



USAID
FROM THE AMERICAN PEOPLE

ENHANCING NUTRITION MONITORING, EVALUATION, RESEARCH, WHAND LEARNING IN THE HEALTH SECTOR (NUMERAL)

NuMERAL LEARNING FRAMEWORK

May 2024



Community health worker with caregiver in Preah Vihear Province, Cambodia. Photo by Chan Sothea for RTI International.

COOPERATIVE AGREEMENT NUMBER: 7200AA23CA00021

RTI PROJECT NUMBER: 0219290

APPROVED DATE: MAY 8, 2024

This document is made possible by the generous support of the American people through the U.S. Agency for International Development (USAID) and NuMERAL, led by RTI International and partners. The contents are the responsibility of the authors' and does not reflect the views of USAID or the United States Government

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

NuMERAL's Background.....	I
Project Overview	I
NuMERAL Strategic Approaches	I
Overview of NuMERAL's Learning Framework.....	2
What is Included in the Learning Framework?	2
Main Audience	3
NuMERAL Learning Agenda.....	4
Participatory Process for Developing the Learning Agenda	4
NuMERAL Learning Agenda	5
Focus Area 1: Mainstream nutrition in RMNCAH policies and services.....	5
Focus Area 2: Increase linkages between components of nurturing care with a focus on integrating responsive caregiving and opportunities for early learning into nutrition policies and programs.....	10
Focus Area 3: Improve assessment and prevention of micronutrient deficiencies and anemia...	14
Cross-cutting issues	20
Prioritization within the NuMERAL Learning Agenda.....	22
Why is Prioritization Important?	22
NuMERAL's Contribution to Addressing Evidence Gaps	22
Prioritization of NuMERAL's Learning Agenda.....	23
Locally Implemented Learning.....	25
Generation and Translation of Evidence through Sub-awards to Local Partners	25
Types of Sub-awards	25
Review of Sub-awards to Local Partners.....	26
Evidence Translation.....	27
Unit of Evidence	27
Main Audience	27
Evidence Broker	27
Evidence to practice plan.....	28
Evidence Sharing Platforms.....	28
Evidence Documentation and Dissemination.....	28
Localization and capacity strengthening	29
Governance.....	31
Management	31
NuMERAL Advisory Board	31
NuMERAL Core Scientific Committee (CSC).....	31
Monitoring Progress of the NuMERAL Learning Framework.....	32
References.....	33

LIST OF EXHIBITS

Exhibit 1. NuMERAL’s Learning Framework.....	2
Exhibit 2. Illustrative Examples of Learning Modalities	22

LIST OF BOXES

Box 1: NuMERAL Focus Areas.....	1
Box 2: NuMERAL Strategic Approaches	1
Box 3: Guiding Principles to Develop the Learning Agenda.....	4
Box 4: Rapid Literature Review Methodology	5
Box 5: Themes to Mainstream Nutrition in RMNCAH Policies and Services	6
Box 6: Assess Current Integration in RMNCAH Contact Points: Illustrative Questions.....	6
Box 7: Improve Analysis of the Cost of Integrating Nutrition into RMNCAH Services and Policies: Illustrative Questions	7
Box 8: Increase Community Engagement and Demand for Integrated Nutrition Services: Illustrative Questions	7
Box 9: Improve Policy and Governance for Mainstreaming Nutrition in RMNCAH: Illustrative Questions.....	7
Box 10: Ensure Adequacy of Health Provider Capacity in Delivering High-Quality Nutrition Interventions within RMNCAH Programs: Illustrative Questions.....	8
Box 11: Improve Experience of Care Regarding Integrated Nutrition and RMNCAH Services: Illustrative Questions	9
Box 12: Improve Data Availability for Nutrition Interventions in RMNCAH: Illustrative Questions.....	9
Box 13: Improve Data Use for Decision-Making about Nutrition Services in RMNCAH: Illustrative Questions.....	10
Box 14: Increase Linkages between Components of Nurturing Care with a Focus on Integrating Responsive Caregiving and Opportunities for Early Learning into Nutrition Policies and Programs: Themes	10
Box 15: Enhance Understanding of the Degree to which RCEL Interventions may be Appropriately Adapted for the Cultural Context of Caregiving and Caregivers’ Preferences: Illustrative Questions.....	12
Box 16: Increase Understanding of and Improvement in Caregivers’ Experiences of RCEL Interventions: Illustrative Questions	12
Box 17: Improve Design and Implementation of RCEL Interventions: Illustrative Questions	13
Box 18: Improve Integration of RCEL Interventions with Existing Systems: Illustrative Questions	13
Box 19: Improve the Use of Indicators for RCEL Interventions : Illustrative Questions.....	14
Box 20: Improve Indicators for Child Development: Illustrative Question.....	14
Box 21: Improve Assessment and Prevention of Micronutrient Deficiencies and Anemia: Themes	14

Box 22: Assessing Safety, Efficacy, and Cost-Efficiency of Micronutrient Interventions: Illustrative Questions.....	16
Box 23: Review of Biomarker Methodology and Criteria to Diagnose Deficient and Excessive Micronutrient Status: Illustrative Questions.....	16
Box 24: Increase Capacity Strengthening and Platform Development for Surveillance of Micronutrient Deficiencies and Anemia: Illustrative Questions	17
Box 25: Enhance Efforts in Understanding Analysis and Reporting on Data Related to Anemia and Its Etiological Factors: Illustrative Questions	18
Box 26: Inform about Comprehensive Data Collection, Interpretation, and Use on Causes of Anemia at the National and Global Levels: Illustrative Questions.....	18
Box 27: Increase Considerations of Biological Factors when Delivering Micronutrient and Anemia Interventions: Illustrative Questions	19
Box 28: Increase Use of Data to Inform Selection of Micronutrient and Anemia Interventions: Illustrative Questions	19
Box 29: Tailor the Design and Delivery of Micronutrient and Anemia Interventions to the Local Context: Illustrative Questions	20
Box 30: NuMERAL Principles of Prioritization	22
Box 31: Modified Delphi Method.....	24
Box 32: Key Elements of Evidence Translation	27
Box 33: Localization, Coordination, and Collaboration within NuMERAL	29

ACRONYMS AND ABBREVIATIONS

APHRC	African Population and Health Research Center
COI	conflict of interest
CSC	Core Scientific Committee
ECD	early childhood development
ECDI2030	Early Childhood Development Index 2030
GSED	Global Scales for Early Development
HMIS	health management information system
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
LMIC	low- and middle-income country
NuMERAL	Enhancing Nutrition Monitoring, Evaluation, Research, and Learning in the Health Sector
RCEL	responsive care and early learning
REOI	request for expression of interest
RMNCAH	reproductive, maternal, newborn, child, and adolescent health
RTI	RTI International
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHO	World Health Organization

NUMERAL'S BACKGROUND

Project Overview

Achieving optimal nutrition and early childhood development (ECD) outcomes at scale mandates new ways of working and learning. It requires bringing together a diverse group of health sector leaders, program implementers, and researchers to collaboratively generate and use evidence to guide holistic policies and programs.

The U.S. Agency for International Development (USAID)-funded Enhancing Nutrition Monitoring, Evaluation, Research, and Learning in the Health Sector (NuMERAL) Activity (subsequently, “the project;” 2023–2028) is at the forefront of this change. NuMERAL is designed to support local research, monitoring, and evaluation, and its translation to inform country-level and cross-national learning, collaboration, and action across three focus areas (**Box 1**). The project places a strong emphasis on locally led efforts to generate, use, and properly document and disseminate evidence with the intent of enhancing the capacity of health systems to deliver integrated, evidence-based services. Through NuMERAL, we strive to contribute to the long-term impact of improved survival, health, physical growth, cognitive development, school readiness, and school performance in children and adolescents; improved survival, health, productivity, and wages in women and adults; and improved prosperity and cohesion in societies (United Nations Children’s Fund [UNICEF] 2021).

Box 1: NuMERAL Focus Areas

- Mainstreaming nutrition in reproductive, maternal, newborn, child, and adolescent health (RMNCAH) policies and services.
- Integrating responsive caregiving and opportunities for early learning into nutrition policies and programs.
- Improving assessment and prevention of micronutrient deficiencies and anemia.

NuMERAL Strategic Approaches

NuMERAL will achieve its objectives through four strategic approaches (**Box 2**), each aligned with the project’s four intermediate results. The first strategic approach focuses on empowering local partners to lead evidence-generation activities from the design stage to the end-use and publication stages. This involves not only enhancing the technical expertise and institutional capacity of local partners, but also facilitating and supporting their collaboration with key stakeholders. Local partners are defined as individuals, communities, networks, organizations, and private entities that are either actively collaborating with or keen on collaborating with NuMERAL. Stakeholders include governments, donor organizations, civil society and multilateral organizations, and the private sector, all of which play a role in the translation and adoption of evidence. The second strategic approach seeks to increase the generation of evidence on nutrition and ECD within the health sector, ensuring it effectively informs policies, programs, and information systems. The third approach centers on translating evidence to inform country-level and cross-national learning, collaboration, and action. The fourth approach addresses the critical need to strengthen and use nutrition and ECD information systems for informed decision-making. These four approaches each represent a key strategic area integral to the project’s success and are incorporated into the NuMERAL Learning Framework.

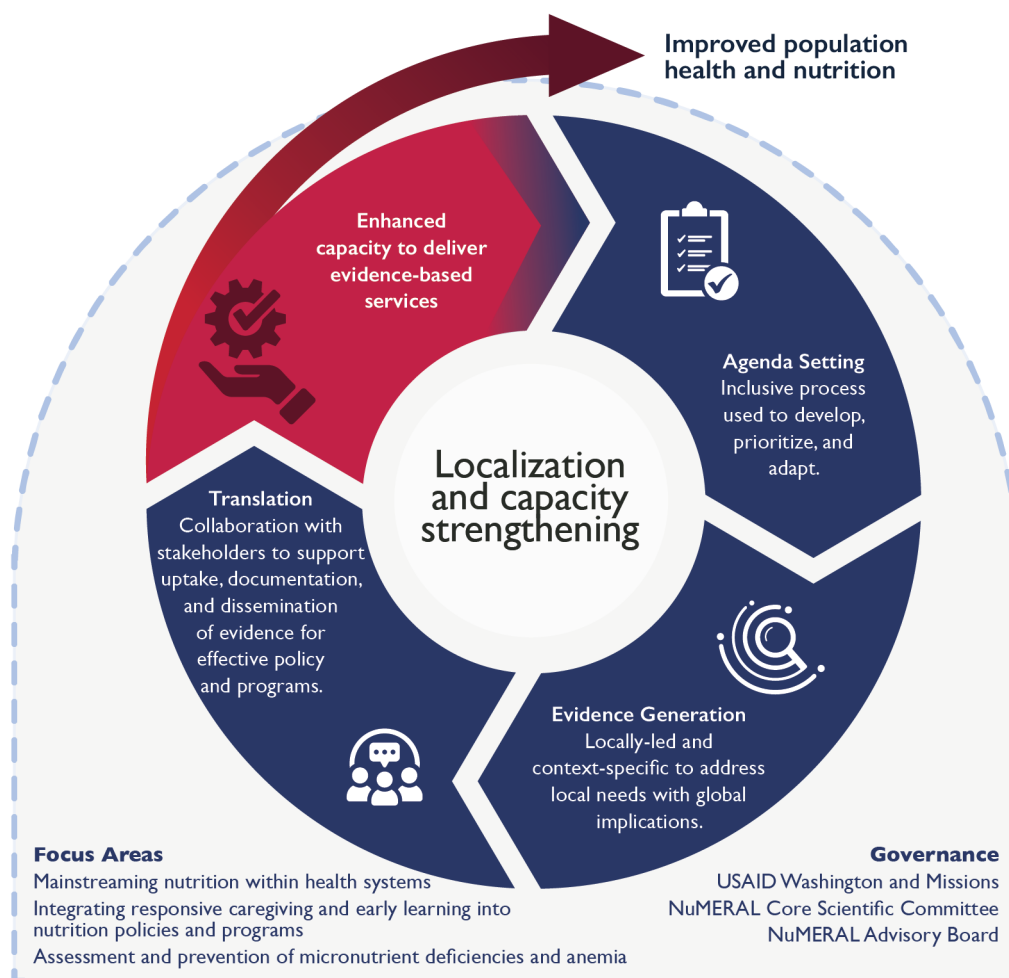
Box 2: NuMERAL Strategic Approaches

- Increased local partners’ leadership and strategic partnerships.
- Strengthened and expanded evidence base for implementation.
- Evidence translated for learning, cross-country sharing, and utilization.
- Optimized monitoring, evaluation, and information systems in nutrition and ECD.

OVERVIEW OF NUMERAL'S LEARNING FRAMEWORK

The NuMERAL Learning Framework serves as a guide to support collective learning in nutrition and ECD within the project. Generally, learning frameworks provide a useful tool for formulating the underlying structure of learning programs and guiding research and policy agendas (Partelow 2023). As such, our Framework outlines the project's core principles and approaches to agenda setting, evidence generation, and translation of findings with the goal of enhancing the capacity of health systems to deliver evidence-based services (**Exhibit I**).

Exhibit I. NuMERAL's Learning Framework



What is Included in the Learning Framework?

The Learning Framework includes several key components as described below.

- **Localization and capacity strengthening.** The Framework prioritizes leveraging collective knowledge and expertise to foster strong partnerships and collaborator relationships. It highlights our commitment to fair and equal collaboration, following the principles of decolonization to address power asymmetry. This involves tackling imbalances in power dynamics, focusing on what communities need, diversifying voices, and engaging with respect and dignity.

- **The NuMERAL Learning Agenda.** Developed using a transparent and collaborative process, the 5-year Learning Agenda outlines specific themes, sub-priorities, and illustrative questions to inform evidence generation across the project's three focus areas.
- **Prioritization within the NuMERAL Learning Agenda.** Designed to be flexible through the project's duration, the Learning Agenda intends to be a global good for those involved in nutrition and ECD. It is strategically positioned to address critical gaps while being tailored to meet the needs of different regions and countries.
- **Evidence generation and its translation, documentation, and dissemination.** The Framework lays out a roadmap for operationalizing the Learning Agenda. This includes supporting local partners in producing evidence and engaging them in its translation, as well as documenting and widely disseminating the findings and experiences. This approach seeks to find a balance between meeting local country needs and advancing learnings that have global implications.

Main Audience

The primary audiences for this Learning Framework consist of actors either currently engaged with or interested in engaging with NuMERAL. These actors include:

- Local partners, such as individuals, communities, networks, organizations, and private entities, either actively collaborating with or keen on collaborating with the NuMERAL project.
- Stakeholders like governments, donor organizations, civil society and multilateral organizations, and the private sector, all of whom play a role in the translation and adoption of evidence.
- USAID/Washington and USAID Missions, along with their implementing partners, who are involved in or interested in supporting and contributing to the project.

