a host of other conditions are considered necessary to position iCCM as an effective strategy.^{8–14} Efforts to categorise these dimensions have led to the creation of indices and benchmarks to assist program planners and managers in measuring success at different phases of implementation.^{15–17}

While these indices provide an essential basis for harmonising design and establishing common implementation standards, the benchmark categories prescribed may not necessarily reflect all the thematic areas significant to the iCCM intervention. They are also proposed as a measurable checklist for the core components of iCCM program development and therefore may not comprehensively cover key programmatic interactions or their consideration in design or evaluation. Additionally, because the target audiences for these benchmarks are often high-level stakeholders, they may not account for some of the challenges or nuances of implementation at the decentralised level. Inadequate consideration for this complexity and the range of elements that influence intervention dynamics can lead to suboptimal outcomes or negative unintended consequences.^{6 9}

We propose an iCCM Systems Framework that aims to address these elements. The purpose of the iCCM Systems Framework is to elevate the discussion of iCCM from specific measurement criteria to a broader discourse on the interactions that can occur within community health systems, particularly those that underlie an activity and what these might mean for the success of that program component.

Rather than suggesting indicators or accompanying metrics, this framework aims to collate the major systems thematic areas relevant to iCCM with corresponding critical questions that program managers should ask during the planning, implementation and evaluation phases. This allows the planner to move from generic to specific foci, revealing meaningful questions that may be overlooked when focusing on defined indicators.

The utility of the framework lies both in its comprehensiveness and its equal treatment of system components, including the dynamic forces that are challenging to measure yet potentially critical to program success. While the archetypal Building Blocks of Health Systems prescribes the foundational integrants essential to the production of health, this framework better supports the positioning of community health and its determinants effectively within the scope of health systems strengthening.¹⁸ A defining difference of this framework is that it proposes three additional thematic areas, program architecture, context and software, described below. While the framework is not designed to be exhaustive, it does attempt to draw attention to the ‘how’ and the ‘why’ of iCCM and its components. It is intended to complement current iCCM and community-based frameworks with new health systems domains vital to the design and success of the intervention, and to expand existing domains with a broader scope. Finally, the framework is unique in that its contents are guided primarily by contributors of the Global South who are heavily involved with on-the-ground iCCM implementation.

METHODS

This framework is the product of the domain charting process of a scoping review for the design, implementation and evaluation of iCCM, and is informed by working groups and structured interviews with stakeholders from the iCCM program and policy community. A scoping review approach was used due to its ability to capture the full breadth of the current iCCM literature landscape. This was supplemented by a document review of selected country iCCM policy and publicly available program documents. The methods and criteria for this scoping review can be found elsewhere.¹⁹ As the domain charting process was part of the methodological approach to the development of the framework, results of the literature search are presented in this section.

Patient and public involvement

No patient or health data were collected as a part of the development of this framework, nor were patients or the public involved during the research process.

Literature review

Search strategy

The primary objective of the review was to assess the key thematic areas of emphasis according to the current body of available literature on iCCM. We conducted a literature search in October 2020 in selected electronic databases

