Improving nutrition during middle childhood and adolescence by 2032

A research roadmap

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Contents

Acronyms

ANC	Antenatal Care
CHNRI	Child Health and Nutrition Research Initiative
e/m-health	Electronic/Mobile Health
ENN	Emergency Nutrition Network
GANN	Global Adolescent Nutrition Network
IFA	Iron and Folic Acid
LMICs	Low- and Middle-Income Countries
MMS	Multiple Micronutrient Supplementation
PGB	Programa Geração Biz
PNC	Postnatal Care
RCT	Randomised Controlled Trial
SAC	School-Age Children
SAMIA	School-Based Assessment of Micronutrient Interventions in Adolescents
SBCC	Social and Behaviour Change Communication
SRH	Sexual and Reproductive Health
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization
WIFAS	Weekly Iron and Folic Acid Supplementation

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Summary

Despite the importance of nutrition during middle childhood (5–9 years) and adolescence (10–19 years) for the health and well-being of current and future generations, the 5–19-year period remains relatively neglected in research, policy and programming agendas.

In 2021, Emergency Nutrition Network (ENN) conducted a research prioritisation exercise using the Child Health and Nutrition Research Initiative (CHNRI) methodology.[a] This research roadmap provides a scoping review of available literature for the six priority research areas identified by the CHNRI exercise (**Table 1**). It collates current knowledge, evidence gaps and lessons learnt from research conducted in other health-related fields to set out a detailed, global research agenda to support nutrition for children and adolescents 5–19 years of age in low- and middle-income countries (LMICs) over the next 10 years.

Table 1: Research areas covered

1	How should antenatal care (ANC) and postnatal care (PNC) interventions be adapted to effectively, and cost-effectively, support the specific health and nutritional needs of pregnant adolescents?
2	What strategies are effective for delivering interventions in schools to improve the quality of diets and the nutritional outcomes of school-age children (SAC) and adolescents?
3	What strategies are effective at involving SAC and adolescents in defining their own context-specific solutions to nutrition problems, and does their involvement result in more effective interventions?
4	What are effective, context-specific behaviour change communication strategies to improve the diets and nutritional status of SAC and adolescents?
5	What improvements can be made to local food systems to support access to healthy diets in schools?
6	What are the optimal cross-sector partnerships and delivery platforms (health, education, social protection, digital platforms, media/technology, etc.) for the effective uptake of nutrition interventions for SAC and adolescents, considering scale, sustainability and youth engagement?

a https://www.ennonline.net/adolescentchnri2022

Research Area 1. How should antenatal care (ANC) and postnatal care (PNC) interventions be adapted to effectively, and cost-effectively, support the specific health and nutritional needs of pregnant adolescents?

Approximately 11% of births occur in adolescent girls 15–19 years of age, 95% of whom live in LMICs, making them and their infants vulnerable to adverse growth and development outcomes and contributing to an intergenerational cycle of malnutrition and ill health. Despite this, available research lacks examples of tailored, effective delivery platforms and implementation guidance for ANC and PNC services that address the specific needs of adolescent girls in LMICs.

Key evidence gaps include a lack of data on the uptake of PNC services and barriers to accessing care; the impacts of tailored services on health and nutrition outcomes, including cost-effectiveness; and a lack of evidence on how other adolescent-responsive health service strategies can be applied to ANC/PNC.

Way forward

Research Question 1.1: What packages of adolescent-responsive ANC and PNC services support optimal nutrition and health outcomes for mother and infant? What are optimal delivery platforms? What is their cost-effectiveness?

- Study design: evidence review and cluster randomised controlled trial (RCT)
- Intervention: adolescent-tailored package of services vs standard ANC/PNC (control)
- Note: packages of interventions should be informed by the World Health Organization (WHO) ANC and PNC guidelines

Research Question 1.2: Does including family members and healthcare providers in education/social and behaviour change communication (SBCC) interventions increase the uptake of, and retention in, ANC/PNC services by adolescent girls?

- Study design: cluster RCT
- Intervention: SBCC intervention targeting pregnant adolescents, their families (male partners, mothers/mothers-in-law, fathers) and healthcare providers vs SBCC intervention for adolescent girls only

Research Question 1.3: Does locating ANC/PNC services for adolescent girls within existing community-based services or platforms for adolescents increase the uptake of, and retention in, ANC/PNC services?

- Study design: cluster RCT or pre-/post-intervention analysis
- Intervention: locating ANC/PNC services within existing community-based services or platforms for adolescent girls vs standard facility-based ANC/PNC services (control)

Research Question 1.4: Does the use of electronic/mobile health (e/m-health) platforms (social media; text messaging) to educate, inform and engage adolescent girls during pregnancy and postpartum increase the uptake of, and retention in, ANC/PNC services, improve knowledge of nutrition and health and improve nutrition and health-related behaviours?

- Study design: cluster RCT
- Intervention: media-based SBCC package including education, promotion and peer-to-peer/peer-to-healthcare provider engagement on ANC/PNC attendance and nutrition and health behaviours during pregnancy and postpartum vs simple text reminders to attend ANC/PNC services (control)

Research Area 2. What strategies are effective for delivering interventions in schools to improve the quality of diets and the nutritional outcomes of school-age children (SAC) and adolescents?

Schools are widely recognised as the optimal delivery platform for nutrition and health interventions during middle childhood and adolescence. While school feeding programmes reach millions of children globally, their coverage and quality varies across settings and there is a lack of consensus on effective delivery strategies. Another important school-based intervention is weekly iron and folic acid supplementation (WIFAS), recommended by WHO for menstruating adolescent girls in many LMICs; however, few countries are currently implementing this approach at scale.