While these are the primary audiences for the Learning Framework, the Learning Agenda enclosed within can be utilized by a wider audience of health, nutrition and ECD practitioners as a global good, since it outlines gaps and presents ideas to other organizations, partners, and countries to contribute to the global evidence-base.

NUMERAL LEARNING AGENDA

Nutrition, caregiving, and early learning all play an important role in long-term health, growth, cognition, academic achievement, and productivity (UNICEF 2021). Despite concerted efforts to address maternal and child malnutrition, countries globally have not yet met the 2025 nutrition goals set by the World Health Assembly. Although the nutrition community has developed an evidence base for some nutrition interventions that can significantly improve nutritional outcomes through the health sector (Keats et al. 2021), scaling these interventions equitably and ensuring their quality within national health systems presents ongoing challenges (Heidkamp et al. 2020; Salam, Das, and Bhutta 2019a). Additionally, although the effectiveness of ECD interventions is recognized, the evidence base is still evolving on which aspects of these interventions are the most impactful in different contexts and how to integrate them into existing systems (Black and Dewey 2014; Black et al. 2017).

The past decade has seen rapid progress in maternal and child nutrition research, providing guidance on effective interventions to address malnutrition (Keats et al. 2021; Bhutta et al. 2013). Research is increasingly focusing on how interventions progress in the real-world, non-ideal situation; thus, providing a more genuine portrayal of their effectiveness (Keats et al. 2021). Despite these advances, disparities in nutrition and ECD outcomes remain, especially affecting marginalized groups and those in varied conditions, such as different geographies, socioeconomic status, gender, health, literacy, and educational backgrounds (Harris and Nisbett 2021; Celhay, Martinez, and Vidal 2020; Alao et al. 2021). Bridging these gaps requires the high-quality, efficient implementation of interventions with wide-scale coverage, guided by an evidence base that understands the multifaceted nature of malnutrition and ECD in various contexts.

Participatory Process for Developing the Learning Agenda

The NuMERAL Learning Agenda was developed to guide learning activities that will inform effective context-specific approaches in the fields of nutrition and ECD and to serve as a global good for others engaged in learning activities. We established a set of guiding principles (see **Box 3**) and applied these principles in shaping the NuMERAL Learning Agenda through the incorporation of the following inputs:

- We held a series of internal consultations on each focus area and cross-cutting topics with subject matter experts from the NuMERAL Consortium. These discussions were instrumental in shaping the initial agenda.
- Following these consultations, we carried out a series of external consultations for each focus area with subject matter experts representing diverse research, policy, and program experiences. The purpose was to validate the Agenda's existing content and identify remaining gaps.
- We conducted a rapid literature review to identify existing knowledge gaps within the three focus areas (**Box 4**).
- We held consultations with USAID Missions and USAID/Washington to ensure that the Learning Agenda aligns with identified gaps in the evidence.

Box 3: Guiding Principles to Develop the Learning Agenda

- Responsive to the gaps in knowledge, latest thinking, and most up-to-date evidence.
- Complementary to ongoing work and learnings.
- Inclusive of diverse research and practice backgrounds and perspectives.
- Transparency on the development, validity, and use of the agenda.

- Finally, the NuMERAL Advisory Board conducted a review to ensure that the Learning Agenda is responsive to global and local needs.

Box 4: Rapid Literature Review Methodology

The objective of the rapid literature review was to summarize knowledge gaps; existing learning agendas; and future directions for research, monitoring, and evaluation across the project's three focus areas. The search strategy for the rapid literature review included published and gray literature and focused on documents that outlined future research needs and learning agendas in the three focus areas. We searched for English articles in four databases (PubMed, Embase, Web of Science, CINAHL) and used a snowball technique to include articles obtained from a manual search and suggested by NuMERAL experts. We included 53 articles from 2,428 search results. Findings* from this review are provided as a supplementary file. These results were used to inform the Learning Agenda themes, sub-priorities, and illustrative questions with the recognition that knowledge is continually evolving. Only the most up-to-date gaps identified in the literature were incorporated into the Learning Agenda.

*The results of the search were synthesized by Kavle Consulting LLC under the terms of the agreement C000631469 with RTI International.

NuMERAL Learning Agenda

The Learning Agenda is organized by NuMERAL's three focus areas: (1) mainstreaming nutrition in RMNCAH policies and services, (2) integrating responsive caregiving and opportunities for early learning into nutrition policies and programs, and (3) improving assessment and prevention of micronutrient deficiencies and anemia, with a section for cross-cutting topics. Each focus area includes learning themes, sub-priorities, and illustrative questions.

Focus Area 1: Mainstream nutrition in RMNCAH policies and services

The health system plays a vital role in delivering nutrition interventions, especially those that focus on promoting the health of children and mothers. Expanding the reach of nutrition interventions to individuals who are already accessing health services can significantly accelerate progress toward improved nutrition outcomes (King et al. 2021b; Heidkamp et al. 2020). A key method for understanding health systems is through their building blocks. To this end, the World Health Organization (WHO) established the WHO Framework in 2010 to help enhance the performance of national health systems (WHO 2010). The WHO Framework categorizes health systems into six components or "building blocks:" (1) financing, (2) health workforce, (3) information systems, (4) medical products and technologies, (5) leadership/governance, and (6) service delivery.

Efficacy trials have provided substantial evidence on the positive impacts of direct healthcare nutrition interventions on nutritional outcomes (Keats et al. 2021). However, recent reviews by King et al. (2021a) and Salam, Das, and Bhutta (2019a) underscore the need for additional research to identify the most effective ways to mainstream and integrate nutrition within RMNCAH policies and services.

Efforts to strengthen nutrition within RMNCAH services are ongoing in many contexts, primarily through programs, such as the Integrated Management of Childhood Illness/Integrated Community Case Management project, Child Health Days, immunizations, and antenatal care services (Salam, Das, and Bhutta 2019b). However, the evidence base on strengthening nutrition services with RMNCAH using the six WHO building blocks is limited. Studies from Salam, Das, and Bhutta (2019b) and Pérez-Escamilla and Engmann (2019) highlight the complexities involved with integration. These studies emphasized that integration or mainstreaming nutrition is a multifaceted task that requires careful analysis and planning to design programs considering various context-specific factors. Such planning is critical to ensure fidelity in implementation, client's compliance, and the long-term sustainability of programs. **Box 5** lists the three organizing themes for Focus Area 1, which are further discussed below.

Box 5: Themes to Mainstream Nutrition in RMNCAH Policies and Services

- **Theme 1:** Improve integration of nutrition in RMNCAH services.
- **Theme 2:** Improve quality of care in nutrition services in RMNCAH.
- **Theme 3:** Improve data ecosystem to track the coverage and quality of nutrition services in RMNCAH.

Theme 1: Improve integration of nutrition in RMNCAH services

Integration can be measured in several ways. The WHO defines integration as the management and delivery of services so that clients receive a continuum of preventive and curative care based on their needs across the health system (WHO 2018). In the context of RMNCAH services, integrating or “mainstreaming” nutrition refers to embedding and delivering nutrition interventions through existing service contact points across a broad range of health services using health system inputs, such as availability of supplies, equipment, workforce, and information systems. This approach is not only efficient but also serves as a catalyst for improving health outcomes. However, despite the clear advantages, the extent to which nutrition services are integrated into routine RMNCAH services is not well known and there is considerable variability and limited data on the coverage of nutrition interventions and the quality with which they are delivered within RMNCAH programs (Amouzou et al. 2019; King et al. 2022). This theme is organized around four sub-priorities, detailed below.

Sub-priority 1: Assess current integration in RMNCAH contact points

In recent years there has been a concerted effort to integrate nutrition into RMNCAH interventions and programs. However, a significant challenge exists due to the lack of evidence regarding effective integration models and the reasons why they work. This knowledge gap hampers the successful scaling up of nutrition services within health systems. This sub-priority focuses on key barriers to integration and evaluating the extent to which nutrition is mainstreamed and integrated into existing RMNCAH policies and services by assessing existing models for integration, identifying new models, and identifying gaps and opportunities. This sub-priority will be guided by the health system building blocks as the underlying framework. **Box 6** lists illustrative questions.

Sub-priority 2: Improve analysis of the cost of integrating nutrition into RMNCAH services and policies

Evidence around the cost of strengthening nutrition into RMNCAH services is limited. Previous cost studies have mainly focused on nutrition programs with a narrow focus on single outcomes (e.g., iron status [Bhutta et al. 2013; Horton et al. 2010]). This sub-priority considers both broader efficiencies within the health system and the longer-term benefits of nutrition and health outcomes. The costing studies that will be considered include cost-utility, cost-efficiency, and cost-effectiveness. **Box 7** lists illustrative questions.

Box 6: Assess Current Integration in RMNCAH Contact Points: Illustrative Questions

- How do improved models and approaches for more effective nutrition services delivered through the health system, such as improved counseling, increased provider skills, and knowledge, affect nutrition outcomes?
- How can contact points within the health system be better utilized to deliver nutrition services?
- How does the integration of nutrition in RMNCAH interventions affect human resource requirements and capacity, financing, supplies, and supply chains in resource-poor settings?

Box 7: Improve Analysis of the Cost of Integrating Nutrition into RMNCAH Services and Policies: Illustrative Questions

- How can cost-efficiency and -effectiveness of nutrition interventions or services be enhanced when delivered through existing health systems?
- What is the incremental cost of integrated nutrition interventions (versus stand-alone nutrition interventions) delivered through primary healthcare?
- What are the effective and cost-efficient and -effective approaches to integrate wasting or acute malnutrition prevention efforts into health systems?

Sub-priority 3: Increase community engagement and demand for integrated nutrition services

Demand for integrated nutrition services refers to the capacity of women and caregivers to actively seek healthcare. Generating demand for nutrition and healthcare is critical to improving coverage of nutrition services within RMNCAH. Engaging communities (including fathers) and civil society organizations can be instrumental in increasing demand for nutrition services and is central to the design and delivery of services within health. Numerous innovative approaches have been developed to increase demand for nutrition and RMNCAH services (Engmann et al. 2016). However, many innovative strategies are tested as pilots, and gaps remain on the most effective approaches for scaling up demand for integrated nutrition services. **Box 8** lists illustrative questions.

Box 8: Increase Community Engagement and Demand for Integrated Nutrition Services: Illustrative Questions

- What are the best strategies for engaging key influencers (e.g., fathers, grandmothers) to promote optimal integrated nutrition practices and services?
- What is the role of local leaders and grassroots organizations in driving demand for nutrition services within existing RMNCAH contact points?

Sub-priority 4: Improve policy and governance for mainstreaming nutrition in RMNCAH

Insufficient governance and weak policy frameworks hinder the efficient allocation of resources, transparency, and accountability in program implementation and can present significant challenges to mainstreaming nutrition in RMNCAH services. As highlighted in the 2013 Lancet Series on Maternal and Child Undernutrition (Gillespie et al. 2013), the governance and policy gap can be a major barrier to strategic planning, resource mobilization, and establishment of standards and guidelines. Examining RMNCAH policies related to nutrition across different domains, like maternal and child health, reproductive health, and infection, and assessing whether nutrition messaging across these areas is synergistic is important. **Box 9** lists illustrative questions.

Box 9: Improve Policy and Governance for Mainstreaming Nutrition in RMNCAH: Illustrative Questions

- What are the gaps in existing RMNCAH policies for nutrition services (e.g., weekly iron and folic acid supplementation among adolescent girls)?
- How can the capacity of policymakers, influencers, and decision-makers be strengthened to increase evidence-informed decision-making for prioritization of nutrition issues, geographical location, and resource optimization?

Theme 2: Improve quality of care in nutrition services in RMNCAH

The Lancet Global Health Commission on High Quality Health Systems delivers a compelling message on the importance of enhancing the quality of healthcare across the entire healthcare system (Kruk and Pate 2020). Quality of care has been traditionally grouped into various domains, as follows (Donabedian 1988):

- **Inputs:** Service availability and whether a provider has access to needed equipment, diagnostics, and medicines. Referred to as readiness measures.

- **Service delivery:** The extent to which health providers follow protocols or standards of care.
- **Outcomes:** Covers both health benefits and patient satisfaction.

More recently, WHO has established standards of care aimed at improving the quality of maternal and newborn care in health facilities (WHO 2016). Recognizing the significant progress made in reducing maternal and child deaths over the past two decades, WHO has emphasized the need for improved quality of care during labor, delivery, and the immediate postnatal period. This is promoted through a comprehensive Quality of Care framework and standards focusing on the provision and experience of care around childbirth. The Quality-of-Care framework consists of eight domains, each backed by specific standards to ensure high quality care during childbirth and early neonatal period. These standards along with quality measures, outline the requirements for routine care and the management of complications, centering on women, the newborn, and the family (WHO 2016).

Inadequate quality of care can undermine the effectiveness of nutrition programs as they often manifest as inconsistencies and missed opportunities in service delivery, insufficient adherence to evidence-based practices, and a lack of patient-centeredness in nutrition and RMNCAH services. Although the assessment and enhancement of quality of care has received significant attention in the RMNCAH community, this priority has not received the same support in the nutrition community (King et al. 2021b). Furthermore, current methods for measuring nutrition intervention coverage within RMNCAH services are insufficient in capturing the quality of services delivered (Amouzou et al. 2019). Implementation of quality-of-care standards can impact the delivery of existing or new nutrition services. This theme will also assess the implementation of existing or newly developed quality-of-care standards on nutrition services. It is organized around two sub-priorities.

Sub-priority 1: Ensure adequacy of health provider capacity in delivering high-quality nutrition interventions within RMNCAH programs

Health providers' capacity to deliver high-quality nutrition programs into health programs and address access inequity is crucial, but it is hindered by several challenges (Development Initiatives 2020). These include inadequate job descriptions leading to a lack of clarity in providing nutrition services and inadequate pre-service and in-service training and opportunities to build skills on the job and stay updated with global nutrition policies and protocols. Additionally, there are limited strategies to broaden the range of health professionals providing nutrition services to strengthen the delivery of nutrition services within the health system (Development Initiatives 2020). Training, supervision, and motivation are essential to nutrition workforce preparation, yet there is limited evidence on management capacities and strategies for motivating the nutrition workforce (Menon et al. 2014). **Box 10** lists illustrative questions.