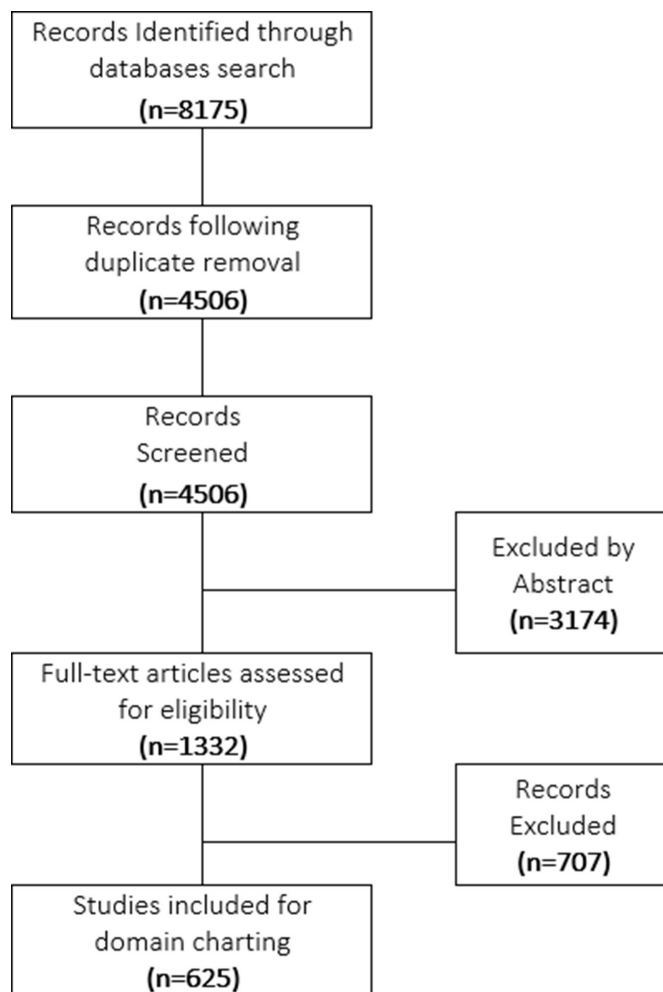


Figure 1 PRISMA document review flowchart.

ISI Web of Science, PubMed, including its archive of full-text articles in PMC, *Ethiopian Medical Journal* and CCM Central using the keywords and Boolean operators “iCCM” OR “integrated community case management” OR “community case management” as prescribed in the scoping review protocol. Testing search terms revealed that the inclusion of “community(-)integrated management of childhood illness”, “community(-)IMCI”, “community(-)based IMCI”, and “CIMCI” in the search strategy was necessary as these antecedent terms served as precursors to the modern definition of iCCM. This search was repeated in October 2021 to include more recently published material. We also manually retrieved relevant peer-reviewed publications from the reference lists of selected articles that were unindexed or did not appear in our original search.

Screening and eligibility

We assessed publications against prescribed inclusion criteria in two stages.¹⁹ In the first stage, we screened titles and abstracts; remaining articles were read in their entirety in the second stage. The search and subsequent application of inclusion criteria were conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method for

scoping reviews. [Figure 1](#) illustrates the flowchart for the collection of review documents according to PRISMA guidelines.

Inclusion and exclusion criteria

The search included only peer-reviewed publications in English that addressed any aspect of iCCM with reference to iCCM, published from 2002. These were not limited to interventional or observational studies, but also included reflections and critical analyses. Studies focusing on neonates or children over 5 years were excluded unless the study in some way assessed the impact of assimilating these age groups into existing iCCM programs and their influence on the intervention. Studies of single CCM interventions such as severe acute malnutrition, intermittent preventive treatment during pregnancy or antenatal care were excluded unless they were integrated into an existing iCCM program where the impact of this expansion on iCCM was assessed in some capacity. If the iCCM structure was simply the delivery mechanism for another intervention (eg, mass drug administration) with no implications for iCCM, the study was excluded. Research assessing general household understanding and behaviours related to childhood pneumonia, malaria or diarrhoea without explicit reference to inform a CCM program was excluded.

Data extraction and analysis

The search yielded a total of 8175 hits, of which 625 were included for the coding development of the framework. A complete list of these sources is provided in online supplemental appendix 1. Data from the final set of articles were extracted and analysed using MaxQDA and MS Excel software. We performed a content analysis of the selected literature according to the Standard Framework Approach, categorising key areas and their elements according to emergent areas of emphasis.²⁰ In the event of discrepancies, the investigators discussed until a consensus was reached. To verify the validity of the resulting code list and categories, we compared them to the existing iCCM Interagency Framework and the WHO Systems Building Blocks on which it is based.^{15 18} Although all domains in our framework emerged organically from the literature, certain domains autonomously mirrored those found in these previous frameworks.

Stakeholder consultations and policy document review

We held stakeholder consultations with iCCM experts to supplement and validate this information. These included technical advisors, country program managers and researchers in the field of iCCM and child health. We also reviewed publicly available global and country-specific iCCM program and policy documents.