Key evidence gaps include a lack of data on the prevalence of anaemia and micronutrient deficiencies during middle childhood (5–9 years) in LMICs and the impact of supplementation programmes targeting this age group; a lack of minimum quality standards for school meals; limited solutions to address barriers to delivering WIFAS programmes; and a lack of evidence on the potential benefits, barriers and cost-effectiveness of transitioning from WIFAS to weekly multiple micronutrient supplements (MMS).

Way forward

Research Question 2.1: What are the minimum standards for school feeding programmes associated with improved school attendance and child health, growth and well-being outcomes, and how should these be tailored by context, age and sex?

- Study design: literature review and meta-analysis (as applicable)
- Intervention: school feeding of different quantities and qualities (macro and micronutrient), including fortified foods vs micronutrient supplementation, in primary and secondary schools in a variety of regions

Research Question 2.2: How should WIFAS programmes be contextualised across diverse settings, including overcoming delivery barriers at scale?

- Study design 1: qualitative research to explore barriers and facilitators across diverse contexts
- Follow-on study design 2: pilot implementation, followed by adaptation and scale-up

Research Question 2.3: Should WIFAS programmes be replaced with programmes providing MMS to school-going adolescents, and what is the cost-effectiveness of this?

- Study design: cluster RCTs in various contexts, followed by use of secondary data to model cost differences vs effectiveness
- Intervention: MMS vs iron and folic acid (IFA), such as in the ongoing School-Based Assessment of Micronutrient Interventions in Adolescents (SAMIA) trial

Research Question 2.4: What is the burden of anaemia and other micronutrient deficiencies (iron, vitamin A, zinc, iodine, etc.) during middle childhood and how does this differ by context?

- Study design: cross-sectional surveys in a wide variety of contexts including Africa and Asia

Research Question 2.5: What are the benefits of micronutrient supplementation for addressing the risk of anaemia and micronutrient deficiencies, as well as for other health, growth, and well-being outcomes, during middle childhood and how does this differ by context?

- Study design: cluster RCT at the school level
- Intervention: WIFAS vs MMS vs placebo (control) and impact on haemoglobin levels, micronutrient status and other outcomes of interest (including, but not limited to, school attendance, retention and performance)

Research Area 3. What strategies are effective at involving SAC and adolescents in defining their own context-specific solutions to nutrition problems, and does their involvement result in more effective interventions?

A growing body of evidence demonstrates the benefits of youth engagement on research outputs, as well as on young people and their communities. Many research entities, civil society organisations, policy makers, United Nations organisations and donors have worked to incorporate youth engagement in their various workstreams and developed guidance documents and tools to support these processes. However, while such strategies and guidelines may provide useful platforms to build on, more evidence is needed on the barriers and enablers to youth engagement in LMICs, as well as on relevant and effective context-specific implementation strategies.

Key evidence gaps include a lack of data to inform strategies, models and tools for effective youth engagement in nutrition interventions in LMICs; a lack of data on context-specific barriers and enablers to sustained and effective youth engagement in nutrition interventions; and a lack of consensus on how to describe youth engagement in research and how to measure impact. Understanding is also limited on how to ensure that youth have adequate expertise in nutrition and health topics, as well as training in research methodology, while considering their lived experiences and priorities.

Way forward

Research Question 3.1: What are the optimal strategies for engaging children and adolescents in nutrition interventions in LMICs, and how do they vary by context, age, and sex?

- Study design: compilation of case studies and exemplars, including any reported impacts on nutrition outcomes
- Intervention: using different methods of engaging youth (such as participatory workshops and creative methods including photos, graffiti walls, drawings, games, etc.) at different scales, frequencies and timepoints
- Context: from a variety of contexts and scenarios, including research and programming

Research Question 3.2: What are the barriers and enablers to sustainably engaging children and adolescents in nutrition interventions in LMICs, and how do they vary by context, age and sex?

- Study design: qualitative study
- Methods should be relevant to the context and samples should include both sexes, as well as a range of ages to assess the needs of different groups
- Context: a wide variety are needed – Africa and Asia, urban and rural

Research Area 4. What are effective, context-specific SBCC strategies to improve the diets and nutritional status of SAC and adolescents?

Nutrition behaviours are influenced by a range of factors during middle childhood and adolescence, including existing habits, social and cultural norms and aspirations, access to resources, self-efficacy and structural constraints and opportunities. Diet and physical activity behaviours adopted during this time can persist into adulthood, influencing the risk of developing non-communicable diseases, as well as affecting the health and well-being of the next generation. SBCC strategies are increasingly utilised in nutrition programmes to promote positive behaviour change; however, more evidence is needed to inform development of comprehensive, context-specific, child- and adolescent-responsive strategies in LMICs.

Evidence gaps include limited understanding of the mechanisms of behaviour change that support improved diets during middle childhood and adolescence; a lack of guidance on developing context-specific content and intervention materials; limited understanding of effective school mobilisation strategies, especially in rural settings, and of complementary approaches that target out-of-school adolescents; and a lack of examples of strategies that engage community members across all stages of programme design and implementation. There is also a need for guidance on how to provide SBCC training for teachers and other staff at scale; for examples of feasible, acceptable and effective media-based approaches in LMICs; and for consensus on how the policy environment can support healthy behaviours in children and adolescents.