Box 10: Ensure Adequacy of Health Provider Capacity in Delivering High-Quality Nutrition Interventions within RMNCAH Programs: Illustrative Questions

- What factors of health workforce training, planning, and performance (e.g., specific job descriptions and requirements, skills building, support, equipment and supplies, and incentives) affect the degree of nutrition interventions integration?
- How can the quality of counseling be improved and high-quality nutrition counseling be supported within the health system?
- What are the parameters for assessing the quality of integrated nutrition and RMNCAH programs?
- How does the availability and management of nutrition supplies affect the quality of nutrition services within the health system?

Sub-priority 2: Improve experience of care regarding integrated nutrition and RMNCAH services

There are notable gaps in understanding the quality of patient interaction and the experiences of clients, particularly when they are receiving recommended nutrition interventions in RMNCAH services (Ramadan et al. 2023). The WHO Quality of Care standards emphasizes “the experience of care” as fundamental aspect of their framework, focusing on the interpersonal interactions between health care providers and their patients. The standards highlight communication, respect for patient dignity, emotional support and the provision of care that responds to the needs and preferences of women and their families. The standards also highlight the importance of ensuring privacy, preventing mistreatment, and facilitating informed choices and the continuity of care (WHO 2016).

Box 11 lists illustrative questions.

Box 11: Improve Experience of Care Regarding Integrated Nutrition and RMNCAH Services: Illustrative Questions

- How can we update or adapt existing job aids to help improve the experience of care and meet caregivers where they are, based on their needs and context?
- How can we examine whether there are disparities in the quality of nutrition services received by different population groups, including marginalized groups or rural communities?
- What are the perceptions and levels of satisfaction among women regarding the respect and support they receive during nutrition services at health facilities?

Theme 3: Improve data ecosystem to track the coverage and quality of nutrition services in RMNCAH

Despite the critical role of data and nutrition information systems in informing the coverage and quality of evidence-based nutrition interventions, the data landscape in many countries is characterized by limited prioritization, inadequate collection and analysis of nutrition data, insufficient data quality assurance, and inadequate use of data for evidence-based decisions and policy (Piwoz et al. 2019). This theme is organized around two sub-priorities.

Sub-priority 1: Improve data availability for nutrition interventions in RMNCAH

This sub-priority focuses on evaluating the extent to which nutrition data are available; assessing the quality of nutrition data; analyzing the data; and examining whether the data are disaggregated by geographic region, gender, or socioeconomic status. The aim is to assess the equity and coverage of integrated services and identify opportunities and strategies to improve the availability and use of data for policy-making and program design. **Box 12** lists illustrative questions.

Box 12: Improve Data Availability for Nutrition Interventions in RMNCAH: Illustrative Questions

- What are countries' experiences in designing or prioritizing the collection of nutrition indicators in health and management information systems to improve quality of care?
- What indicators can effectively measure quality counseling and its dimensions?

Sub-priority 2: Improve data use for decision-making about nutrition services in RMNCAH

A major challenge with nutrition and RMNCAH services is the gap between data collection and its practical application in policy and service delivery (Maternal and Child Survival Program Partnership 2019). Although it is important to collect data on the right indicators, there is often a disconnect between the availability of high-quality data and its use in informed policy-making, resource allocation, and service delivery. Although nutrition indicators are increasingly being integrated into routine health facility data, challenges remain with effectively using these data in strengthening service delivery and improving nutrition and health outcomes. It is essential to translate the data collected and analyzed into concrete actions to achieve both global sustainable development goals and nutrition-specific objectives at the country level (Piwoz et al. 2019). We will explore the translation of data to programs within this sub-priority; for example, using data by local leaders and partners to design, test, and implement innovative approaches to mainstreaming nutrition within RMNCAH. **Box 13** lists illustrative questions.

Box 13: Improve Data Use for Decision-Making about Nutrition Services in RMNCAH: Illustrative Questions

- Does collection and use of nutrition data for quality improvement efforts lead to better-quality nutrition programming in health systems?
- What are the pathways that data follow from collection to decision-making platforms and users?
- How can we ensure the quality, completeness, and accuracy of nutrition data, and enhance data visualization to support nutrition service delivery, planning, and governance?

Focus Area 2: Increase linkages between components of nurturing care with a focus on integrating responsive caregiving and opportunities for early learning into nutrition policies and programs

Children who do not receive adequate care in the early years of life are at an elevated risk of missing developmental milestones in childhood and may face diminished academic achievement, poor health, and other negative outcomes in adulthood (Britto et al. 2017). The 2016 Lancet Series *Advancing Early Childhood Development: from Science to Scale* provided the scientific basis for the Nurturing Care Framework (described below), which aligns with the Sustainable Development Goals, which represent an urgent call to action to end poverty and other deprivations, improve health and education, reduce inequality, and spur economic growth while tackling climate change. To thrive, young children throughout the world need five indivisible components of the Nurturing Care Framework: (1) adequate nutrition, (2) good health, (3) responsive caregiving, (4) opportunities for early learning, and (5) security and safety (WHO, UNICEF, and World Bank Group 2018). The Nurturing Care Framework was adopted by the World Health Assembly in 2018 and has been advanced globally by UNICEF, the WHO, and the World Bank Group. Conceptual principles of the Nurturing Care Framework have informed policies and programs globally and are translated into the local infrastructure and culture of countries for implementation and ongoing monitoring and evaluation. RCEL has been incorporated into programs for parents and non-parental caregivers and shown to positively influence children's socio-emotional and cognitive development (Black et al. 2023; Jervis et al. 2023). However, much remains to be understood about the implementation and mechanisms driving RCEL interventions, their impact on

Box 14: Increase Linkages between Components of Nurturing Care with a Focus on Integrating Responsive Caregiving and Opportunities for Early Learning into Nutrition Policies and Programs: Themes

- **Theme 1:** Improve understanding of caregiving cultural norms and caregiver experiences.
- **Theme 2:** Improve design of responsive care and early learning (RCEL) interventions and integration of interventions into existing health systems for scale and sustainability.
- **Theme 3:** Improve measures and monitoring of RCEL interventions and child development outcomes.

children’s socio-emotional and cognitive development, and how these services can be delivered cost-effectively and at scale. Box 14 lists the three organizing themes for Focus Area 2.

Theme 1: Improve understanding of caregiving cultural norms and caregiver experiences

Responsive caregiving occurs when caregivers respond to their children’s signals for interaction with developmentally and culturally appropriate behavior that supports children’s socio-emotional development (Dunst and Kassow 2008; Isabella and Belsky 1991). Through responsive caregiving, children learn to feel secure, to manage their emotions, to explore, and to negotiate relationships with others (Dunst and Kassow 2008; Isabella and Belsky 1991). The implementation of responsive caregiving may vary across cultures, as shown in Pakistan, where observed responsive caregiving was positively associated with children’s socio-emotional development (Scherer et al. 2019). The implementation of responsive caregiving also has many linkages to nutrition service delivery—for example, promoting responsive feeding is an integral part of responsive care practice. Children acquire local customs and culturally acceptable interaction patterns through responsive caregiving relationships, thus supporting caregivers’ perceptions of what it means to be a good caregiver. However, indicators for responsive caregiving have been applied inconsistently and often rely on parent-child engagement in learning activities with limited attention to interaction patterns that support children’s socio-emotional development. It is necessary to ensure that local beliefs and customs are included in evidence-based policies and programs to promote children thriving through cooperation among policymakers, program implementers, and communities (Weber et al. 2021). Although children’s early health, growth, and development (including socio-emotional development) follow consistent patterns globally (de Onis et al. 2007; Ertem et al. 2018; Kärtner, Schuhmacher, and Giner Torrens 2020), caregivers’ and policymakers’ perceptions of thriving children are also influenced by cultural norms. Caregivers may be more likely to adapt existing practices, attitudes, and behaviors if they are aligned with the cultural norms, values, and priorities of the community, family, and children (Weber et al. 2021; Harkness et al. 2013). Cultural norms evolve over time (Creanza, Kolodny, and Feldman 2017). The dramatic changes in child survival, fertility, family size, and women’s employment have led to changes in care practices and in support for children’s learning and education (Black et al. 2023). Healthcare providers have begun to involve communities in the planning of intervention research through “community conversations” (Burgess et al. 2023). In the same vein, the personal experiences of caregivers accessing RCEL services (whether provided by government or externally funded programs) influence their satisfaction with those services, engagement with service providers, and adherence to the recommendations. Learning to involve communities and caregivers in planning services and evaluating their satisfaction with services are critical steps in scaling up the delivery of high-quality, cost-effective programs. We will examine how these factors influence RCEL interventions that are linked to nutrition policies and programs delivered through the health system.

Sub-priority 1: Enhance understanding of the degree to which RCEL interventions may be appropriately adapted for the cultural context of caregiving and caregivers' preferences

As the research on RCEL has expanded and implementers have widely adopted the Nurturing Care Framework as the governing theory for early years interventions, community involvement has been and will continue to be needed to ensure that the translation to country-level policies and programs reflects the local cultural patterns. This sub-priority will advance research to understand the interaction of cultural norms of caregiving with RCEL interventions and develop methods for appropriately adapting current learnings to local contexts. Caregiver perspectives also play a role in the types of RCEL interventions they would value within the delivery of nutrition services in the health system. Box 15 lists illustrative questions.

Sub-priority 2: Increase understanding of and improvement in caregivers' experiences of RCEL interventions

RCEL services will only be successful if they reflect caregivers' values and are well received by caregivers, regardless of whether those services are delivered at hospitals, health clinics, community-based settings, at home, or elsewhere. Caregiver satisfaction includes their perception of the ease of incorporating new practices or modifications of existing practices into their daily routines. Different profiles of caregivers (e.g., caregivers of children with disabilities, adolescent caregivers, and male caregivers) likely have variable needs. This sub-priority means to explore the factors that influence the satisfaction with RCEL services among diverse types of caregivers to guide future caregiving interventions linked to nutrition and health systems.

The content and focus of RCEL interventions inherently vary according to the age and skill level of the child and should be refined accordingly. Recommendations for feeding a 4-month-old are different from those for a 24-month-old and may be different still for a child with a developmental delay, disability, or feeding challenge. Therefore, evaluations of caregiver satisfaction should be monitored at regular intervals to ensure that services and messages are updated and revised as needed, while ensuring that they are culturally appropriate, and are prioritized according to the preferences of the caregivers. Often, caregivers find some aspects of the services more useful and satisfying than others—understanding what aspects of the services they have implemented and find satisfying can be helpful in developing and tailoring future services. This sub-priority will advance research efforts to document caregivers' experience of RCEL services as they are implemented with nutrition interventions and services in the health system, and guide future service development.

Box 16 lists illustrative questions.

Box 15: Enhance Understanding of the Degree to which RCEL Interventions may be Appropriately Adapted for the Cultural Context of Caregiving and Caregivers' Preferences: Illustrative Questions

- What cultural factors influence local perspectives on RCEL, and how do these vary—both across diverse contexts and within them?
- How can interventions be developed or adapted to ensure that caregivers' values, preferences, and cultural norms are incorporated into programs' design?
- How do caregivers' goals for their children relate to aspects of the Nurturing Care Framework?

Box 16: Increase Understanding of and Improvement in Caregivers' Experiences of RCEL Interventions: Illustrative Questions

- What are effective ways to monitor caregivers' (including male caregivers, adolescent caregivers, and caregivers of children with disabilities) satisfaction with RCEL services, and how is the information on satisfaction used by the providers?
- What strategies are used to modify RCEL programs in response to feedback from caregivers?
- How can the health system meet the needs of caregivers by strengthening health worker competencies required for implementing RCEL interventions (e.g., through mentoring, training, and creating job aids based on feasible context-dependent solutions)?

Theme 2: Improve design of RCEL interventions and integration of interventions into existing health systems for scale and sustainability

The RCEL evidence base has expanded rapidly in recent years; however, in many cases, neither the theory of change nor the mechanisms driving the change have been addressed, thus limiting policymakers' understanding of the mechanisms necessary for future interventions (Schindler et al. 2019). Although the evidence to guide policymakers about the program cost, and cost-effectiveness of intervention components is emerging (Baek et al. 2023), it is limited (Wilton et al. 2023). These are particularly important considerations as governments allocate scarce resources to scale RCEL interventions and nutrition programs and consider the most effective uses of resources to improve child outcomes.

Sub-priority 1: Improve design and implementation of RCEL interventions

There has been enthusiasm for the potential of implementing multi-component interventions (e.g., nutrition and RCEL) with the possibility of additive and synergistic effects. However, multi-component interventions that cross two sectors have training, administrative, and delivery requirements, along with the challenge of integrating the intervention without overloading the caregivers (Dulal et al. 2021). Thus, there is a risk of reducing the impact of any one component by overwhelming the caregiver. As multi-component interventions are a relatively new area of service provision, evaluations should consider both the benefits and potential harms. Implementation science has a crucial role in building our understanding of the mechanics of program delivery and the models that are most effective and therefore, are appropriate for scaling. **Box 17** lists illustrative questions.

Box 17: Improve Design and Implementation of RCEL Interventions: Illustrative Questions

- What are the additive, synergistic, and unintended effects of multi-component RCEL and nutrition interventions versus single-component interventions, and which models are appropriate for scaling?
- What is the feasibility of implementing multi-component RCEL interventions versus single components in extremely constrained settings?

Sub-priority 2: Improve integration of RCEL interventions with existing systems

To deliver RCEL services at scale—particularly to ensure coverage of the most vulnerable populations (who stand to benefit the most)—the existing health systems can play a critical role (Wilton et al. 2023). Multiple issues surround the operationalization of this integration in conjunction with nutrition service delivery, considering the already overburdened workforce and resource-constrained health systems around the world. **Box 18** lists illustrative questions.

Box 18: Improve Integration of RCEL Interventions with Existing Systems: Illustrative Questions

- How can interventions on RCEL be delivered, adapted, integrated, and scaled into nutrition and health systems? What training and support will be needed for providers, and at which tiers of the health system?
- How should integrated program content and modes of delivery differ depending on population risk and context?

Theme 3: Improve measures and monitoring of RCEL interventions and child development outcomes

As governments and other stakeholders expand their support for RCEL services, the need for valid and reliable measurement and monitoring of these services, and the child outcomes they strive to improve, has increased. The United Nations Sustainable Development Goal 4.2 calls for all children to have access to quality RCEL by 2030, with proposed indicators related to pre-primary education and a measure of RCEL (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2021). Population- and program-based measurement tools and monitoring processes have been developed by the WHO (Global Scales for Early Development [GSED]) for children under 36 months of age (Mccray et al. 2023) and by UNICEF (the Early Childhood Development Index 2030

[ECDI2030]) for children aged 24 to 59 months (Petrowski et al. 2023). Both scales have been used in multiple countries, and WHO and UNICEF are working on a translation between the two scales. We will examine the monitoring of interventions and outcomes in the context of linkages between RCEL and nutrition interventions within the health system.