Following final development of the framework, a set of critical questions were formulated using a modified Delphi approach.²¹ These questions correspond to each thematic domain category and are designed to be posed to actors at different levels of the programmatic



Figure 2 iCCM Systems Framework domains and categories. CHW, community health worker; iCCM, integrated community case management; HF, health facility; HMIS, health management information systems; M&E, monitoring and evaluation; SOPs, Standard Operating Procedures.

and administrative hierarchy. The critical questions listed are intended to be non-exhaustive, but are considered important enough to warrant discussion by those planning and implementing iCCM. This list was iteratively circulated among iCCM experts resulting in a final compendium of domains, categories and questions. The resulting framework was developed into an interactive, publicly accessible dashboard.

RESULTS
iCCM systems framework

The iCCM Systems Framework comprises 10 domains, 106 categories and corresponding critical questions relevant to each category (figure 2). Tables for each domain, including category definitions and critical questions, can be found in online supplemental table S2. Online supplemental figure S1 illustrates a mind map of the 10 domains and their categories. An interactive version of the framework is available at <https://kumu.io/iccm/iccm-systems-framework> (figure 3).

Each of the following sections describes the thematic domain and its categories as they are relevant to the iCCM intervention and includes a list of key questions. The critical questions posed in this framework operate in a variety of ways. They can be asked at different stages of the planning, implementation and evaluation phases of iCCM and can be used to prompt discussion about the potential consequences of an activity, input, design decision or the influence of embedded context or structures.

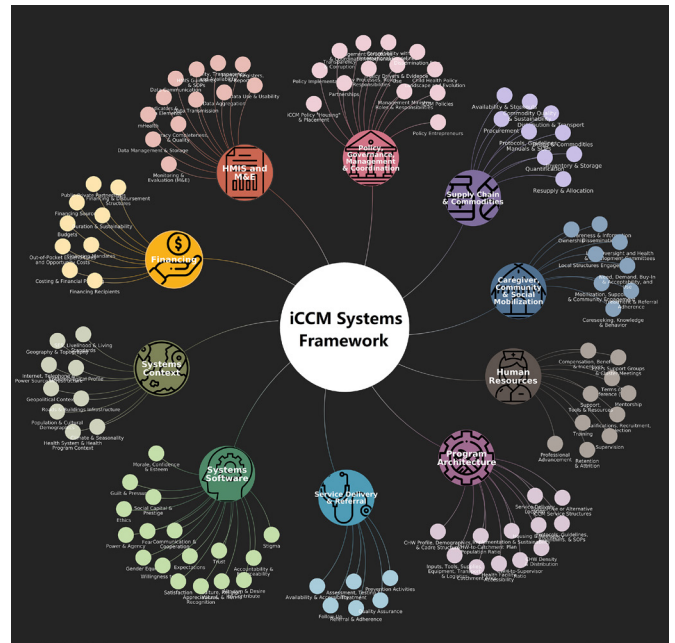


Figure 3 Interactive iCCM Systems Framework. Available at: <https://kumu.io/iccm/iccm-systems-framework>.

The framework posits that a program’s context, its architecture and intangible elements such as power and agency, personal motivations and social norms may govern the outcomes of iCCM to the same or similar extent as other systems factors, such as the presence of a supportive policy environment or the availability of medicines. Just as these elements may influence each other, so might they overlap. For example, the availability of general guidelines for iCCM implementation is relevant to its structure (program architecture), where more targeted operational guidelines are relevant to their associated domains (ie, guidelines specific to community mobilisation or data transmission). Similarly, the way CHW cadres are structured is relevant to both the programmatic setup—or architecture—of iCCM and its human resources (HR). Outside of these 106 categories, some domains include an additional category entitled ‘Systems Considerations’ which explores synergies between domains.