Way forward

Research Question 4.1: What common framework can be used to design contextualised and effective SBCC programmes for improving nutrition in middle childhood and adolescence?

- Study design: systematic review of current strategies, examples, evidence and toolkits that effectively promote behaviour change during middle childhood and adolescence
- Note: this should include lessons learnt from other sectors, such as sexual and reproductive health (SRH), as well as frameworks that promote gender equity and girls' empowerment. RCTs of a common package of tools, cost-effectiveness analyses and national-scale pilots should follow

Research Question 4.2: What SBCC strategies are effective for rural adolescents and out-of-school adolescents?

- Study design: cluster RCT and cost-effectiveness analysis
- Intervention: different multifaceted SBCC strategies are needed that are specific to adolescents in rural communities and those out of school. Outcomes should extend beyond anthropometry

Research Question 4.3: What is the feasibility, acceptability and effectiveness of large-scale media-based campaigns on nutrition outcomes during middle childhood and adolescence in LMICs?

- Study design: cluster RCT randomised at community level
- Intervention: school-based SBCC vs school-based SBCC and media-based campaigns, including exploration into whether the media campaign reached the target audience, what platforms were most effective and whether there were additional benefits on nutrition outcomes when compared to school-based, face-to-face strategies alone

Research Area 5. What improvements can be made to local food systems to support access to healthy diets in schools?

In recent years, increased attention has been paid to the role of food systems in determining the diets of children and adolescents, particularly those within and surrounding schools. Good school food systems should both promote the availability of healthy, micronutrient-dense foods and restrict access to less healthy food items high in fat and sugar, while incorporating behavioural components. However, existing food systems often overlook the nutritional needs of children and adolescents, and pervasive marketing of unhealthy food and drinks in and around schools promotes the consumption of these items for those who can afford to purchase them. The literature suggests that the following interventions should be considered to improve school food systems, but trialling their acceptability, feasibility and impact in LMICs remains a key evidence gap:

- Healthy food standard regulations should be implemented on all foods consumed at school, including direct provision of food in classrooms and/or cafeterias, food brought to school by students and purchases made from tuck shops and vending machines
- Unhealthy food/beverage vendors and marketing in and around schools should be restricted
- The affordability, availability and desirability of healthy foods in and around schools should be improved through nutrition education and food systems interventions with local producers. This may include school gardens and rearing of small livestock, as well as improving supply chain links
- Good water, sanitation and hygiene practices should be implemented
- Adequate food storage facilities to ensure adequate food safety and hygiene should be implemented

Way forward

Research Question 5.1: Which aspects of school food environments are associated with dietary/ anthropometric outcomes in LMICs?

- Study design: systematic review (initially), including observational and intervention research. This will guide future interventions and identify gaps in knowledge
- Context: all LMICs, ideally

Research Question 5.2: Can school regulation interventions (restricting marketing, setting regulations on what foods are allowed in schools, etc.) impact adolescent diet and nutrition outcomes in urban LMIC settings?

- Study design: cluster RCT, multi-armed
- Intervention: implementing healthy food standard regulations on all foods consumed at school; restricting unhealthy food/beverage vendors and marketing in and around schools (primary and secondary)

Research Question 5.3: Can interventions to support supply chains between local farming systems and school feeding programmes (in primary and secondary schools) increase farming income and improve nutrition outcomes for children and adolescents?

- Study design: cluster RCT (or pre-/post-intervention analysis, where applicable)
- Intervention: supporting local producers of healthy foods (fruits, vegetables, legumes and animal-source foods) to supply schools for school meal programmes (primary and secondary schools)

Research Area 6. What are the optimal cross-sector partnerships and delivery platforms (health, education, social protection, digital platforms, media/technology, etc.) for the effective uptake of nutrition interventions for SAC and adolescents, considering scale, sustainability and youth engagement?

This research area focused on the use of structural and community-based interventions to improve nutrition and health in children and adolescents, particularly those out of school. Structural interventions – including legislation, taxation and the implementation of policies promoting and supporting the consumption of healthy, nutrient-dense foods and engagement in physical activity, while restricting less healthy diet and activity behaviours – have been shown to influence food access and consumption at the population level. Community-based interventions provide opportunities to work with a range of local organisations to target social norms and environments that influence dietary choices and engagement in physical activity, and to reach out-of-school children and adolescents with nutrition interventions.

Key evidence gaps include a lack of data on the impacts of legislative policies improving the availability of, and access to, healthy nutritious foods, while restricting that of unhealthy foods/beverages, on diets and nutritional status during middle childhood and adolescence. Examples of social protection programmes targeting middle childhood and adolescence are lacking, particularly for vulnerable children and adolescents who are out of school, and a lack of qualitative evidence on the barriers and enablers to accessing services for out-of-school children and adolescents. Quantitative research on the impact of contextualised community-based platforms on nutrition outcomes beyond schools is also needed.

Way forward

Research Question 6.1: Can social protection programmes targeting food security and nutrition outcomes be adapted to improve nutritional status during middle childhood and adolescence, particularly for those out of school?

- Study design: systematic review (initially) of current social protection programmes that effectively promote food security and improve dietary intake and quality. This will identify gaps in knowledge and inform future interventions
- Context: diverse LMICs, particularly targeting those where many children and adolescents are not in school

Research Question 6.2: What are the barriers and enablers that out-of-school children and adolescents experience to accessing nutrition, health and social protection services in LMICs, and how do they vary by context, age and sex?

- Study design: qualitative study
- Notes: sample should include a range of ages and sexes to assess different needs

Research Question 6.3: What are the optimal community-based platforms for delivering nutrition interventions to children and adolescents beyond schools at scale, and how do they vary by context, age and sex?