Sub-priority 1: Improve the use of indicators for RCEL interventions

The implementation of monitoring and evaluation systems can be used to assess program fidelity and to guide program improvement and ensure that programs are responsive to the needs of the communities, families, and children. Considering the diversity of program designs and delivery modalities, we must consider what constitutes a quality RCEL intervention. **Box 19** lists illustrative questions.

Box 19: Improve the Use of Indicators for RCEL Interventions : Illustrative Questions

- How can measures be used to monitor the implementation of integrated RCEL programs to ensure fidelity and quality and improve quality?
- How should we measure the success of programs that integrate nutrition and RCEL, including how well these programs serve people in marginalized populations?
- Which RCEL indicators should be monitored or included in national surveillance programs?

Sub-priority 2: Increase integration of RCEL indicators into health management information systems (HMISs) and other existing data systems

There is a significant opportunity for health systems to incorporate nutrition and RCEL data alongside traditional health measures. However, centralized data systems may be challenging to implement due to the multisectoral nature of data (i.e., data coming from different divisions within ministries of health or from different ministries). Aggregation of multisectoral data may facilitate the ability to draw conclusions about whether investments are having the desired effect on children's health, nutrition, and RCEL outcomes. This sub-priority focuses on development or integration of monitoring and information systems for RCEL. **Box 20** lists illustrative questions.

Box 20: Increase integration of RCEL indicators into health management information systems (HMISs) and other existing data systems : Illustrative Question

- How can indicators of RCEL and ECD be used in health management information systems to inform programs?
- What supports do policymakers need to integrate nutrition and RCEL or ECD indicators into health management information systems?
- When is the use of facility-based surveys most appropriate to improve nutrition and RCEL services, and how can we support the collection of this data source (with consideration given to barriers like cost and health force capacity)?

Focus Area 3: Improve assessment and prevention of micronutrient deficiencies and anemia

Micronutrient deficiencies are frequently known as “hidden hunger” because the symptoms of deficiency often manifest only when they become severe, yet the consequences of mild or moderate deficiency, which are frequently not detected, have large health, social, and economic impacts on individuals and their communities. Anemia is a response of the organisms to external and internal ecological factors that affect the physiological status of the individual (Raiten et al. 2023), but at the same time it is a major contributor to morbidity and mortality worldwide (Global Burden of Disease 2021 Anaemia Collaborators 2023). Anemia is a condition characterized by insufficient or impaired circulating red blood cells for tissue

Box 21: Improve Assessment and Prevention of Micronutrient Deficiencies and Anemia: Themes

- Theme 1: Assess current situation of micronutrient-delivery interventions.
- Theme 2: Improve validity of anemia measurement and its etiological factors.
- Theme 3: Improve selection and delivery of interventions and intervention packages to reduce micronutrient deficiencies and anemia.

oxygenation and reflects the health of the hematologic system (Raiten et al. 2023). The prevalence of anemia and its causes remains unacceptably high around the world, and there has been limited progress toward its reduction over the last 20 years (Stevens, Paciorek, et al. 2022; Stevens, Beal, et al. 2022). Anemia reduction is a complex endeavor to tackle because anemia stems from multiple factors (Global Burden of Disease 2021 Anaemia Collaborators 2023). Although the causes of anemia are multifactorial, they mainly fall into four categories or combinations thereof: (1) infection, inflammation, and chronic diseases; (2) micronutrient deficiencies; (3) gynecological and obstetric conditions, and (4) inherited red blood cell disorders (WHO 2023). This Learning Agenda will primarily consider nutritional assessment of micronutrient deficiencies and anemia, and any related physiological factors like inflammation and infection that exert influence on these biomarkers. Although the Learning Agenda is focused on micronutrients and the nutritional aspects of anemia, we recognize that nutrition is only one aspect of health. Therefore, we will also explore data system needs and delivery of an integrated package of interventions and services that jointly addresses other health conditions related to anemia, e.g., infection and inflammation. **Box 21** lists the three organizing themes for Focus Area 3.

Theme 1: Assess current situation of micronutrient-delivery interventions

Micronutrient deficiencies cause adverse effects beyond anemia, like goiter, cognitive and physical deficits from iodine deficiency disorders, neural tube defects, xerophthalmia, impairment of the immunological response, rickets, and beri-beri, among others (Brittenham et al. 2023; Lowe 2021). These deficiencies are caused by low dietary intake, but also by the simultaneous presence of infections and parasitism. On the other hand, supply of excessive intakes of micronutrients may result in unintended consequences whose public health implications are frequently unknown but that may be severe, such as possible neural and physical negative effects due to iodine (Farebrother, Zimmermann, and Andersson 2019), teratogenic effects due to vitamin A (retinol) during pregnancy (Collins and Mao 1999), alterations on vitamin B12 metabolism because of folic acid (Finnell et al. 2008), hypercalcemia and abnormal bone function because of vitamin D (Tebben, Singh, and Kumar 2016), competition for iron absorption by zinc (Stiles, Ferrao, and Mehta 2024), and increments of cardiovascular diseases associated with high intakes of niacin in healthy individuals (Hathcock 1997). Therefore, it is important to monitor intakes and biomarkers associated with micronutrient status to guarantee safety and efficacy of specific interventions or the combination of them (for example, simultaneous implementation of food fortification and supplementation). Moreover, the appropriate assessment of the status and the impact of interventions will help to allow the most efficient use of resources and hence increase the cost-effectiveness of the interventions.

New biomarkers are also needed, including those that reflect micronutrient deficiency and excess that may be of public health concern (Brown et al. 2021). This thematic area will include commonly studied micronutrients like iron, zinc, vitamin A, vitamin D, folate, and vitamin B12, whose deficiencies are recognized to be of public health importance (Brown et al. 2021). We will also consider other micronutrients such as thiamine, riboflavin, niacin, and pyridoxine, and minerals like calcium and selenium, which are considered “neglected micronutrients” because their public health importance has not yet been established. We recognize that there are topics that are considered research priorities in select low- and middle-income countries (LMICs); for example, folic acid risks for malaria; biological effects of riboflavin inadequacy in sub-Saharan Africa; and interplay between folate and vitamin B12 with respect to neural tube defects in countries where folate deficiency does not exist. To this end, we will consider these topics for prioritization. There are technologies currently being evaluated for research purposes, e.g., “omic” technologies like proteomic, metabolomic, and genetic analysis, which are being developed to obtain metabolic markers at the individual level. Biomarkers and technologies that are being developed and used for research purposes will not be considered under this Learning Agenda.

Sub-priority 1: Assessing safety, efficacy, and cost-efficiency of micronutrient interventions

Micronutrient-delivery interventions (improvement of dietary diversity, biofortification, food fortification, and supplementation) are frequently introduced without responding to the need for estimating changes in biomarkers, which are the first indicators to monitor. Moreover, in some instances, those interventions are implemented together on the same population, therefore placing them at risk of excesses, and leading to inappropriate allocation of sparse resources. It is important to promote the use of biomarkers in implementation of interventions to ensure that these interventions are in response to identified deficiencies, that they have the expected bioefficacy, and that the resultant micronutrient intakes remain within reasonable and safe values. The total cost for implementing the interventions as local sustainable programs should also be estimated. **Box 22** lists illustrative questions.

Box 22: Assessing Safety, Efficacy, and Cost-Efficiency of Micronutrient Interventions: Illustrative Questions

- What is the comparative bioefficacy of multiple-micronutrient supplements (MMS), lipid-nutrient supplements (small-quantity LNS), and fortified foods when providing the same amounts of micronutrients to pregnant women under different contexts?
- What are the potential coverage and costs (efficiency and effectiveness) of the promoted micronutrient-delivering interventions?
- How much does the micronutrient content of breast milk increase with the promoted micronutrient-delivering interventions?
- Does folic acid facilitate multiplication of Plasmodium in malaria-endemic areas before the initiation of treatment in response to malaria infection?
- What is the impact of vitamin B12 deficiency in neural tube defect incidence in populations already receiving folic acid interventions?

Sub-priority 2: Review of biomarker methodology and criteria to diagnose deficient and excessive micronutrient status

Adequacies of vitamin A and riboflavin have been found satisfactory and deficient in women of sub-Saharan Africa, respectively. However, association with the corresponding biomarker has failed or is unknown. A similar situation occurs with calcium and zinc. Vitamin D status should, in theory, be satisfactory in tropical and subtropical countries where local populations tend to wear less clothes due to the temperature; thereby, exposing more skin to absorb vitamin D. However, supply of this vitamin is being promoted without first assessing if it is required. These cases suggest that more work with these and other micronutrients is needed in LMICs, for both responding to needs and avoiding unnecessary excesses. **Box 23** lists illustrative questions.

Box 23: Review of Biomarker Methodology and Criteria to Diagnose Deficient and Excessive Micronutrient Status: Illustrative Questions

- Why are dietary adequacies of vitamin A and calcium (among others) in adult women not reflected in the values of the corresponding biomarkers?
- What is the association between micronutrient biomarkers (e.g., vitamin A, vitamin B2, folate, iron, and zinc) and dietary intake?
- Is there a concern for vitamin D in populations with good skin exposure to sunlight?
- How can trends in micronutrient deficiencies and excesses, including for vitamins and minerals that are not currently being assessed, be tracked using biomarker or non-biomarker data to inform policy and direct programming?
- What neglected micronutrients (e.g., thiamine and riboflavin) should be collected to determine their public health importance, and what methodological approach should be used to collect these data?
- What are cost-effective mechanisms for implementing surveys that provide population-level data on micronutrient status and its associated cofactors?

Sub-priority 3: Increase capacity strengthening and platform development for surveillance of micronutrient deficiencies and anemia

The measurement of biomarkers of micronutrient status, and of anemia and its causes, requires the harmonization of these measures and coordination in the joint assessment of multiple biomarkers and their interpretations. This sub-priority addresses gaps related to guidance on biomarker measurement, including selection and testing of platforms for carrying out periodical surveillance, coordination and collaboration among institutions and countries, and collection and interpretation of results. Capacity strengthening efforts under this sub-priority require a contextualized approach. This sub-priority addresses the need to better understand what approaches should be taken to ensure collection of high-quality data for capacity strengthening and infrastructure development (e.g., preferred data collection platforms and assessed demand and potential value for a regional laboratory for biomarker assessment). **Box 24** lists illustrative questions.

Box 24: Increase Capacity Strengthening and Platform Development for Surveillance of Micronutrient Deficiencies and Anemia: Illustrative Questions

- What are cost-effective mechanisms for promoting surveillance of micronutrient deficiencies and anemia that provide population-level data with timely periodicity?
- What complementary mechanisms to population surveys of micronutrient and anemia surveillance could be implemented at subnational levels?
- What are gaps in the data ecosystem on anemia, its causes, and intervention in a given country, and how can we customize existing data sources to address these gaps?

Theme 2: Improve validity of anemia measurement and its etiological factors

Improved assessment of both non-nutritional and nutritional causes of anemia is needed to develop localized programs to address the specific anemia causes. There is currently a lack of evidence on how to enhance the assessment of anemia, and causes of anemia, at the pre-analytical, analytical, and post-analytical stages of data generation.

It is important to note that diagnosis, prevention, and treatment of anemia requires more than hemoglobin assessment—it requires the establishment of basic infrastructure and knowledge among all sectors that should be involved in addressing this condition.

Sub-priority 1: Enhance efforts in understanding analysis and reporting on data related to anemia and its etiological factors

Data on hemoglobin concentration are used to track progress in combating anemia. However, this has commonly been based on imprecise methodologies for the measurement of hemoglobin (use of drops of capillary blood), without searching for the anemia etiological factors. Consequently, prevention and treatment of anemia has been reduced to the supply of iron. It is important to not only properly measure hemoglobin concentration to estimate the magnitude of anemia, but to also follow the progress on its reduction. Moreover, it is essential to identify the causes (infection and inflammation, nutritional, genetic) to select the appropriate interventions.

Accurate and reliable methods to measure micronutrient status at the individual and population levels are critical. There is a need to improve existing measurement techniques for anemia and its causes. Guidance is lacking on the frequency of measurement and selection of micronutrient biomarkers, as per the needs determined by geographic distribution or risks within specific population subgroups. Furthermore, the value of micronutrient biomarker data for clinical or public health purposes lies in the ability to define micronutrient status and anemia in individuals or populations. There are currently gaps in the reference ranges and cutoffs as well as potential for refinements in adjustments for factors like age for young children. **Box 25** lists illustrative questions.

Box 25: Enhance Efforts in Understanding Analysis and Reporting on Data Related to Anemia and Its Etiological Factors: Illustrative Questions

- Is it possible to rescue data on anemia prevalence estimated using drops of capillary blood in past population surveys?
- What are acceptable levels of accuracy and precision for hemoglobin assessment in field surveys?
- What are the appropriate hemoglobin cut-off values to diagnose anemia in healthy children from 6 to 23 months of age?
- What are appropriate statistical approaches to assess anemia etiologies using cross-sectional data?
- Are the emerging multiplex method(s) reliable enough to be used to estimate basic biomarkers associated with anemia (e.g., malaria, parasitic infections, iron deficiency, and inflammation)?

Sub-priority 2: Inform about comprehensive data collection, interpretation, and use on causes of anemia at the national and global levels

There are several challenges with data that do exist, such as various population-level data sources that are inconsistent or cannot be directly compared. This includes differences in methodology between surveys and changes in methodology over time. Anemia etiology is also being measured in different surveys like malaria and soil-transmitted helminths, and more guidance is needed on ways to triangulate these different sources or support combined data collection. There is a lack of clarity on how to interpret and use information derived from different types of indicators (e.g., dietary versus biomarkers) and different data sources (e.g., routine, facility-based surveys, and population-level surveys) to arrive at a complete picture of micronutrient and anemia status. Efforts are being made to standardize the statistical and analytical methods used to assess micronutrient status, and the interpretation and reporting of their results.

In some countries, relevant data are collected through facility-based surveys and routine administrative data. In addition to a need to support the availability of data, there are several challenges with data use, including the need to draw on various data sources to capture the multiple etiologies of anemia, lack of publicly available microdata for reanalysis, and limited guidance on interpretation and application of existing data (Hess et al. 2023). Strengthening and investing in the data ecosystem for anemia and micronutrient status requires building a consensus on data priorities and strengthening capacity to generate, analyze, interpret, and use data (Piwoz et al. 2019). We will explore how we can expand the availability and use of data related to the association of micronutrient biomarkers with non-nutritional factors, with the intent of coordination and integration with health topics, including infection and inflammation. **Box 26** lists illustrative questions.