Domain 1: systems context

The systems context domain comprises the natural and preexisting conditions inherent to the situation and setting of a system. The context of a system sets the stage for an intervention and can determine many of the interactions among its parts.²² For iCCM, this can mean assessing how the geographical layout, climate and infrastructural makeup of target areas may affect the types and timing of inputs, medicines, transportation and equipment needed for service delivery. The demographic composition of the population and the geopolitical situation may affect where and how activities can take place and who the intervention can (or cannot) target.^{23 24} Optimising CHW density and distribution is

essential to effective coverage and requires mapping exercises that incorporate contextual factors beyond spatial distances.^{25–27} Healthcare infrastructure, disease burden and epidemiologic profiles may vary across administrative and ecological areas, necessitating a potentially stratified approach to implementation.²⁸ Whether and what type of mobile networks are available in areas of service delivery can affect coordination among downstream program actors or mobile Health (mHealth) applications that depend on them, and electrical infrastructure can affect a CHW's ability to provide services at night or transmit data.^{29–31} The healthcare, socioeconomic and geophysical context can also determine whether iCCM is even a suitable response at all to address child mortality in a target area or population.

Domain 2: program architecture

The core elements that form the backbone of the iCCM intervention are grouped in the program architecture domain. These are not specific to programmatic processes such as data transmission or supply chain, but rather form the overarching setup and typology of iCCM implemented. Factors such as how the program chooses to allocate and geographically arrange its CHWs can set the foundation for coverage, workload and intervention requirements.³² Accounting for how populations fluctuate across target areas is important to tempering expectations and monitoring capacity for service delivery, as is safeguarding a reasonable CHW-to-supervisor ratio to optimise adequate and timely supervision.^{33–34} A judicious approach to defining catchment areas in terms of their breadth and accessibility to the health facility dually ensures better coverage by CHWs and that communities where there is a real need are those targeted for iCCM.³⁵

The program architecture domain also addresses a myriad of other key facets of intervention design and its organisational arrangement. Major context issues can only be overcome with the provision of certain tools and materials, and it is up to programs to either offer these or relay this responsibility to CHWs, supervisors or district managers. Developing ministry-sanctioned and technically vetted protocols and guidelines for CHWs, supervisors and district actors to perform their various functions is indispensable to quality assurance and helps programs align with international standards while measuring achievements. Deciding how CHWs are housed, where they deliver health services, and who, if anyone, should provide these buildings can be a critical determinant of health service utilisation, quality of care and retention of CHWs.^{36–38} In addition, the model of volunteer or remunerated CHWs can have significant implications for program longevity and far-reaching systems impacts such as the type of primary healthcare models promoted within the country.^{39–42} Finally, the development of a timely, well-reasoned and practical handover plan for ministry ownership is imperative to ensure fluid transition and sustainability of program gains.⁴³

Domain 3: policy, governance, management and coordination

The extent to which iCCM can be considered a tenable strategy depends on whether and how its basic tenets are enshrined in local policies; how these are advocated by influential political champions; and how the ecosystem of governing structures and management partners organise responsibilities among themselves and other key stakeholders.^{9–44–47} This is the focus of the policy, governance, management and coordination domain, which describes the coordination among program actors and the policy landscape underpinning the iCCM intervention. Policy players, managing partners and the technical working groups that oversee and steer iCCM implementation can have a palpable impact on intervention success by shaping or enacting legislation that is both thorough and realistic. This facilitates program design that is appropriately aligned with and integrated into country health systems, while promoting its sustained priority as a regular part of the expected health service delivery package.

However, how successful these actors are depends not only on the development of an enabling policy environment, but also on the arrangement of primary healthcare and how it has evolved within the country's health system.⁴⁷ The scope of iCCM policy can be shaped by factors such as the ministry jurisdiction under which it is placed, existing policies for CHW cadres that preceded iCCM, and the influence of powerful policy entrepreneurs outside of common dialogues.⁴⁷ In addition to policy, management and coordination mechanisms among ministries, non-governmental organisations (NGOs), multilateral organisations and other multisectoral partners can be decisive in determining the impact and continuity of iCCM. How these groups liaise with each other and clearly define their roles and responsibilities at the national, state and local levels lays the groundwork for the capacity building necessary to promote successful program handover.⁴⁶ Moreover, mechanisms for such intersectoral partnerships are necessary to act on local social determinants of health for change.⁴⁸ Finally, transparency among political entities, and the presence and influence of corruption in health systems, are important forces influencing health systems behaviour and merit examination in the context of iCCM.⁴⁹