- Study design: compilation of case studies and exemplars, including any reported impacts on nutrition outcomes, from a variety of contexts, including research and programming

Cross-cutting considerations

Funding and cost-effectiveness: Across research areas, funding limitations were highlighted as key barriers to the implementation and/or sustainability of nutrition interventions/programmes during middle childhood and adolescence, with interventions/programmes targeting secondary schools and out-of-school children and adolescents being particularly under-researched. In all research areas, there is a need to incorporate estimations of cost-effectiveness to assess suitability, sustainability and scalability across LMICs.

Monitoring and evaluation: Many interventions across high-, middle- and low-income settings failed to incorporate the adequate, long-term monitoring and evaluation components essential to assess impact, identify effective intervention strategies, establish formal standards for nutrition-related policies in schools and coordinate various intervention components. More research is needed on what indicators and outcomes to measure, as well as on the optimal timing and platforms for the monitoring and evaluation of nutrition interventions/programmes during middle childhood and adolescence.

Multi-sector engagement: While the focus of many school-based interventions has been on implementation via the education sector, the increasing focus on multicomponent strategies to holistically address malnutrition relies on effective engagement across sectors – for example, incorporating social protection systems to address food insecurity, ensuring access to basic health services and facilitating access to healthy food via engagement with the agricultural and commercial sectors.

Conclusion

One of the 10 recommendations from the 2021 Lancet series on adolescent nutrition was that *"donors and research funding agencies … invest in and prioritize the knowledge gaps thwarting action for adolescent nutrition."* While this research roadmap is not exhaustive, it provides detailed background evidence on priority research areas, identifies evidence gaps and outlines specific research questions to guide the efforts of researchers, funders and governments over the next 10 years.

Opportunities for collaboration and coordination

To streamline and optimise efforts to address these (and other) research gaps related to improved nutrition during middle childhood and adolescence, collaboration and coordination between partners is key. The Global Adolescent Nutrition Network (GANN) is a network of researchers, programmers, government representatives, donors, and United Nations agencies, coordinated by ENN, that provides a platform to identify emerging research, share operational experiences and disseminate information.

The GANN would welcome expressions of interest to co-develop concept notes around the research questions outlined in this roadmap with group members. We would also appreciate hearing any details from researchers on how content in this report is being used to shape research plans, whether within or external to the GANN. This is both to improve the coordination of future activities and to understand the utility of this type of report. Any feedback on the content is welcome and can be shared with the GANN coordinator at **natasha@ennonline.net** or **office@ennonline.net**.

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Background

Nutrition during middle childhood (5–9 years) and adolescence (10–19 years) influences physical, cognitive and social development, with implications throughout the life course and for future generations.[1] Growth and development during these periods establish adult health trajectories via biological and behavioural pathways. Children who are stunted between the age of five and nine often enrol late in school, and persisting malnutrition affects their ability to learn and concentrate.[2] Between the ages of 10 and 19, adolescents achieve approximately 20% of their adult height and 50% of their adult weight, as well as experiencing a 40% increase in bone mass.[3] In low- and middle-income countries (LMICs), children and adolescents aged 5–19 experience various nutrition challenges including thinness, stunting, overweight and obesity, anaemia and other micronutrient deficiencies.[4,5] Despite its importance for health and well-being, nutrition during middle childhood and adolescence has been relatively neglected in research, policy and programming agendas.

Given the gaps in evidence, policy and programming, the 2021 Lancet series on adolescent nutrition recommended that *"donors and research funding agencies … invest in and prioritize the knowledge gaps thwarting action for adolescent nutrition."*[6] To this end, Emergency Nutrition Network (ENN) conducted a research prioritisation exercise in 2021 using the Child Health and Nutrition Research Initiative (CHNRI) methodology to guide priorities in future research on nutrition for children and adolescents aged 5–19 in LMICs.[a] This research roadmap builds on results from the CHNRI exercise, setting out a detailed, global research agenda to guide the efforts of researchers, funders and governments towards filling the highest-priority evidence gaps over the next 10 years.

a https://www.ennonline.net/adolescentchnri2022

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Methods

Scoping reviews of existing evidence and ongoing research, including peer-reviewed and grey literature, were conducted to develop a detailed research agenda for the six research areas outlined in **Table 1**. These represent the five highest-priority evidence gaps according to CHNRI survey respondents, as well as the highest-ranked research areas for pregnant adolescent girls (the same as the highest-ranked area overall), in-school children and adolescents (the same as the second highest-ranked area overall) and out-of-school children and adolescents. Research areas were informed by a list of research questions ranked by respondents according to their answerability, deliverability, effectiveness and potential to improve equity. **Research Area 1** (ranked highest overall, and highest for pregnant adolescent girls) was identified as having the greatest potential to improve equity. **Research Area 2** (ranked highest for in-school children and adolescents) was ranked as the most answerable and most likely to produce an effective and deliverable intervention. While CHNRI survey questions fell into four categories (descriptive, development, delivery and discovery), research areas ranked as the highest priorities were from either the development or delivery categories.