Box 26: Inform about Comprehensive Data Collection, Interpretation, and Use on Causes of Anemia at the National and Global Levels: Illustrative Questions

- What is the essential type of information that is required for taking actions at the facility level (clinical signs, complemented or not with estimation of all anemia or only moderate/severe anemia; inclusion or not of infection/inflammation indicators, other biomarkers)?
- What needs to be done to properly assess hemoglobin concentration at the facility level? (Is it possible to use pools of capillary blood for determining hemoglobin concentration? Otherwise, how can venous blood be collected efficiently?)
- What information is required, at the national level only, for supporting population programs, and at what frequency (micronutrient biomarkers, genetic characterization)?

Theme 3: Improve selection and delivery of interventions and intervention packages to reduce micronutrient deficiencies and anemia

A range of effective interventions are available to reduce micronutrient deficiencies and anemia. Depending on the underlying causes of these conditions, effective intervention delivered through the health sector includes malaria-preventive chemoprophylaxis, anthelmintic treatment, treatment of anemia of inflammation, blood transfusion, micronutrient supplementation, and delayed cord clamping (Loechl et al. 2023). To this, reduction of heavy menstrual bleeding might be added. Despite knowledge of appropriate interventions, strengthening the service delivery of a contextually appropriate intervention package that is equitable, high-quality, and cost-effective within the health system remains a challenge. This theme focuses on improved interventions (either individually or as a package) delivered through the health sector with the recognition that the multifactorial nature of anemia requires engagement with non-nutritional partners dealing with infections, family planning, and maternal care related to menstruation and post-partum hemorrhage.

Box 27: Increase Considerations of Biological Factors when Delivering Micronutrient and Anemia Interventions: Illustrative Questions

- What is the ideal relationship (temporal, spatial) for delivering iron supplementation with malaria and other infectious disease control programs?
- What is the effect of vitamin A and zinc interventions' interactions delivered alongside iron interventions?

Sub-priority 1: Increase considerations of biological factors when delivering micronutrient and anemia interventions

The efficacy of anemia and micronutrient interventions is often considered in isolation without an understanding of human biology, which is required to identify safe and efficacious interventions. There is a lack of evidence on interactions between interventions, interventions' sequencing (given the role of infection and inflammation in nutrition), and the impact of excessive micronutrient intake in the context of multiple interventions (Lopez de Romaña et al. 2023). **Box 27** lists illustrative questions.

Sub-priority 2: Increase use of data to inform selection of micronutrient and anemia interventions

There is a need to use the best available evidence to inform the selection of interventions within programs, given the multifactorial nature of anemia. If the etiology of anemia within a given context is established, we have a knowledge gap when considering evidence that is needed to select an appropriate package of interventions. **Box 28** lists illustrative questions.

Box 28: Increase Use of Data to Inform Selection of Micronutrient and Anemia Interventions: Illustrative Questions

- How do we design a program or intervention with the knowledge of the etiology?
- How do we address data gaps in the evidence needed to select an appropriate intervention package given the etiology of anemia in each context?
- How can local capabilities be enhanced to use existing data on micronutrient deficiencies and anemia and its causes for decision-making?

Sub-priority 3: Tailor the design and delivery of micronutrient and anemia interventions to the local context

Anemia is a complex condition that to appropriately address requires an understanding of the condition's full ecology. There is currently a lack of evidence demonstrating how to improve access, coverage, adherence, and quality of micronutrient and anemia interventions and their integration into health systems. An additional knowledge gap is the estimation and use of costing and cost-

effectiveness data for diagnosing and preventing anemia and micronutrient deficiencies at the individual and population levels. In many country programs, multiple interventions are delivered independently, and there is a need to coordinate the implementation of multiple-micronutrient interventions to deliver optimal levels of micronutrients to the population. Implementation of multiple interventions should also be accompanied by assessment of dietary and micronutrient intakes, impact modeling on health outcomes, and use of cost-efficiency and cost-effective methodologies to ensure optimal allocation of resources across many interventions. We will consider clinical applications in the context of public health settings when they refer to the utilization and interpretation of micronutrient deficiencies and anemia data within the health system. **Box 29** lists illustrative questions.

Box 29: Tailor the Design and Delivery of Micronutrient and Anemia Interventions to the Local Context: Illustrative Questions

- What is the comparative cost-effectiveness and biological safety of different interventions focusing on micronutrient deficiencies and anemia, such as food fortification, small-quantity lipid-based nutrient supplements, and multiple-micronutrient supplements?
- Does integrating micronutrient interventions with other nutrition interventions increase coverage, reduce costs, and improve cost-effectiveness?

Cross-cutting issues

In addition to the themes and sub-priorities under the three focus areas, NuMERAL presents emergent cross-cutting topics—multiple-component interventions, linkages and relationships between risk factors and interventions, understanding the enabling environment, and data systems for collection, utilization, and translation of evidence. Even though these topics have been presented as themes or sub-priorities within the focus areas, these represent distinct ideas that must be highlighted.

The implementation of multi-component interventions across the health system recognizes that the health system is not a monolith, and there is a gap in evidence on the efficiency, equity, coverage (especially with geographically hard-to-reach or marginalized groups), and quality of service related to the delivery of multi-component interventions. We also need to understand the mechanistic rationale for the interactions between risk factors, different interventions, and their effectiveness. However, the linkages and relationships between nutrition, ECD, and micronutrients and anemia are not static, and change across time in both the characteristic of the relationship and its intensity. The enabling environment refers to the political, financial, social, cultural, and environmental conditions underpinning nutrition, health, and ECD (Gillespie, Menon, and Kennedy 2015). Although the enabling environment spans beyond the health sector, NuMERAL addresses the elements of the enabling environment that lie within the health sector, i.e., health access and affordability of healthcare. This is infrequently studied despite its potential for driving sustainable change. Finally, the data ecosystem consists of data platforms—infrastructure, tools, processes; data; and the collaborators involved in the data’s collection, use, and management to ensure the data are managed in a responsible way. A significant knowledge gap exists on how to effectively collect, analyze, and interpret data from across the multiple focus areas.

The NuMERAL Learning Agenda incorporates themes and sub-priorities that were shaped by discussions across a wide range of interested groups and partners. The scope and breadth of these discussions led to a Learning Agenda that not only reflects the priorities of the various interested parties but also complements other research efforts in the three focus areas. NuMERAL’s contributions can provide a significant added value, particularly in terms of influencing policy, enhancing programs, or strengthening health system components toward improved nutrition and

child development outcomes. NuMERAL is also unique in its focus on integration of ECD interventions at scale within nutrition programs in the health sector, which has been identified as a major gap (Black, Pérez-Escamilla, and Rao 2015).

PRIORITIZATION WITHIN THE NUMERAL LEARNING AGENDA

Why is Prioritization Important?

The process of priority setting is crucial for the efficient allocation of a limited pool of funding for research in nutrition and ECD in LMICs, especially when faced with competing demands from other health issues (Terry et al. 2018). Prioritization requires pragmatic decision-making to find a balance between inputs and outcomes like improved health and nutrition status (WHO 2020). The purpose of prioritization within NuMERAL's Learning Agenda is to guide its investments in nutrition and ECD research and learning in a manner that is responsive to the most pressing evidence gaps.

Box 30: NuMERAL Principles of Prioritization

- **Impact:** Changes in the health, nutrition, and development statuses of a significant proportion of the population
- **Translation:** Evidence that will be translated into program or service delivery action.
- **Answerability:** Feasibility of the research achieving its stated objectives
- **Deliverability:** Likelihood of the results reaching their intended audience, leading to sustainability of policies and practices
- **Equity:** Likelihood of reducing health inequities in the population

NuMERAL's Contribution to Addressing Evidence Gaps

The criteria for NuMERAL's prioritization is adapted from the methodology pioneered by the Child Health and Nutrition Research Initiative (Rudan et al. 2008) and includes the potential for impact, translation, answerability, deliverability, and equity (**Box 30**). NuMERAL will prioritize research areas that will have the greatest impact on improving equitable program and service delivery, especially among the vulnerable and underprivileged. Programs and services that are widely accessible contribute to increased equity within society or in specific contexts. Impact refers to the ability of the service or programs to significantly change the disease burden and health and nutrition status of a large proportion of the population (Rudan et al. 2008). This impact must be grounded in efficacy. Moreover, impact is intricately linked to answerability—whether the work will be feasible and achieve its stated objectives—and deliverability—whether the results will be used to establish sustainable policies and practices leading to improved health and nutrition status.

NuMERAL will focus on small-scale, short-term evidence-generating activities but with high potential to easily be broadened and be locally sustainable. The range of topics in the NuMERAL Learning Agenda calls for employing a wide array of learning and research modalities to answer the prioritized learning questions. The research design will depend on the category of studies to be included under the NuMERAL Learning Framework. A key aspect of the project is prioritizing research that can inform policy and program decision-making. Therefore, the research and learning modalities selected will reflect this aim. A large emphasis will be placed on implementation research, such as formative research, quality improvement assessments, participatory action research, and cost studies.

Exhibit 2 provides examples of learning modalities that NuMERAL will use in its research studies and evaluation designs.

Exhibit 2. Illustrative Examples of Learning Modalities

Prioritized Study Area	Types of Learning Approaches
Implementation research: Planning and design	Diverse forms of assessments and formative research using focus groups, key informant interviews, mixed methods, concept mapping, action research (including participatory action research), ethnographic studies, partner or instructional analysis, opinion leader research, Delphi studies, group model building, and conjoint analysis

Exhibit 2. Illustrative Examples of Learning Modalities

Prioritized Study Area	Types of Learning Approaches
Implementation research: Efficacy and pragmatic program effectiveness studies	Cross-sectional or cohort studies, small-scale comparative studies, longitudinal quantitative analyses, longitudinal qualitative analyses, and factorial trial
Implementation research: Quality of interventions or services	Operations research, process evaluation, quality improvement/assurance, monitoring and evaluation, local observation, cross-sectional survey intervention mapping, social network analysis, journey mapping, and video observation
Data system analysis	Cross-sectional or cohort studies
Biological association studies	Cross-sectional or cohort studies
Laboratory and clinical studies	Cross-sectional or cohort studies
Economic analysis	Cost-utility, cost-efficiency, and cost-effectiveness studies

The study designs above are illustrative, and for each NuMERAL award, the local partner will work together with the NuMERAL Consortium team to develop a plan for the study design, its data collection and management, and how to report and disseminate study results. A study can use a combination of study designs if that is an appropriate approach to answer the learning question. Translation of evidence into practice will be placed at the forefront of the study design, with a process to transform results and evidence into actionable practice, which is further shared with the intention to meaningfully integrate into policy and program design, implementation, and monitoring.

Prioritization of NuMERAL's Learning Agenda

The NuMERAL Learning Agenda was designed with a broad base, providing the flexibility to prioritize learning topics at various points of the project. The prioritization approach will vary depending on specific objectives. The choice of methodology will be driven by the need for broad or narrow prioritization, the geographical scope of interest (whether it will be community, national, regional, or global), and the partners responsible for implementing the prioritized agenda (Yoshida 2016).

NuMERAL prioritization varies depending on the type of solicitations—investigator-initiated broad solicitations to strengthen local research and respond to a specific area of research, and cross-country solicitations to implement a harmonized protocol to answer high-priority learning questions. These sub-awards, described later, will be designed after the prioritization process for each type of award. Prioritization for investigator-initiated broad solicitations takes place at the learning sub-priorities level. Investigator-initiated broad solicitations can respond to learning sub-priorities in the focus areas that have been identified by USAID/Washington and Missions as vital to their investments. Cross-country solicitations are prioritized at two levels—first at the level of the learning sub-priorities and again at the level of the learning question. Prioritization takes many forms—they can be derived from inputs gathered from USAID/Washington and Missions and the NuMERAL Core Scientific Committee (CSC) and Advisory Board or identified by USAID/Washington and Missions. Alternatively, a Delphi process for priority setting may be used in soliciting expert opinions to reduce a long list of topics to a final prioritized list (WHO 2020).

Box 3 I provides an example of a systematic prioritization process using a modified Delphi method (Khodyakov et al. 2023) that may be used to identify learning priorities for solicitations. NuMERAL will continually assess the need for an approach to prioritization to understand what has worked and what has not and apply this learning to future prioritization exercises.

Box 3 I: Modified Delphi Method

- Two-stage prioritization—first at the sub-priority level and next at the learning question level, depending on the award type
- Panelists: Expert group from USAID/Washington and Missions, local partners and contributors, and the NuMERAL Consortium
- Investigator-initiated broad solicitations: Prioritize sub-priorities with an online anonymous questionnaire.
 - Step 1: Priority rank each sub-priority on a 9-point Likert scale with multiple-choice rationale for ranking (based on prioritization principles)
 - Step 2: Identify top five sub-priorities
- Cross-country solicitation: An example of a process to initially identify sub-priorities and then prioritize learning questions among listed sub-priorities.
 - Step 1: Prioritize sub-priorities with an online anonymous questionnaire
 - Step 2: Identify top five sub-priorities
 - Step 3: Questionnaire to identify learning questions for five selected sub-priorities
 - Step 4: Workshop to select research questions (or bundles of research questions)

LOCALLY IMPLEMENTED LEARNING

NuMERAL champions country-level, context-specific, locally led research, monitoring, evaluation, learning, and translation of evidence. Key aspects of NuMERAL's evidence-generation process include:

- Filling local knowledge gaps within select sub-priorities in the NuMERAL Learning Agenda
- Building the evidence base on topics that have multi-country, regional, or global implications.

NuMERAL is accomplishing this through funding a combination of investigator-initiated and harmonized cross-country learning.

Generation and Translation of Evidence through Sub-awards to Local Partners

NuMERAL sub-awards are directed to local partners for evidence generation and to facilitate partner engagement for evidence uptake. NuMERAL collaborates with these local partners to provide capacity strengthening support using a participatory process at various stages of the learning process and at different levels. This strategy plans to build a strong pool of experienced experts in the field of nutrition and ECD, who can subsequently utilize these gained experiences to further generate and translate evidence. This approach reflects the project's dual approach of promoting locally led learning and strengthening capacity.

Types of Sub-awards

The project uses multiple award mechanisms to support localized evidence generation. These processes may be modified or expanded as project learning occurs. Three types of solicitations are currently planned, as detailed below.