Domain 4: financing and costing

Uninterrupted, sufficient and well-allocated funding is considered the cornerstone of robust and sustainable health programs.⁵⁰ The iCCM intervention often, if not exclusively, relies on external funding partners that usually operate in parallel with an assembly of financial structures. Different components of the intervention may be funded by multiple entities, resulting in duplicative resources for some areas of iCCM or insufficient allocations for others.⁵¹ If these mechanisms are not coordinated, they risk creating financial misalignment and fragmenting implementation efforts. The way in which ministries earmark funds for iCCM as part of their health expenditure is not only a question of how much and to

which activities funds are allocated, but also the administrative division to which these funds are directed. If resources are allotted to specific iCCM activities (eg, revitalising an existing cadre of CHWs) in selected administrative areas, scale-up efforts would be remiss not to ensure continuity in the areas of initial implementation before expanding resources to other regions.⁵² The kind of financial disbursement mechanisms at lower levels of government and the presence of public–private partnerships may affect which administrative areas and what aspects of the program are prioritised.^{52 53} Planners should anticipate the likely duration of funding streams for inputs and activities and project how the termination of these funds might not only affect gains achieved through the program, but also lead to unwanted effects resulting from local reliance on and abrupt disruption of services. Finally, managers should define the financial and opportunity costs that providers and recipients will incur for the operationalisation of iCCM.⁵⁴

Domain 5: health management information systems and M&E

Health management information systems (HMIS) encompass the processes of data collection, transmission and use within the iCCM intervention, while monitoring and evaluation (M&E) provides a blueprint to ensure the program is operating as intended. In addition to monitoring, the data form the evidential basis for iCCM and are critical to evaluating its deficiencies and impact. This goes beyond data accuracy or how information is transferred between levels of hierarchy. This means ensuring that granular data are not only accessible, but also aggregated in a format that is both useable and useful for effective monitoring and readily available to decision-makers at different levels.^{55 56} How, in what format, and where data are reported and stored can have implications for completeness, transparency, use and even reporting frequency, while influencing how data are linked with the national health system.^{57 58} Critical to overcoming commonplace bottlenecks of evaluation is ensuring that the data elements actually exist to calculate the indicators needed for decision-making and that they are organised in a format conducive to extracting information.^{59 60} The surge of mHealth used in iCCM and other programs in which CHWs frequently participate can impact the data collection burden on CHWs, as well as dependency on hardware that may not always operate effectively.^{61 62} Visibility and visualisation of data, especially at lower levels, have the potential to change the way stakeholders use information to make decisions and influence community understanding of program impacts.^{63 64} A comprehensive M&E plan is necessary to track and measure overall program performance. Finally, it is important to ensure that CHWs, supervisors and ministry stakeholders have the appropriate training and guidelines to inform their data collection and reporting procedures to standardise these activities while maximising data quality and use.^{65 66}

Domain 6: commodities and supply chain

Experts in iCCM globally endorse the mantra ‘There is no program without a product’ (15). Domain 4 of the framework is not solely focused on the ready availability of sufficient quantities of quality medicines at the community level. It also underscores that their procurement and quantification processes, and the formulas that underpin them, can contain overlooked causes of supply chain deficiencies beyond common transport and infrastructural challenges ubiquitous in LMICs.^{67 68} Sufficient resupply and product allocation require accurate projections of actual community demand, which depends on factors that may not be captured simply by measuring aggregate product consumed.⁶⁹ The way district authorities and supervisors choose to allocate supply among CHWs can also determine the potential for stockouts to occur, especially in the absence of standardised procedures.^{67 70} The domain also emphasises its interdependence on other areas, such as how treatment and drug consumption data are recorded and aggregated, whether and how district pharmacists are trained in quantification and allocation processes, and the existence and enforcement of regulatory drug procurement and distribution policies. Systems considerations, such as whether an implementing partner uses existing country supply chain mechanisms or develops one in parallel, can affect the ability of local systems to appropriately support product supply and distribution after program handover.⁷¹