Table 1: Research areas according to question rankings by Child Health and Nutrition Research Initiative (CHNRI) survey respondents

Number	Ranking (overall)	Ranking (sub-category)	Research area	Category
1	1	1 (pregnant adolescent girls; equity)	How should antenatal care (ANC) and postnatal care (PNC) interventions be adapted to effectively, and cost-effectively, support the specific health and nutritional needs of pregnant adolescents?	Development
2	2	1 (in-school children and adolescents; effectiveness; deliverability; answerability)	What strategies are effective for delivering interventions in schools to improve the quality of diets and the nutritional outcomes of school-age children (SAC) and adolescents?	Delivery
3	3	–	What strategies are effective at involving SAC and adolescents in defining their own context-specific solutions to nutrition problems, and does their involvement result in more effective interventions?	Delivery
4	4	–	What are effective, context-specific behaviour change communication strategies to improve the diets and nutritional status of SAC and adolescents?	Delivery
5	5	1 (in-school children and adolescents)	What improvements can be made to local food systems to support access to healthy diets in schools?	Development
6	7	1 (out-of-school children and adolescents)	What are the optimal cross-sector partnerships and delivery platforms (health, education, social protection, digital platforms, media/technology, etc.) for the effective uptake of nutrition interventions for SAC and adolescents, considering scale, sustainability and youth engagement?	Delivery

For each research area, this roadmap outlines:

a. **What we know:** A scoping review of available peer-reviewed and grey literature was undertaken to summarise current knowledge and identify research gaps, as well as to gain insights from research conducted in other health-related fields to suggest solutions and guide next steps

b. **Way forward:** A research agenda is proposed for each area, including key research questions and potential study designs, to address identified gaps and achieve impact over the next 10 years (by 2032). Key considerations for the recommended study designs are provided in **Box 1**.

Box 1: Considerations for study design

For several research questions, the suggested study design is a cluster randomised controlled trial (RCT). RCTs are considered the 'gold standard' for testing the effectiveness of an intervention because randomisation balances observed and unobserved characteristics between study groups, reducing bias and allowing the examination of cause–effect relationships between an intervention and an outcome.[7] Cluster RCTs randomise subjects at the group, rather than at the individual, level – for example, delivering interventions to groups of individuals attending the same school or health facility, or from the same community. This is particularly useful for interventions aiming to change behaviours at the population level, for example education and social and behaviour change communication (SBCC) strategies, and can provide insights into optimal delivery platforms.[8,9]

However, RCTs have drawbacks, particularly in resource-limited settings, such as high time and monetary costs, implications for generalisability to the population of interest, being unethical in some cases and not necessarily being scalable.[7]

Where RCTs are not feasible or useful, alternative study designs may warrant consideration, including:

- **Stepped-wedge designs:** Cluster trials in which all clusters start in the control condition but cross over to the intervention condition in a randomised sequence until every cluster has received the intervention. This can help achieve statistical power in cases where only a small number of clusters are available[8]
- **Multi-stage approaches with pre-planned interim evaluations:** These can be used to reassess the required sample size and the feasibility of continuing the trial, considering resource availability and the likelihood of false-negative findings[8]
- **Pre-/post-intervention analyses:** These are used in studies that do not have a comparison/control group. The collection of baseline and endline data allows for assessing changes in process indicators and outcomes of interest following exposure to the intervention, but these changes cannot be attributed directly to the intervention[10]
- **Quasi-experimental designs:** Experimental designs with intervention and comparison/control groups that are not randomly allocated. They are useful in cases where design rigour needs to be balanced against other elements, such as programming needs and ethical considerations[10]

In all cases, study designs should be combined with robust process evaluation, and this may help overcome some limitations regarding scalability and practical implementation. Robust process evaluation can inform relationships between interventions and outcomes, while providing opportunities to assess barriers and facilitators to implementation, uptake and adherence, and to identify the potential risk of programme failure.[10] Such evaluations are critical, but often neglected, regardless of study design and rigour.[10]

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Research Area 1.

How should antenatal care (ANC) and postnatal care (PNC) interventions be adapted to effectively, and cost-effectively, support the specific health and nutritional needs of pregnant adolescents?

Background

Globally, approximately 11% of births occur in adolescent girls 15–19 years of age, 95% of whom live in LMICs.[11] Adolescent pregnancy is associated with adverse growth and development outcomes for mother and infant, contributing to an intergenerational cycle of malnutrition and ill health.[11,12] Despite this, tailored services, implementation guidance to support adolescents during pregnancy and early motherhood, and the delivery of interventions to prevent subsequent early pregnancies, are lacking. Further, many pregnant adolescent girls do not access existing ANC and PNC services due to psychosocial and system-level barriers.[13,14] More research is needed to inform the tailoring of ANC and PNC content and service delivery to respond to the specific needs of adolescents during and after pregnancy, and to ensure their cost-effectiveness as part of sustainable and scalable interventions/programmes in LMICs.

What we know

Available research lacks examples of tailored content, effective delivery platforms and implementation guidance for ANC and PNC services that address the specific needs of adolescent girls. Instead, research has focused on uptake of general ANC services by adolescent girls and the barriers that they experience to accessing care. Overall, barriers fall into the following categories:

Lack of personal autonomy: Many adolescent girls describe losing their autonomy upon becoming pregnant.[15] They may lack agency in making decisions about whether, and when, to access ANC services and are often at the mercy of other decision-makers in the family, particularly mothers/mothers-in-law and husbands/male partners.[15,16]

Stigma and judgement: Stigma associated with adolescent pregnancy and early childbearing is a powerful deterrent to attending ANC, especially in the first trimester.[15] Some adolescents seek confirmation of their pregnancy from a medical professional, but others are reluctant to attend ANC due to fears of being forced to leave school or of ramifications should they decide to terminate their pregnancy.[17] While some pregnant adolescents report positive experiences of accessing ANC services delivered by caring and friendly staff, many feel judged and disrespected by healthcare providers and/or older pregnant women when attending facilities.[13,17]