- Broad solicitations:** These support investigator-initiated learning to address gaps in one or more focus areas. The goal of broad solicitations is to strengthen local research and learning capacity in nutrition and ECD and respond to a specific research area proposed by the applicant. Priority will be given to local partners in LMICs within the 18 Nutrition Priority and Nutrition Strategic Support Countries (USAID n.d.b). Under this type of solicitation, applicants must submit a concept note describing the research need; an outline of how they will study it; and how the findings of the research will lead to action in policy, programs, or service delivery. Selected local partners will participate in a co-creation process with NuMERAL and USAID to refine their learning question(s), collaboratively identify new and existing learning solutions, build consensus around study design and the implementation plan, and subsequently carry out the study and translate findings.
- Cross-country solicitations:** These solicitations invite local partners to implement studies through collaboration of several countries to answer high-priority learning topics in the NuMERAL Learning Agenda. The goal of the cross-country solicitations is to build the evidence base by using a common research protocol implemented in different settings. The approach may mirror the process of broad solicitation, with applicants submitting a concept note that outlines a proposed approach to answering the learning questions in the solicitation, and how the findings of the research will lead to action in policy, programs, or service delivery. In this approach, the cross-country protocol will be developed by a co-creation process by selected local partners with the support of NuMERAL and USAID. Alternatively, NuMERAL may develop a common protocol to be followed by the applicants. NuMERAL's flexible approach allows for protocol development to adapt to different learning modalities that may be utilized for various learning questions. The sub-awards will be open

to local partners in any LMIC. Investigators will participate in a peer-to-peer network to collaborate and learn from each other.

- iii. **Country-specific solicitations:** Tailored to the country-specific NuMERAL Learning Agenda, mainly among countries where USAID Missions decide to buy-in to this project, which may or may not be within the 18 Nutrition Priority and Nutrition Strategic Support Countries.

Review of Sub-awards to Local Partners

NuMERAL will establish a review committee to select local partners for each individual solicitation. Each committee will comprise experts across the three focus areas or experts with knowledge on a specific focus area, depending on the solicitation's scope. Committee members must have a strong commitment to health equity research and decolonization, be well-versed in appropriate evidence-generation methodologies, and be knowledgeable about evidence translation to policies and programs.

Review committees will be composed of NuMERAL Consortium members and potentially USAID/Washington and Mission staff. Reviewers will be asked to identify any conflict of interest (COI) or apparent COI that may affect or appear to affect the integrity of the review process. We will use the COI statements to determine if reviewers need to be excluded from the committee or recuse themselves from specific applications.

Review members will assess applicants against objective criteria specific to each solicitation type, as detailed in the call for proposals, to select awardees.

EVIDENCE TRANSLATION

The value of evidence generation for nutrition and ECD can be measured by its influence on program interventions and service delivery in the health sector. Evidence or knowledge translation is the process by which the generated evidence is utilized appropriately to inform effective policy and program choices across the fields of health, nutrition, or ECD (Wong 2017; Grimshaw et al. 2012; Kraemer and van Zutphen 2019). Evidence translation methods and tools help researchers to communicate findings from their research and learning activities in an easy-to-understand form to inform policy and programs (Health Policy Project 2014). NuMERAL's evidence translation process, led by local partners, involves interpreting and sharing the findings from the sub-awards and other activities with a diverse group of collaborators, ranging from study participants to national policymakers, and global guideline developers. This approach will build the capacity of NuMERAL local partners to translate their findings into practical and useful policy and program inputs.

NuMERAL's evidence translation efforts are customized based on answers to the following critical questions on the evidence translation process (**Box 32M**), as designed by Grimshaw et al. (2012):

- What is the unit of evidence being translated?
- Who is the main audience and at what level do they operate (national, regional, or global)?
- Who is responsible for sharing the evidence?
- How is the evidence being shared?

Unit of Evidence

Although the fields of nutrition and ECD have adopted evidence synthesis methods in healthcare (Bhutta et al. 2013; Keats et al. 2021), the main currency of evidence remains the individual study. The NuMERAL Learning Agenda has identified the context under which the studies will be carried out and translated into policy or program action. NuMERAL will facilitate the translation of project-generated research into easily accessible formats to help link knowledge to action in the priority countries.

Main Audience

NuMERAL will adapt the evidence presented to suit its main audiences, depending on the type of research study. For example, the implementation research focused on planning and design of interventions will focus on policymakers and program managers. NuMERAL supports studies that address the needs of the community, policymakers, program managers, individual and institutional researchers, and USAID implementing partners. The use of evidence for policy-making can occur at the community level, or higher (i.e., national, regional across many countries, or global). NuMERAL's sub-awards look to answer learning questions at every policy-making level, with the evidence translation efforts tailored to the respective audiences.

Evidence Broker

Evidence or knowledge brokers are individuals or groups who generate, synthesize, and disseminate evidence to inform decision-making (Norton, Rodriguez, and Willems 2019). The legitimacy of the evidence broker and the choices made by the broker in communicating the evidence to the main

Box 32: Key Elements of Evidence Translation

- Unit of evidence: Results from primary studies or evidence synthesis
- Main audience: Community, policymakers, program managers, researchers, and USAID and its implementing partners (national, regional, and global)
- Evidence broker: Local researcher, community or nongovernmental organization, etc.
- Evidence to practice plans
- Evidence sharing platforms: Peer-to-peer networks, platforms, and events (e.g., webinars, meetings, and conferences) and partnerships with resource centers in countries

audience in easy-to-understand formats is critical to its translation and use. NuMERAL's evidence brokers include local partners and collaborators involved in each stage of the learning-based cycle: design, implementation, dissemination, and monitoring and evaluation.

Evidence to practice plan

NuMERAL will ensure that evidence generated by the local partners is accessible and available to the main audience. A best practice is engaging key stakeholders from the early design stage to ensure research and other learnings are used and outputs remain relevant. Each NuMERAL sub-award includes an evidence to practice plan describing collaboration steps to work with local stakeholders at each stage of the learning-based cycle. The evidence to practice plan will be developed at the beginning of the award period by the awardee, with the support of NuMERAL. This plan looks to ensure evidence generation and sharing effectively inform and meaningfully integrate into policy and program design, implementation, and monitoring.

Evidence Sharing Platforms

NuMERAL will offer numerous opportunities for local partners to participate in dissemination platforms (e.g., online communities of practice like Data for Nutrition, webinars, meetings, and conferences) to showcase findings and share their experiences in local and global fora. NuMERAL will connect the local partner to existing local or regional peer-to-peer learning networks to exchange ideas, methodologies, and learnings. NuMERAL also intends to encourage sustainability by linking local partners with local, national, or regional resource centers. Resource centers are institutions (like the national Tanzania Food and Nutrition Centre in Dar es Salaam or the regional Institute of Nutrition of Central America and Panama in Guatemala) that are well-recognized hubs of research and learning excellence, with a rich history of contributing evidence toward national or regional policies and programs.

In summary, NuMERAL's approach to evidence translation through sustainable partnerships and involvement of partners from the beginning will move the needle on the twin goals of capacity strengthening and having an impact on specific nutrition and ECD areas.

Evidence Documentation and Dissemination

NuMERAL will offer support for local partners to publish the results of their work in peer-reviewed publications and as broad knowledge products. This will be part of the global dissemination strategy, which will include other avenues like presentations in webinars (either organized by NuMERAL or with partners' participation facilitated by NuMERAL) and participation and presentation of local partners' work in regional and/or international meetings, showcasing their efforts prominently with policymakers to enable them to access future opportunities beyond the life of the project. NuMERAL will allocate time and resources for this phase of evidence translation.

LOCALIZATION AND CAPACITY STRENGTHENING

Equity, localization, and decolonization are central operating principles in the implementation of the NuMERAL Learning Agenda, emphasizing the importance of addressing health inequities (George et al. 2019) and ensuring diverse perspectives in monitoring, evaluation, research, and learning activities to create inclusive policies and programs. Acknowledging the significance of cultural contexts is critical to avoid perpetuating imbalance in power structures and overlooking local strategies to improve nutrition and ECD (Scheidecker et al. 2024). In alignment with the USAID approach to localization, NuMERAL prioritizes the needs and contributions of local partners to enhance the relevance, equity, and sustainability of its initiatives (USAID n.d.a). The project intends to empower local actors, so they lead the solutions to generate and translate evidence for learning and utilization.

The NuMERAL Learning Framework includes various methods for collaboration and coordination, which will be integral to implementing the NuMERAL Learning Agenda. For example, mechanisms like request for expression of interest (REOI) can engage local partners to carry out evidence generation and translation in the priority topics, in conjunction with capacity strengthening efforts (Rees et al. 2020).

Box 33 highlights some of the activities and components that we will introduce to address the underlying principles of equity, localization, and capacity strengthening.

Capacity strengthening is one of NuMERAL's core strategic approaches, with an emphasis on providing sub-awards to local researchers and institutions. These sub-awards will be uniquely designed to include mentoring and capacity strengthening support where needed, using tools like an evidence to practice plan, to build the capacity of NuMERAL's partners and local researchers to translate their findings into actionable knowledge for policies and programs.

Research on authorship of publications from LMICs shows that only one-quarter of countries had a local researcher as the first author in more than 75 percent of their research, with the lowest level in sub-Saharan Africa (Chersich and Martin 2017). Therefore, NuMERAL will support local researchers to publish protocol papers in open-access journals, thereby promoting the reuse of study designs in other contexts. Additionally, to bridge the gap in publishing research findings, NuMERAL will assist local researchers in navigating the complexities of submitting in peer-reviewed journals, ensuring that their research receives recognition. Furthermore, NuMERAL will facilitate local researchers' participation in peer-to-peer knowledge networks, such as the Data for Nutrition Community of Practice; offer virtual skills-building courses; mentor emerging researchers; and connect researchers with a virtual community of practice to exchange ideas, methodologies, and learnings from their NuMERAL-supported research. Our support to local partners will extend to organizational capacity strengthening, where needed.

Addressing injustice in the production, use, and dissemination of knowledge is crucial for decolonizing research practices, particularly where knowledge produced by researchers in the

Box 33: Localization, Coordination, and Collaboration within NuMERAL

- **Support local research partners' leadership:** Local primary investigators lead studies, write an evidence to practice plan for each award, and connect to local established institutions, like resource centers, for technical capacity strengthening and sustainability.
- **Strengthen and build the evidence base:** Prioritize the NuMERAL Learning Agenda with Request for Expressions of Interest (REOIs), including broad and cross-country solicitations, and receive support from the NuMERAL Consortium.
- **Advance capabilities in translating, sharing, and utilizing evidence:** Establish peer-to-peer knowledge and learning networks; write an evidence to practice plan for each award; connect to local established institutions, like resource centers, for technical capacity strengthening and sustainability, and connection to communities of practices.

Global South is misunderstood and/or undervalued (Koum Besson 2022). By focusing on equitable and inclusive partnership strategies, NuMERAL commits to promoting diversity and changing power dynamics in knowledge generation and application.

GOVERNANCE

The NuMERAL Learning Framework will be guided throughout the project's duration by USAID, through the Bureau for Global Health and the Children in Adversity Team; USAID Missions in participating countries; and the NuMERAL Consortium, the Advisory Board, and the CSC. The Learning Framework's governance structure outlines the roles and responsibilities of these collaborators in designing, procuring, implementing, and disseminating the solicitation, alongside utilizing the knowledge developed by local collaborators and partners. Furthermore, NuMERAL is committed to systematically tracking and monitoring the Learning Framework's implementation to strengthen local capacity and fill critical gaps regarding nutrition and ECD in the health sector.

Management

USAID's Bureau for Global Health, Children in Adversity Team, and the USAID Missions will play a critical role in the Learning Framework and Learning Agenda by actively participating in the development and prioritization process. Other roles USAID may contribute to include developing content for REOs, developing evaluation criteria for the REOs, supporting outreach and communications with potential local partners, participating in proposal development training programs with local partners, and reviewing submitted proposals. The NuMERAL Consortium will lead the solicitation process. NuMERAL's Consortium is led and managed by RTI International in collaboration with our project partners: the African Population and Health Research Center (APHRC); the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b); and the University of California Davis. This consortium offers a wealth of expertise in generating and translating evidence within the project's three focus areas. Further, all consortium members had an active role in the development of NuMERAL's Learning Framework and Learning Agenda through a series of collaborative efforts.

NuMERAL Advisory Board

The NuMERAL Advisory Board is an independent, authoritative advisory body to the NuMERAL Consortium on topics related to the project's strategic direction. The NuMERAL Advisory Board is formed by invitation from the project and consists of approximately 10 members who have expertise in the project's three focus areas, as well as in information systems and health equity and decolonization. Advisory Board members will serve for up to 3 years, with the possibility of annual renewal based on availability and relevance. They will contribute to providing expert input on the NuMERAL Learning Framework and Learning Agenda, providing feedback on the progress of project activities, and advising on application of findings and dissemination strategies to ensure accessibility and practicality for policymakers and health system practitioners.

NuMERAL Core Scientific Committee (CSC)

The NuMERAL CSC includes experts from RTI, APHRC, icddr,b, and the University of California Davis, covering NuMERAL's three focus areas. The CSC is chaired by the Project Director, with rotating co-chairs among our partner institutions. It is a critical internal body within the RTI-led consortium, which ensures that country-level studies are high-quality, scientifically rigorous, and responsive to the NuMERAL Learning Agenda. The NuMERAL CSC designs and evaluates country-level solicitations and engages with USAID Missions and other country-level community leaders and members at all stages of evidence generation. It oversees the selection of final proposals for funding, sets the agenda for Advisory Board meetings, and incorporates the Board's guidance into project activities.

This governance structure ensures a comprehensive and collaborative approach to developing and implementing NuMERAL's Learning Framework and Learning Agenda.

Monitoring Progress of the NuMERAL Learning Framework

To effectively track the NuMERAL Learning Framework's implementation, we will use a combination of tracking data from various sub-award activities and the project's Collaborating, Learning, and Adapting approach. This approach will help us report on the performance in achieving our Framework's goals. The monitoring data collected will also inform the indicators that form the project's Activity Monitoring, Evaluation, and Learning Plan (AMELP). The learning from management of each round of solicitations will be applied to the next round of sub-awards. This iterative learning is in line with the project's Collaborating, Learning, and Adapting approach. Our methods combine qualitative and quantitative information to develop a comprehensive picture of our progress, as detailed below.

- We will use a tracker to assess the progress of various monitoring, evaluation, research, and learning activities. These activities will be evaluated against clear, specific goals and objectives established for the activities, with grantees required to report their progress as part of the solicitation process.
- We will develop performance indicators to provide metrics on the design, implementation, translation, dissemination, and use of each funded opportunity. These indicators, which sub-awardees will report on, will be integrated into the solicitation process and serve as a collaborative tool for our consortium and research partners to make mid-course corrections based on the tracked results.
- NuMERAL will connect the local partners to existing local or regional peer-to-peer learning networks. NuMERAL will also connect the awardees with each other virtually. These connections will enable local partners to share experiences, challenges, successes, and failures with each other and other peers. These exchanges will inform the documentation of lessons learned and best practices developed.
- All partners will support the translation and dissemination of research and learning into practice. This will include synthesizing the evidence, developing practical recommendations that local governments and collaborators can follow, engaging and collaborating with local partners, promoting cross-country exchange, and supporting local interested parties with applying the research findings to strengthen policies and programs.