Domain 7: service delivery and referral

Service delivery in iCCM encompasses the series of activities performed by the CHW to ensure an illness case achieves an optimal health outcome. This begins when a case successfully attains contact with the CHW; receives a diagnostic test (in the case of fever or cough and fast breathing); is appropriately treated and/or referred; until finally exiting the care pathway through adhered referral and/or follow-up by the CHW.⁷ While these activities require guidelines for diagnosis and case management to ensure quality and consistency, it is insufficient to simply assure the existence of nondescript plans or algorithms. These must address the specificities of diverse treatment options and diagnostic instruments, suit the organisational context and align with country policy.^{9 44 72–75} How service delivery standards are defined and organised can affect who receives services, when, and how, impacting the workload for CHWs, their capacity to carry out activities, and the quality of services rendered.^{76–80} Defining the expected and feasible schedule for iCCM service delivery, and setting standards for the physical structures of service provision, are arguably important to achieving better health outcomes by optimising CHW availability.^{38 54} Diagnostic ambiguities persist, particularly in the confirmation of pneumonia at the community level, and thus addressing these with clear and practical guidelines and tools is a pressing need of iCCM.⁸¹ Follow-up procedures in practice can be challenging, as can ensuring a clear counter-referral system

that both caregivers and supervisors can easily adhere to and verify.^{82–84} This affects accurate reporting of successful case management and evaluators' subsequent ability to adequately measure outcomes.

Domain 8: human resources

There are many actors within the iCCM intervention, and few are as important as the CHWs who provide services and the supervisors who support and oversee them. The HR domain comprises the recruitment, selection and training of CHWs, their terms of reference, and performance quality control provided by supervisors. Who has a say in the selection of CHWs, what expectations are placed on the CHW, or which training modules CHWs and supervisors have or have not completed can significantly affect how services are delivered and how stakeholders relate to and manage their responsibilities.^{85–88}

We expand this domain to include CHW retention and attrition, CHW mentorship and their meeting forums and peer groups, the last of these having especially demonstrated support for CHW activities and service delivery quality.^{89–90} The domain also includes categories that examine what support channels are available to iCCM service providers, as well as their potential incentives, benefits and career path. Because these aspects of HR can vary widely in different iCCM programs, designers and managers must weigh which components are most applicable to their respective interventions, while also considering how other HR models might better align with their health system environment and intervention goals.

Domain 9: caregivers, community and social mobilisation

The central role that caregivers, the community and local decision-makers play in the success of community programs is increasingly recognised, especially in the case of iCCM.^{91–92} Social mobilisation is the activity that aims to inform these stakeholders and trigger local buy-in and support for the intervention. More than rallying grassroots patronage from local leaders or sensitising communities to the availability and benefits of iCCM, mobilisation sets the tone for how communities and caregivers relate to, support and engage with the CHW and the intervention as a public service.^{92–94} This support, whether moral or material, can arguably serve as an impetus to sustain intervention longevity by both intrinsically motivating CHWs and providing a source of funds that enables them to perform services.^{91–95–96} Establishing or supporting existing local health and development committees as part of the mobilisation strategy has the potential to safeguard this support in the long term and ensure that it is congruous with program needs.⁹⁷

This domain also encompasses community and caregiver knowledge, attitudes and behaviour, which influence the key intervention steps of timely careseeking, treatment compliance and referral adherence, among others.^{98–100} The content of the information, education and communication component of mobilisation can

influence whether caregivers are only aware of disease symptoms and the offer of iCCM services, or if they also understand the voluntary status of the CHW and the necessity of community ownership for its continuity. Who delivers these messages, such as external mobilisers or participating CHWs themselves; and to whom, whether these target female caregivers or the village at large; can affect what information is conveyed and how it is received, and subsequently impact the opportunities for successful integration.^{101–102}