Lack of support: The support of family members influences uptake and retention in care,[16] with the engagement of male community members being a particularly important determinant of whether adolescent girls access interventions and of their participation in any available programmes or services.[18]

Limited knowledge and misinformation: Healthcare providers are often a trusted source of information.[14] However, in some cases, their advice conflicts with that of family members and with traditional practices. While some pregnant adolescents report receiving generic nutrition advice from healthcare providers, they may not be given opportunities to ask questions or raise concerns during facility visits.[14]

Financial constraints: Cost is a substantial barrier to accessing nutrition and healthcare services in many contexts, including supplementation, ultrasounds and facility-based care.[14] Transport costs are a widely documented deterrent to accessing ANC services, but may be particularly relevant to adolescent girls due to their social positioning and their lack of access to financial resources.[17]

Lack of adolescent-responsive services: ANC services are not perceived as being adolescent-responsive. Adolescent girls feel that spaces are lacking which specifically respond to their needs, and that restrictive operating hours, inadequate privacy and confidentiality and poor service quality deter them from accessing care.[17,19] A lack of standard treatment guidelines for pregnant adolescent girls has been particularly emphasised for mental health services, which require better tailoring to address their specific needs.[13]

Potential solutions

Evidence from sexual and reproductive health (SRH) and, to a lesser extent, from mental health research provides examples of interventions that have successfully targeted adolescents (girls and boys). This can inform the adaptation of ANC and PNC services, including the World Health Organization (WHO)'s most recent guidance on ANC for a positive pregnancy experience,[20] to ensure they respond to adolescents' needs and address barriers to quality care.

Behavioural/educational components: This includes individual/group learning and/or counselling to increase knowledge and uptake of services (e.g. HIV testing).[21,22] However, effectiveness has depended on the intensity and duration of interventions, with more labour-intensive, longer-term interventions being more effective. Incorporating interactive components into education-based interventions has allowed adolescents to clarify their understanding on the topics covered and to address questions/doubts.[23] In all cases, ensuring healthcare providers are adequately trained to provide respectful education and counselling services that respond to adolescent needs is critical. In Nigeria, Care Groups have been used to specifically target pregnant adolescents, improving their uptake of health services, as well as influencing other nutrition and health-related behaviours, by providing adolescent-only sessions and tailoring education and support to their specific needs.[24]

Alternate venues/platforms for adolescents/adolescent-responsive services: Providing non-traditional venues for adolescent-responsive

services (e.g. HIV testing) can overcome some of the structural barriers to accessing care (e.g. inconvenience) and improve service uptake by reducing exposure to judgement and stigma.[22] Combining school-based interventions, such as sex education, with adolescent-responsive sexual health services has been shown to positively influence health behaviours such as contraceptive use.[25] Programa Geração Biz (PGB) is an example of a multi-sector programme across health facilities, schools and community settings in Mozambique to improve adolescent SRH that has been successfully scaled up nationwide.[25] Adolescent-responsive aspects of the programme have included competent and empathic staff, expanded and/or dedicated clinic hours for adolescents, offering services in a dedicated room/space, provision of appealing health promotion information including through peer educators in waiting areas, and the reduction of cost barriers.

Electronic/mobile health (e/m-health): Interventions using e/m-health platforms (e.g. mobile phones and personal or public computers) can address psychological barriers such as perceived risk, privacy, stigma, disclosure and fear of rejection.[22,26] However, findings from intervention studies suggest that structural barriers (e.g. accessibility issues and attitudes of healthcare professionals) need to be addressed alongside the use of e/m-health to ensure uptake of services and retention in care.[22] Across settings, adolescents and young adults have found e/m-health platforms acceptable and feasible.[27] Such platforms have also expanded programme reach and improved equity of access to services, allowing for real-time interactions between participants and healthcare professionals and facilitating peer-to-peer networking.[27,28] Combining a variety of media-based tools (e.g. videos, social media, interactive elements, live chats and quizzes) with active participation by communities during intervention development has fostered better engagement.

Incentive/cash-based interventions: Conditional (e.g. on school attendance) and unconditional cash transfers have been identified as effective strategies targeting early and/or repeat pregnancies.[29] Establishing small funds (village health funds) for use in emergencies has also been shown to improve the utilisation of pregnancy care.[30] A pilot intervention programme in Ecuador successfully improved adolescent girls' access to healthy diets during pregnancy and promoted health service use by pairing a comprehensive cash-based transfer programme with nutrition education, highlighting the benefits of linking food and social protection systems.[31]

Peer/community-based interventions: Establishing young women's groups can promote peer-to-peer support and tailored strategies for specific life stages (e.g. newly married women, pregnant women, mothers of one/more children) have been successful in targeting specific needs of girls and women.[30] Interventions that include family/community members generally aim to influence the decision-makers and gatekeepers via group counselling, the use of local media to promote supportive environments and social mobilisation activities. Peer educators are used in some studies to provide information and counselling through print materials, one-on-one sessions, group talks and presentations, with positive effects. However, the retention of peer educators can be a challenge, as they are often volunteers.[32] In cases where interventions are delivered by community health workers, there is a need to ensure they are adequately trained in adolescent-responsive counselling techniques and that they receive appropriate remuneration for their roles.[33]