These efforts find the balance between the work needed to track the successful implementation of the Learning Framework and the needs of the overall NuMERAL project, in terms of staff resources and time.

REFERENCES

- Alao, Rotimi, Hayaan Nur, Emily Fivian, Bhavani Shankar, Suneetha Kadiyala, and Helen Harris-Fry. "Economic Inequality in Malnutrition: A Global Systematic Review and Meta-Analysis." *BMJ Global Health* 6, no. 12 (2021): e006906. <https://doi.org/10.1136/bmjgh-2021-006906>.
- Amouzou, Agbessi, Hannah Hogan Leslie, Malathi Ram, Monica Fox, Safia S. Jiwani, Jennifer Requejo, Tanya Marchant, et al. "Advances in the Measurement of Coverage for RMNCH and Nutrition: From Contact to Effective Coverage." *BMJ Global Health* 4, no. S4 (2019): e001297. <https://doi.org/10.1136/bmjgh-2018-001297>.
- Baek, Yeji, Zanfina Ademi, Thach Tran, Alice Owen, Trang Nguyen, Stanley Luchters, David B Hipgrave, et al. "Considering Equity and Cost-Effectiveness in Assessing a Parenting Intervention to Promote Early Childhood Development in Rural Vietnam." *Health Policy and Planning* 38, no. 8 (2023): 916–925. <https://doi.org/10.1093/heapol/czad057>.
- Bhutta, Zulfiqar A., Jai K Das, Arjumand Rizvi, Michelle F Gaffey, Neff Walker, Susan Horton, Patrick Webb, Anna Lartey, and Robert E Black. "Evidence-Based Interventions for Improvement of Maternal and Child Nutrition: What Can Be Done and at What Cost?." *The Lancet* 382, no. 9890 (2013): 452–477. [https://doi.org/10.1016/S0140-6736\(13\)60996-4](https://doi.org/10.1016/S0140-6736(13)60996-4).
- Black, Maureen M., and Kathryn G. Dewey. "Promoting Equity through integrated Early Child Development and Nutrition Interventions." *Annals of the New York Academy of Sciences* 1308, no. 1 (2014): 1–10. <https://doi.org/10.1111/nyas.12351>.
- Black, Maureen M., R. Perez-Escamilla, and S. F. Rao. "Integrating Nutrition and Child Development Interventions: Scientific Basis, Evidence of Impact, and Implementation Considerations." *Advances in Nutrition* 6, no. 6 (2015): 852–859. <https://doi.org/10.3945/an.115.010348>.
- Black, Maureen M., Susan P. Walker, Orazio Attanasio, Marta Rubio-Codina, Costas Meghir, Jena D. Hamadani, Lia C. H. Fernald, Alysse Kowalski, and Sally Grantham-McGregor. "Promoting Childhood Development Globally through Caregiving Interventions." *Pediatrics* 151, no. S2 (2023). <https://doi.org/10.1542/peds.2023-060221B>.
- Black, Maureen M., Susan P. Walker, Lia C. H. Fernald, Christopher T. Andersen, Ann M. DiGirolamo, Chunling Lu, Dana C. McCoy, Günther Fink, et al. "Early Childhood Development Coming of Age: Science through the Life Course." *The Lancet* 389, no. 10064 (2017): 77–90. [https://doi.org/10.1016/S0140-6736\(16\)31389-7](https://doi.org/10.1016/S0140-6736(16)31389-7).
- Brittenham, Gary M., Gemma Moir-Meyer, Kelvin Mokaya Abuga, Ananya Datta-Mitra, Carla Cerami, Ralph Green, Sant-Rayn Pasricha, and Sarah H. Atkinson. "Biology of Anemia: A Public Health Perspective." *Journal of Nutrition* 153, no. S1 (2023): S7–S28. <https://doi.org/10.1016/j.tjnut.2023.07.018>.
- Britto, Pia R., Stephen J. Lye, Kerrie Proulx, Aisha K. Yousafzai, Stephen G. Matthews, Tyler Vaivada, Rafael Perez-Escamilla, et al. "Nurturing Care: Promoting Early Childhood Development." *The Lancet* 389, no. 10064 (2017): 91–102. [https://doi.org/10.1016/s0140-6736\(16\)31390-3](https://doi.org/10.1016/s0140-6736(16)31390-3).
- Brown, Kenneth H., Sophie E. Moore, Sonja Y. Hess, Christine M. McDonald, Kerry S. Jones, Sarah R. Meadows, Mari S. Manger, Jennifer Coates, Silvia Alayon, and Saskia J. M. Osendarp. "Increasing the Availability and Utilization of Reliable Data on Population Micronutrient (MN) status Globally: The MN Data Generation Initiative." *The American Journal of Clinical Nutrition* 114, no. 3 (2021): 862–870. <https://doi.org/10.1093/ajcn/nqab173>.

Burgess, Rochelle A., Funmilayo Shittu, Agnese Iuliano, Ibrahim Haruna, Paula Valentine, Ayobami Adebayo Bakare, Tim Colbourn et al. "Whose Knowledge Counts? Involving Communities in Intervention and Trial Design Using Community Conversations." *Trials* 24, no. 385 (2023). <https://doi.org/10.1186/s13063-023-07320-1>.

Celhay, Pablo, Sebastian Martinez, and Cecilia Vidal. "Measuring Socioeconomic Gaps in Nutrition and Early Child Development in Bolivia." *International Journal for Equity in Health* 19, no. 122 (2020). <https://doi.org/10.1186/s12939-020-01197-1>.

Chersich, Matthew F., and Greg Martin. "Priority Gaps and Promising Areas in Maternal Health Research in Low- and Middle-Income Countries: Summary Findings of a Mapping of 2292 Publications between 2000 and 2012." *Global Health* 13, no. 1 (2017): 6. <https://doi.org/10.1186/s12992-016-0227-z>.

Collins, Michael D., and Gloria E. Mao. "Teratology of Retinoids." *Annual Review of Pharmacology and Toxicology* 39, no. 1 (1999): 399–430. <https://doi.org/10.1146/annurev.pharmtox.39.1.399>.

Creanza, Nicole, Oren Kolodny, and Marcus W. Feldman. "Cultural Evolutionary Theory: How Culture Evolves and Why it Matters." *Proceedings of the National Academy of Sciences* 114, no. 30 (2017): 7782–7789. <https://doi.org/10.1073/pnas.1620732114>.

de Onis, Mercedes, Cutberto Garza, Adelheid W. Onyango, and Elaine Borghi. "Comparison of the WHO Child Growth Standards and the CDC 2000 Growth Charts." *Journal of Nutrition* 137, no. 1 (2007): 144–148. <https://doi.org/10.1093/jn/137.1.144>.

Development Initiatives. *2020 Global Nutrition Report: Action on equity to end malnutrition*. Bristol, UK, 2020.

Donabedian, Avedis. "The Quality of Care." *Journal of the American Medical Association* 260, no. 12 (1988): 1743–1748. <https://doi.org/10.1001/jama.1988.03410120089033>.

Dulal, Sophiya, Audrey Prost, Surendra Karki, Naomi Saville, and Dafna Merom. "Characteristics and Effects of Integrated Nutrition and Stimulation Interventions to Improve the Nutritional Status and Development of Children Under 5 Years of Age: A Systematic Review and Meta-Analysis." *BMJ Global Health* 6, no. 7 (2021): e003872. <https://doi.org/10.1136/bmjgh-2020-003872>.

Dunst, Carl J., and Danielle Z. Kassow. "Caregiver Sensitivity, Contingent Social Responsiveness, and Secure Infant Attachment." *Journal of Early and Intensive Behavior Intervention* 5, no. 1 (2008): 40–56. <https://doi.org/10.1037/h0100409>.

Engmann, Cyril M., Sadaf Khan, Cheryl A. Moyer, Patricia S. Coffey, and Zulfiqar A. Bhutta. "Transformative Innovations in Reproductive, Maternal, Newborn, and Child Health over the Next 20 Years." *PLOS Medicine* 13, no. 3 (2016): e1001969. <https://doi.org/10.1371/journal.pmed.1001969>.

Ertem, Ilgi Ozturk, Vibha Krishnamurthy, Mphelakedzeni C Mulaudzi, Yanina Sguassero, Hakan Balta, Ozlem Gulumser, Burcu Bilik, et al. "Similarities and Differences in Child Development from Birth to Age 3 Years by Sex and across Four Countries: A Cross-Sectional, Observational Study." *The Lancet Global Health* 6, no. 3 (2018): e279–e291. [https://doi.org/10.1016/s2214-109x\(18\)30003-2](https://doi.org/10.1016/s2214-109x(18)30003-2).

Farebrother, J., M. B. Zimmermann, and M. Andersson. "Excess Iodine Intake: Sources, Assessment, and Effects on Thyroid Function." *Annals of the New York Academy of Sciences* 1446, no. 1 (2019): 44–65. <https://doi.org/10.1111/nyas.14041>.

Finnell, Richard H., Gary M. Shaw, Edward J. Lammer, and Thomas H. Rosenquist. "Gene-nutrient Interactions: Importance of Folic Acid and Vitamin B12 during Early Embryogenesis." *Food and Nutrition Bulletin* 29, no. S2 (2008): S86–98. <https://doi.org/10.1177/15648265080292S112>.

George, Asha S., Avni Amin, Claudia García-Moreno, and Gita Sen. "Gender Equality and Health: Laying the Foundations for Change." *Lancet* 393, no. 10189 (2019): 2369–2371. [https://doi.org/10.1016/s0140-6736\(19\)30987-0](https://doi.org/10.1016/s0140-6736(19)30987-0).

Gillespie, Stuart, Lawrence Haddad, Venkatesh Mannar, Purnima Menon, and Nicholas Nisbett. "The Politics of Reducing Malnutrition: Building Commitment and Accelerating Progress." *The Lancet* 382, no. 9891 (2013): 552–569. [https://doi.org/10.1016/s0140-6736\(13\)60842-9](https://doi.org/10.1016/s0140-6736(13)60842-9).

Gillespie, Stuart, Purnima Menon, and Andrew L. Kennedy. "Scaling Up Impact on Nutrition: What Will It Take?" *Advances in Nutrition* 6, no. 4 (2015): 440–51. <https://doi.org/10.3945/an.115.008276>.

Global Burden of Disease 2021 Anaemia Collaborators. "Prevalence, Years Lived with Disability, and Trends in Anaemia Burden by Severity and Cause, 1990–2021: Findings from the Global Burden of Disease Study 2021." *The Lancet Haematology* 10, no. 9 (2023): e713–e734. [https://doi.org/10.1016/s2352-3026\(23\)00160-6](https://doi.org/10.1016/s2352-3026(23)00160-6).

Grimshaw, Jeremy M., Martin P. Eccles, John N. Lavis, Sophie J. Hill, and Janet E. Squires. "Knowledge Translation of Research Findings." *Implementation Science* 7, no. 1 (2012): 50. <https://doi.org/10.1186/1748-5908-7-50>.

Harkness, Sara, Charles M. Super, Caroline Johnston Mavridis, Oumar Barry, and Marian Zeitlin. "Culture and Early Childhood Development: Implications for Policy and Programs." In *Handbook of Early Childhood Development Research and its Impact on Global Policy*, edited by Pia R. Britto, 142–160. New York: Oxford University Press, 2013.

Harris, Jody, and Nicholas Nisbett. "The Basic Determinants of Malnutrition: Resources, Structures, Ideas and Power." *International Journal of Health Policy and Management* 10, no. 12 (2021): 817–827. <https://doi.org/10.34172/ijhpm.2020.259>.

Hathcock, John N. "Vitamins and Minerals: Efficacy and Safety." *American Journal of Clinical Nutrition* 66, no. 2 (1997): 427–437. <https://doi.org/10.1093/ajcn/66.2.427>.

Health Policy Project. *Capacity Development Resource Guide: Knowledge Translation*. Washington, DC: Futures Group, Health Policy Project, 2014. https://www.healthpolicyproject.com/pubs/272_KnowledgeTranslationResourceGuideFinal.pdf.

Heidkamp, Rebecca A., Emily Wilson, Purnima Menon, Helen Kuo, Shelley Walton, Giovanna Gatica-Domínguez, Inacio Crochemore Da Silva, Tricia Aung, Nemat Hajeebhoy, and Ellen Piwoz. "How Can We Realise the Full Potential of Health Systems for Nutrition?" *BMJ* 368 (2020): 16911. <https://doi.org/10.1136/bmj.16911>.

Hess, Sonja Y., Aatekah Owais, Maria Elena D. Jefferds, Melissa F. Young, Andrew Cahill, and Lisa M. Rogers. "Accelerating Action to Reduce Anemia: Review of Causes and Risk Factors and Related Data Needs." *Annals of the New York Academy of Sciences* 1523, no. 1 (2023): 11–23. <https://doi.org/10.1111/nyas.14985>.

Horton, Susan E., Meera Shekar, Christine McDonald, Ajay Mahal, and Jana Krystene Brooks. "Scaling Up Nutrition: What Will It Cost?." Washington, D.C.: The World Bank, 2010. https://www.researchgate.net/publication/242592421_Scaling_up_Nutrition_What_Will_It_Cost.

Isabella, Russell A., and Jay Belsky. "Interactional Synchrony and the Origins of Infant-Mother Attachment: A Replication Study." *Child Development* 62, no. 2 (1991): 373–384.

Jervis, Pamela, Jacqueline Coore-Hall, Helen O. Pitchik, Charles D. Arnold, Sally Grantham-McGregor, Marta Rubio-Codina, Helen Baker-Henningham, et al. "The Reach Up Parenting Program, Child Development, and Maternal Depression: A Meta-Analysis." *Pediatrics* 151, no. S2 (2023). <https://doi.org/10.1542/peds.2023-060221D>.

Kärtner, Joscha, Nils Schuhmacher, and Marta Giner Torrens. "Culture and Early Social-Cognitive Development." *Progress in Brain Research* 254 (2020): 225–246.
<https://doi.org/10.1016/bs.pbr.2020.06.011>.

Keats, Emily C., Jai K. Das, Rehana A. Salam, Zohra S. Lassi, Aamer Imdad, Robert E. Black, and Zulfiqar A. Bhutta. "Effective Interventions to Address Maternal and Child Malnutrition: An Update of the Evidence." *The Lancet Child & Adolescent Health* 5, no. 5 (2021): 367–384.
[https://doi.org/https://doi.org/10.1016/S2352-4642\(20\)30274-1](https://doi.org/https://doi.org/10.1016/S2352-4642(20)30274-1).