Domain 10: systems software

There can be no system without the dynamic interactions of the actors within it. The systems software domain is concerned with the intangible forces at play within community interventions, where the term 'software' refers to its derivation from its namesake framework presented by Sheikh *et al.*¹⁰³ These expressions emanate primarily from key stakeholders and can exert profound influence in shaping program outcomes. They include the feelings, motivations, norms and expectations of caregivers, communities, CHWs and their supervisors. These actors can be largely responsible for holding each other accountable through social contracts, especially in the absence of other extrinsic motivational or accountability mechanisms.¹⁰⁴ Factors such as the sense of esteem, recognition, appreciation or support that a CHW enjoys in the community can not only affect morale and motivation, which in turn influence attrition, but also set the precedent for community expectations and standards in their relationship with the intervention.^{92–102–103} Increased social capital and prestige of the CHW position within the community may encourage more frequent careseeking, higher referral adherence rates and possibly increased chances of financial contributions from communities to support activities.^{79–92–105–107} Other factors, such as culture and values, can influence caregiver–CHW relationships and gestures of support, and may also affect the gender composition of CHW cadres.^{107–110} The agency and power dynamics among CHWs, supervisors and district support mechanisms can influence how these actors approach problem solving, or how beholden they feel to each other to complete activities as expected.^{111–112} Feelings of pressure, guilt or fear by the CHW can be greater drivers of service delivery than previously recognised.^{36–85–113–114} Finally, ethical considerations should be given to the overall concept and policy of iCCM, where its relationship to labour, intrinsic motivation, human rights and other SDGs merit reflection.¹¹⁵ How systems software is addressed within iCCM is case-specific and should not be generalised, but exploring these interactions is critical to unpacking unexpected outcomes and mitigating unintended consequences.

DISCUSSION

In this paper, we present a comprehensive systems framework to inform the design, implementation and evaluation

of community-based interventions, specifically adapted to the iCCM intervention. Robust and sustainable community health interventions are predicated on a host of systems factors. These include facets implicit to program design and systems context, and how these interface with both structural and intangible properties of the health system. We argue that it is not enough to examine these elements as isolated aspects of the intervention, but rather that it is valuable to pose meaningful questions about their interactions with each other and the system at large. Doing so can also assist designers and implementers to view interventions such as iCCM as a means to an end, rather than the end itself. This is in line with the recent WHO global review on the integrated management of childhood illnesses (IMCI), which discourages standalone approaches to iCCM and subsequent fragmentation of child health services in favour of those which include iCCM as part of a system-wide strategy.¹¹⁶ Our framework views the elements of community health systems through a wide-angle lens, defines their fundamental building blocks and offers a range of critical questions that the programmer, researcher, policy-maker and technical expert can use to navigate the minutiae of this complex intervention while simultaneously considering its macro interactions.

Current resources abound to support different aspects of iCCM planning, implementation and evaluation targeting a variety of audiences. These are commonly in the form of definitive technical guidance and training packages primarily developed by WHO/UNICEF¹¹⁷; toolkits produced by supporting agencies¹⁴; and country-specific IMCI/CCM taskforce manuals, protocols and policies. One of the most recognised CCM-based frameworks and guidance documents is the USAID Maternal and Child Health Integrated Program (MCHIP) iCCM interagency framework and its accompanying benchmark indicator guide, which streamlines core parameters and provides a necessary foundation for intervention M&E.^{15 16} As a compendium of 48 indicators divided among 8 categories (coordination and policy setting; costing and financing; HR; supply chain management; service delivery and referral; communication and social mobilisation; supervision and performance quality assurance; M&E and HMISs), it focuses on the use of specific activity benchmarks and performance markers to plan and measure progress and certain program processes. Those listed form the backbone of what is most often used to measure coverage of iCCM, and are generally considered essential across different program stages. While this is critical to measuring performance, sole reliance on such metrics risks conflating coverage outputs with intervention success.

For example, the interagency framework indicator 'case-load by CHW' is defined as the 'proportion of CHWs... treating at least x cases per month (to be defined locally)'.¹⁶ A high proportion could suggest a well-served population, quality data reporting, strong community awareness resulting in elevated demand or an efficient and skilled CHW. However, it could also indicate a poor CHW allocation strategy and subsequent saturated population density-to-CHW ratio, a volatile epidemiological profile, or an

inundated and overburdened CHW. The appropriate case-load figure, as suggested by the interagency framework, is relative and context-dependent, and sits between meeting community needs and maintaining CHW service delivery skills. This calculus is necessary to support the basis of the decision-making processes; however, it is not designed to provide further information. Our framework builds on these metrics to assist managers in exploring their emergent dynamics and underlying factors, helping qualify their interpretation and meaning.