Evidence gaps

- Substantial evidence, mostly from qualitative studies, exists describing the uptake of existing ANC services by adolescent girls in LMICs, as well as the barriers they experience to accessing care. However, similar evidence is needed for PNC services
- There is an absence of data to demonstrate the impacts of tailored ANC and PNC services for adolescents on service uptake and nutrition and health outcomes for mothers and infants
- More research is needed on whether strategies used to make SRH and mental health services adolescent-responsive could be adapted for ANC/PNC services. Such strategies should aim to promote the uptake of services, to reduce barriers to seeking and accessing care and to ensure that pregnant adolescent girls and adolescent mothers are supported at home, in their communities and when utilising services
- Research is needed on the cost-effectiveness of tailoring ANC/PNC services for adolescent girls to ensure they are sustainable and scalable in LMICs. This should be complemented with prioritising investment to support the unmet needs of this vulnerable group

Way forward

Research Question 1.1: What packages of adolescent-responsive ANC and PNC services support optimal nutrition and health outcomes for mother and infant? What are optimal delivery platforms? What is their cost-effectiveness?

- Study design: cluster RCT following a review of existing evidence and guidelines to inform the package of services
- Intervention: adolescent-tailored package of services vs standard ANC/PNC (control)

Packages of interventions should be informed by the WHO ANC[20] and PNC[34] guidelines, with appropriate tailoring of services and implementation strategies to respond to the specific needs of adolescent girls, including (but not limited to) (1) supplementation in deficient populations (balanced energy/protein, multiple micronutrient supplements (MMS), or iron and folic acid (IFA)), both antenatal and postnatal; (2) promoting optimal weight gain, considering both adequate and excessive gestational weight gain and the prevention of gestational diabetes, incorporating diet and physical activity education; (3) SRH education and access to contraceptives to prevent subsequent early pregnancies and optimise interpregnancy intervals;[35] (4) peer-to-peer support via adolescent-specific women's groups;[36] (5) linkages between schools and health services; and (6) complementary social and behaviour change communication (SBCC) strategies.

Research Question 1.2: Does including family members and healthcare providers in education/SBCC interventions increase the uptake of, and retention in, ANC/PNC services by adolescent girls?

- Study design: cluster RCT
- Intervention: SBCC intervention targeting pregnant adolescents, their families (male partners, mothers/mothers-in-law, fathers) and healthcare providers vs SBCC intervention for adolescent girls only (control)

Research Question 1.3: Does locating ANC/PNC services for adolescent girls within existing community-based services or platforms for adolescents increase the uptake of, and retention in, ANC/PNC services?

- Study design: cluster RCT or pre-/post-intervention analysis
- Intervention: locating ANC/PNC services within existing community-based services or platforms for adolescent girls vs standard facility-based ANC/PNC services (control)

Research Question 1.4: Does the use of e/m-health platforms (social media; text messaging) to educate, inform and engage adolescent girls during pregnancy and postpartum increase the uptake of, and retention in, ANC/PNC services, improve knowledge of nutrition and health and improve nutrition and health-related behaviours?

- Study design: cluster RCT
- Intervention: media-based SBCC package including education, promotion and peer-to-peer/peer-to-healthcare provider engagement on ANC/PNC attendance and nutrition and health behaviours during pregnancy and postpartum vs simple text reminders to attend ANC/PNC services (control)

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Research Area 2.

What strategies are effective for delivering interventions in schools to improve the quality of diets and the nutritional outcomes of SAC and adolescents?

Background

Schools are widely recognised as the optimal delivery platform for nutrition and health interventions during middle childhood and adolescence, since most children and adolescents are enrolled in school.[38] School feeding programmes are implemented globally and, in 2018, approximately 370 million children from 117 countries received daily school meals.[37] However, their coverage and quality vary across settings: many programmes target younger age groups, lack specific nutrition objectives and provide poor quality foods.[6,37] Increasingly, school feeding is being implemented through a 'whole-school approach' that promotes better nutrition through the school curriculum, facilitates physical activity, creates a healthy food environment and incorporates deworming and micronutrient supplementation, as needed.[6]

In 2021, WHO and the United Nations Educational, Scientific and Cultural Organization (UNESCO) launched an initiative to 'Make Every School a Health-Promoting School'.[38] While the concept of Health-Promoting Schools emerged in 1995, very few countries have implemented the approach at scale. The Global Standards for Health-Promoting Schools[38] and accompanying implementation guidance[39] provide a framework for health and education sectors to develop, fund, monitor and evaluate contextually adapted whole-school approaches to health promotion in schools. While nutrition is central to effective health and well-being strategies in schools and is emphasised across the Global Standards, implementation guidance still lacks clarity on the optimal package of interventions to support healthy and diverse diets and improved nutrition outcomes during middle childhood and adolescence in schools.

This research area will focus on defining two key components of school nutrition programmes – school feeding and micronutrient supplementation and on addressing implementation gaps. Other aspects of school-based intervention strategies are explored in the research areas below: youth engagement (**Research Area 3**); SBCC (**Research Area 4**); and school food environments (**Research Area 5**).