Khodyakov, Dmitry , Sean Grant, Jack Kroger, and Melissa Bauman. *Methodological Guidance for Conducting and Critically Appraising Delphi Panels*. Santa Monica, California: RAND Corporation (2023).

King, Shannon E., Talata Sawadogo-Lewis, Robert E. Black, and Timothy Robertson. "Making the Health System Work for the Delivery of Nutrition Interventions." *Maternal & Child Nutrition* 17, no. 1 (2021a): e13056. <https://doi.org/10.1111/mcn.13056>.

———. "Making the Health System Work for the Delivery of Nutrition Interventions." *Maternal & Child Nutrition* 17, no. 1 (2021b). <https://doi.org/10.1111/mcn.13056>.

King, Shannon E., Ashley Sheffel, Rebecca Heidkamp, Yvonne Yiru Xu, Shelley Walton, and Melinda K. Munos. "Advancing Nutrition Measurement: Developing Quantitative Measures of Nutrition Service Quality for Pregnant Women and Children in Low- and Middle-Income Country Health Systems." *Maternal & Child Nutrition* 18, no. 1 (2022). <https://doi.org/10.1111/mcn.13279>.

Koum Besson, Emilie S. "How to Identify Epistemic Injustice in Global Health Research Funding Practices: A Decolonial Guide." *BMJ Global Health* 7, no. 4 (2022): e008950.
<https://doi.org/10.1136/bmjgh-2022-008950>.

Kraemer, Klaus, and Kesso Gabrielle van Zutphen. "Translational and Implementation Research to Bridge Evidence and Implementation." *Annals of Nutrition and Metabolism* 75, no. 2 (2019): 144–148.
<https://doi.org/10.1159/000503675>.

Kruk, Margaret E., and Muhammad Pate. "The Lancet Global Health Commission on High Quality Health Systems 1 Year on: Progress on a Global Imperative." *The Lancet Global Health* 8, no. 1 (2020): e30–e32. [https://doi.org/10.1016/s2214-109x\(19\)30485-1](https://doi.org/10.1016/s2214-109x(19)30485-1).

Loechl, Cornelia U., Ananya Datta-Mitra, Lindy Fenlason, Ralph Green, Laura Hackl, Laura Itzkowitz, Marion Koso-Thomas, et al. "Approaches to Address the Anemia Challenge." *The Journal of Nutrition* 153, no. 1 (2023): S42–S59. <https://doi.org/10.1016/j.tjnut.2023.07.017>.

Lopez de Romaña, Daniel, Alison Mildon, Jenna Golan, Maria Elena D. Jefferds, Lisa M. Rogers, and Mandana Arabi. "Review of Intervention Products for Use in the Prevention and Control of Anemia." *Annals of the New York Academy of Sciences* 1529, no. 1 (2023): 42–60.
<https://doi.org/10.1111/nyas.15062>.

Lowe, Nicola M. "The Global Challenge of Hidden Hunger: Perspectives from the Field." *Proceedings of the Nutrition Society* 80, no. 3 (2021): 283–289. <https://doi.org/10.1017/s0029665121000902>.

Maternal and Child Survival Program Partnership. *Maternal and Child Survival Program End-of-Project Report*. Washington, D.C.: The U.S. Agency for International Development (USAID), 2019.
<https://mcsprogram.org/wp-content/uploads/eop/MCSP-EOP-Report-Combined-update.pdf>.

Mccray, Gareth, Dana Mccoy, Patricia Kariger, Magdalena Janus, Maureen M. Black, Susan M. Chang, Fahmida Tofail, et al. "The Creation of the Global Scales for Early Development (GSED) for Children Aged 0–3 Years: Combining Subject Matter Expert Judgements with Big Data." *BMJ Global Health* 8, no 1 (2023): e009827. <https://doi.org/10.1136/bmjgh-2022-009827>.

Menon, Purnima, Namukolo M. Covic, Paige B. Harrigan, Susan E. Horton, Nabeeha M. Kazi, Sascha Lamstein, Lynnette Neufeld, Erica Oakley, and David Pelletier. "Strengthening Implementation and Utilization of Nutrition Interventions through Research: A Framework and Research Agenda." *Annals of the New York Academy of Sciences* 1332, no. 1 (2014): 39–59. <https://doi.org/10.1111/nyas.12447>.

Norton, Theresa C., Daniela C. Rodriguez, and Sara Willems. "Applying the Theoretical Domains Framework to Understand Knowledge Broker Decisions in Selecting Evidence for Knowledge Translation in Low- and Middle-Income Countries." *Health Research Policy and Systems* 17, no. 1 (2019): 60. <https://doi.org/10.1186/s12961-019-0463-9>.

Partelow, Stefan. "What is a framework? Understanding Their Purpose, Value, Development and Use." *Journal of Environmental Studies and Sciences* 13, no. 3 (2023): 510–519. <https://doi.org/10.1007/s13412-023-00833-w>.

Pérez-Escamilla, Rafael, and Cyril Engmann. "Integrating Nutrition Services into Health Care Systems Platforms: Where Are We and Where Do We Go from Here." *Maternal & Child Nutrition* 15, no. S1 (2019): e12743. <https://doi.org/10.1111/mcn.12743>. <https://dx.doi.org/10.1111/mcn.12743>.

Petrowski, Nicole, Filipa De Castro, Susan Davis-Becker, Melissa Gladstone, Claudia Regina Lindgren Alves, Yvonne Becher, Jennifer Grisham, et al. "Establishing Performance Standards for Child Development: Learnings from the ECDI2030." *Journal of Health, Population and Nutrition* 42, no. 1 (2023). <https://doi.org/10.1186/s41043-023-00483-2>.

Piwoz, Ellen, Rahul Rawat, Patrizia Fracassi, and David Kim. "Strengthening the Nutrition Data Value Chain for Accountability and Action: Progress, Gaps and Next Steps." *Sight and Life* 33, no. 1 (2019).

Raiten, Daniel J., Denish Moorthy, Laura S. Hackl, and Omar Dary. "Exploring the Anemia Ecology: A New Approach to an Old Problem." *The Journal of Nutrition* 153, no. 1 (2023): S1–S6. <https://doi.org/https://doi.org/10.1016/j.tjnut.2023.07.016>.

Ramadan, Marwa, Tonny B. Muthee, Latifat Okara, Cameron Feil, and Manuela Villar Uribe. "Existing Gaps and Missed Opportunities in Delivering Quality Nutrition Services in Primary Healthcare: A Descriptive Analysis of Patient Experience and Provider Competence in 11 Low-Income and Middle-Income Countries." *BMJ Open* 13, no. 2 (2023): e064819. <https://doi.org/10.1136/bmjopen-2022-064819>.

Rees, Chris A., Elizabeth M. Keating, Kirk A. Dearden, Heather Haq, Jeff A. Robison, Peter N. Kazembe, Florence T. Bourgeois, and Michelle Niescierenko. "Improving Pediatric Academic Global Health Collaborative Research and Agenda Setting: A Mixed-Methods Study." *American Journal of Tropical Medicine and Hygiene* 102, no. 3 (2020): 649–657. <https://doi.org/10.4269/ajtmh.19-0555>.

Rudan, Igor, Jennifer L. Gibson, Shanthi Ameratunga, Shams El Arifeen, Zulfigar A. Bhutta, Maureen Black, Robert E. Black, et al. "Setting Priorities in Global Child Health Research Investments: Guidelines for Implementation of CHNRI method." *Croatian Medical Journal* 49, no. 6 (2008): 720–733. <https://doi.org/10.3325/cmj.2008.49.720>.

Salam, Rehana A., Jai K. Das, and Zulfiqar A. Bhutta. "Integrating Nutrition into Health Systems: What the Evidence Advocates." *Maternal & Child Nutrition* 15, no. S1 (2019a): e12738. <https://doi.org/10.1111/mcn.12738>.

———. "Integrating Nutrition into Health Systems: What the Evidence Advocates." *Maternal & Child Nutrition* 15, no. S1 (2019b): e12738. <https://doi.org/10.1111/mcn.12738>. <https://dx.doi.org/10.1111/mcn.12738>.

Scheidecker, Gabriel, Bethlehem Tekola, Muneera Rasheed, Seth Oppong, Francesca Mezzenzana, Heidi Keller, and Nandita Chaudhary. "Ending Epistemic Exclusion: Toward a Truly Global Science and Practice of Early Childhood Development." *Lancet Child & Adolescent Health* 8, no. 1 (2024): 3–5. [https://doi.org/10.1016/S2352-4642\(23\)00292-4](https://doi.org/10.1016/S2352-4642(23)00292-4).

Scherer, Elissa, Ashley Hagaman, Esther Chung, Atif Rahman, Karen O'Donnell, and Joanna Maselko. "The Relationship between Responsive Caregiving and Child Outcomes: Evidence from Direct Observations of Mother-Child Dyads in Pakistan." *BMC Public Health* 19, no. 1 (2019). <https://doi.org/10.1186/s12889-019-6571-1>.

Schindler, Holly S., Dana Charles McCoy, Philip A. Fisher, and Jack P. Shonkoff. "A Historical Look at Theories of Change in Early Childhood Education Research." *Early Childhood Research Quarterly* 48, no. 3 (2019): 146–154. <https://doi.org/10.1016/j.ecresq.2019.03.004>.

Stevens, Gretchen A., Ty Beal, Mduduzi N. N. Mbuya, Hanqi Luo, Lynnette M. Neufeld, O. Yaw Addo, Seth Adu-Afarwuah, et al. "Micronutrient Deficiencies among Preschool-Aged Children and Women of Reproductive Age Worldwide: A Pooled Analysis of Individual-Level Data from Population-Representative Surveys." *The Lancet Global Health* 10, no. 11 (2022): e1590–e1599. [https://doi.org/10.1016/s2214-109x\(22\)00367-9](https://doi.org/10.1016/s2214-109x(22)00367-9).

Stevens, Gretchen A., Christopher J. Paciorek, Monica C. Flores-Urrutia, Elaine Borghi, Sorrel Namaste, James P. Wirth, Parminder S. Suchdev, et al. "National, Regional, and Global Estimates of Anaemia by Severity in Women and Children for 2000–19: A Pooled Analysis of Population-Representative Data." *The Lancet Global Health* 10, no. 5 (2022): e627–e639. [https://doi.org/10.1016/s2214-109x\(22\)00084-5](https://doi.org/10.1016/s2214-109x(22)00084-5).

Stiles, Lucy I., Kevin Ferrao, and Kosha J. Mehta. "Role of Zinc in Health and Disease." *Clinical and Experimental Medicine* 24, no. 1 (2024). <https://doi.org/10.1007/s10238-024-01302-6>.

Tebben, Peter J., Ravinder J. Singh, and Rajiv Kumar. "Vitamin D-Mediated Hypercalcemia: Mechanisms, Diagnosis, and Treatment." *Endocrine Reviews* 37, no. 5 (2016): 521–547. <https://doi.org/10.1210/er.2016-1070>.

Terry, R F., E. Charles, B. Purdy, and A. Sanford. "An Analysis of Research Priority-Setting at the World Health Organization—How Mapping to a Standard Template Allows for Comparison between Research Priority-Setting Approaches." *Health Research Policy and Systems*, 16, no. 116 (2018). <https://doi.org/10.1186/s12961-018-0391-0>.

United Nations Children's Fund [UNICEF]. "UNICEF Conceptual Framework on Maternal and Child Nutrition." New York, NY: UNICEF, 2021. <https://www.unicef.org/documents/conceptual-framework-nutrition>.

United Nations Educational, Scientific and Cultural Organization [UNESCO]. "Sustainable Development Goal 4 and its Targets." 2021. <https://en.unesco.org/education2030-sdg4/targets>.

USAID. "Localization." USAID, accessed February 20, 2024. <https://www.usaid.gov/localization>.

———. "Nutrition Priority Countries." USAID, accessed March 8, 2024. <https://www.usaid.gov/nutrition/countries>

Weber, Ann M., Yatma Diop, Diane Gillespie, Lisy Ratsifandrihamanana, and Gary L. Darmstadt. "Africa is Not a Museum: The Ethics of Encouraging New Parenting Practices in Rural Communities in Low-Income and Middle-Income Countries." *BMJ Global Health* 6, no. 7 (2021): e006218. <https://doi.org/10.1136/bmjgh-2021-006218>.

World Health Organization (WHO). "Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and Their Measurement Strategies." Geneva, Switzerland: WHO, 2010. <https://iris.who.int/bitstream/handle/10665/258734/9789241564052-eng.pdf>.

———. "Standards for Improving Quality of Maternal and Newborn Care in Health Facilities." Geneva, Switzerland: WHO, 2016.

<https://iris.who.int/bitstream/handle/10665/249155/9789241511216-eng.pdf>

———. "Continuity and Coordination of Care: A Practice Brief to Support Implementation of the WHO Framework on Integrated People-Centred Health Services." Geneva, Switzerland: WHO, 2018.

———. "A Systematic Approach for Undertaking a Research Priority-Setting Exercise. Guidance for WHO Staff." Geneva, Switzerland: WHO, 2020. <https://www.who.int/publications-detail-redirect/9789240009622>

———. "Accelerating Anaemia Reduction: A Comprehensive Framework for Action." Geneva, Switzerland: WHO, 2023. <https://www.who.int/publications/i/item/9789240074033>.

WHO, UNICEF, and World Bank Group. "Nurturing Care for Early Childhood Development: A Framework for Helping Children Survive and Thrive to Transform Health and Human Potential." Geneva, Switzerland: WHO, 2018. <https://www.who.int/teams/maternal-newborn-child-adolescent-health-and-ageing/child-health/nurturing-care>

Wilton, Katelin Swing, Katie Maeve Murphy, Ahsan Mahmud, Syful Azam, Anika Habib, Iman Ibrahim, Eloisa Della Neve, et al. "Adapting Reach Up and Learn in Crisis and Conflict Settings: An Exploratory Multiple Case Study." *Pediatrics* 151, no. S2 (2023). <https://doi.org/10.1542/peds.2023-060221K>.

Wong, Anne. "Closing the Gap: Applying the Theoretical Domains Framework to Improve Knowledge Translation." *Canadian Journal of Anesthesia* 64, no. 6 (2017): 569–573. <https://doi.org/10.1007/s12630-017-0846-8>.

Yoshida, Sachiyo. "Approaches, Tools and Methods Used for Setting Priorities in Health Research in the 21st Century." *Journal of Global Health* 6, no. 1 (2016).