Indeed, there is growing recognition of the need to transcend current constructs for conceptualising and assessing complex health systems, with a clarion call to better capture the foundational determinants of the production of health.¹¹⁸ Several efforts have coalesced specifically around the adaptation or inclusion of community health in systems frameworks.^{17 119–123} Each maintain their advantages, as there can be no panacea that is well suited to every context or program. The proposed iCCM Systems Framework aims to complement its contemporaries, specifically the iCCM Interagency Framework, by offering some specific advantages. First, it provides three additional areas of consideration: the systems context, programmatic architecture and systems software domains. These often underrepresented, measurable areas of systems forces can provide necessary insights when determining the configuration and implementation of community interventions. Second, it supports a more profound exploration of existing components in the interagency framework. For example, the coordination and policy setting component of the interagency framework and indicators suggests partner mapping, the identification of existing of CCM policy, and measuring the degree to which policy supports CHW practice of the three illness. Our framework supplements this with the proposed examination of the composition and depth of those policies, how they evolved within the landscape of primary health-care within the country, where governance and execution of iCCM policies are placed, the drivers of and evidence use in their development, and the processes and entrepreneurs that support or hinder them. Similarly, the interagency framework supply chain component details drug registration, availability, stockouts and commodity validity. Benchmarks validate whether quantifications for supplies have been completed, procurement plans developed and implemented, and a resupply logistics system in operation. Our systems framework probes further into the calculations underlying these quantification procedures, drug procurement processes, transport and distribution mechanisms at different administrative levels, commodity inventory and storage practices, and the various health systems factors affecting their resupply and allocation methods. It particularly expounds on the areas of community and social mobilisation, supporting the existing recognition of caregiver knowledge and communication, and elevating these to the inclusion of local oversight, ownership, demand, engagement of traditional structures and barriers to careseeking.

Third, this framework recognises that lower-level stakeholders may be better versed in understanding local

consequences of upstream decision-making and planning. It therefore encourages users to pose questions at a granular level, fostering a broader consideration of decentralised effects on implementation.¹²⁴ Finally, because this framework is not a finite checklist of tasks or indicators, but rather a guide designed to comprehensively address community health as a whole, it pairs intention with consequence, transcending a normative input-output-outcome formula in favour of a holistic translational approach.

The framework is versatile in its utility. It can be used alongside planning documentation to guide decision-makers in their design processes of new or restructured iCCM programs by cultivating a dialogue of the latent consequences of certain design decisions. Such forecasting helps support sustainability at the onset of program preparation. It can also be used to assess where barriers to scale of iCCM may exist, especially where and how structural arrangements may collide with contextual realities. It also provides a robust blueprint to outline evaluations of iCCM programs organised according to each dimension and its subcategory, where responses to critical questions can be assessed to either supplement or constitute the evaluation.

The framework poses some limitations. Further research is required to validate its usability and comprehensiveness. Furthermore, it is not intended to be exhaustive. However, it is expected to cover a variety of systems issues anticipated within the iCCM intervention across various stages of planning and operationalisation. While there is substantive need to streamline implementation efforts, there remains an exigency to recognise that every iCCM program is different.⁹⁰ Their varying requirements within diverse environments can yield starkly different outcomes, necessitating a context-driven approach to program architecture and implementation. The framework is intended to serve as an aide alongside planning and monitoring guides and tools to provoke discussion and an enriched examination of intervention dynamics.

CONCLUSIONS

Approaches to improving health in the world's most remote and underserved areas continue to evolve, and iCCM is no exception. True systems integration of these interventions surpasses simply combining various health service packages or focusing on outcomes; it requires a thoughtful examination of their intentions, effects and appropriateness across a spectrum of areas. Our systems framework ultimately aims to support context-driven solutions, reduce fragmentation in health systems, and better enable sustainable impact in community health.

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