What we know

School feeding programmes

The *2020 State of School Feeding Worldwide* report indicated that, prior to the Covid-19 pandemic, one in every two schoolchildren in at least 161 countries from all income levels received daily school meals.[40] School meals have been shown to reduce child hunger, to support child well-being and to help children learn and thrive. They also contribute to reducing gender inequality, promoting girls' retention in school and reducing rates of child marriage and teenage pregnancy. However, many school feeding programmes still fail to reach the most vulnerable children, an issue that has been exacerbated by Covid-19-related school closures. In addition, older adolescents are often neglected, with the *2020–2030 World Food Programme (WFP) School Feeding Strategy* specifically targeting primary school children.[41]

Despite globally acknowledged benefits, school feeding programmes are not specifically incorporated into WHO's eight effective actions for improving adolescent nutrition,[42] and many research studies have failed to show significant effects of school feeding on indicators of undernutrition: weight-for-age z-score; height-for-age z-score; body mass index-for-age z-score; and anaemia and iron deficiency in children and adolescents aged 6–19 from LMICs.[43] This may be because study durations (often under 12 months) are insufficient to demonstrate effectiveness on the outcomes assessed and/or because the meals provided are of suboptimal quality (e.g. lacking in iron-rich, animal-source foods). Research also indicates that the impact of school-based nutrition interventions, including school meals and micronutrient supplementation, have the greatest impact in contexts of food insecurity and on children and adolescents who are undernourished and/or micronutrient deficient.[44,45] A lack of rigorous methodology and reporting regarding school feeding interventions further complicates the interpretation of results and the comparability between contexts.[43] Finally, assessing or estimating the longer-term nutritional benefits of encouraging school attendance through school feeding has also been a research gap.

Setting standards for the composition and quality of school meals (such as serving requirements for specific food groups and age-specific portion sizes) has been associated with increased fruit intake and reduced intakes of sugar-sweetened beverages and unhealthy snacks in high-income contexts.[46] Various tools have been developed to support meal planning and standardisation in schools while considering nutrient requirements and cost-effectiveness in different contexts.[47,48] However, there remains a lack of consensus on key elements of school feeding, including quantity and quality, as well as on tailoring programmes to support local food systems and to promote scalability and sustainability.[40] In 2022, the Food and Agriculture Organization and WFP launched a school food global hub[49] to enhance dialogues and experience-sharing around setting nutrition standards for school food programmes and improving food quality within schools, as well as aiming to stimulate the involvement and participation of schoolchildren and adolescents in these processes.

Micronutrient supplementation and fortification programmes in schools

Most of the evidence available from intervention studies during middle childhood (less evidence) and adolescence (more evidence) in LMICs assesses the impact of micronutrient supplementation and/or fortification on health and nutritional status.[50,51] This evidence demonstrates the benefits of supplementation, mainly through weekly iron and folic acid supplementation (WIFAS) and/or the provision of fortified foods on micronutrient status, as well as on anaemia, cognitive outcomes and anthropometry in some cases.[50] However, heterogeneity in research design and impact, particularly relating to intervention targets, content, adherence, duration and outcomes, hampers consensus on effective context-specific interventions and delivery strategies.

WHO recommends WIFAS for menstruating adolescent girls in regions where the prevalence of anaemia in girls and women aged 15–49 is 20% or higher.[52] In regions where anaemia prevalence is 40% or higher, WHO recommends daily iron supplementation.[53] Currently, only 45% of countries with a reported policy goal related to anaemia reduction implement any WIFAS programmes, including programmes targeting adolescent girls in schools.[54] Some studies that assess the impact of school-based WIFAS programmes have found low coverage and poor adherence due to several barriers, including inconsistent regimens and delivery mechanisms between schools and regions and acceptability issues for adolescent girls, including forgetting to take the supplements, disliking the taste and experiencing side effects.[55]

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Other structural barriers include the additional burden that supplementation programmes place on teachers and other school staff; the training, perceptions and experiences of educators; and accessibility to a regular, good quality supply of IFA supplements for adolescents.[54] The recommended formulation for this age group is not currently part of the WHO Essential Medicines List, which acts as a substantial barrier to procurement across LMICs.[56] Despite these challenges, examples of effective WIFAS programmes do exist but require intensive and sustained multi-sector collaboration.[57] Under the Right Start Initiative (2015–2020), Nutrition International has provided technical assistance to six countries in Africa and Asia to support governments to increase IFA supplementation coverage and adherence, prioritising supply chain management and effective behaviour change interventions and adolescent engagement as key features.[58] In Ghana, WIFAS has been provided to girls aged 10–19 in schools since 2017, resulting in a 5.4% reduction in anaemia prevalence.[59,60]

Increasing evidence shows that iron deficiency coexists with other micronutrient deficiencies in anaemic adolescent girls in LMICs.[61,62] Transitioning from IFA to MMS for adolescents in high-burden contexts has been proposed, but evidence on the benefits of such a transition have been mixed.[63,64] However, a study in Bangladesh has shown that providing anaemic adolescent girls with twice-weekly MMS confers additional benefits to their haemoglobin and micronutrient status when compared to IFA alone.[61,65] Nevertheless, the optimal and most cost-effective composition of micronutrient supplements for adolescents has not been established, nor have effective implementation strategies. As part of these efforts, the School-Based Assessment of Micronutrient Interventions in Adolescents (SAMIA) trial is currently comparing the effects of WIFAS and daily MMS on anaemia status, school performance/attendance and development outcomes among adolescents aged 10–17 enrolled in secondary schools in Burkina Faso and Zanzibar. However, other recent evidence has shown that a higher dose of folic acid than in the current formulation of MMS may be beneficial to prevent neural tube defects.[66]

Evidence gaps

- More evidence, or evidence collation, is needed to inform minimum standards for school feeding in LMICs, with a particular focus on the quantity, quality and timing of school meals and adequate tailoring by context, age and sex
- Research is needed on how to overcome current barriers to WIFAS programmes, including uptake, adherence, teacher/staff engagement, community buy-in and supply chain issues, to support the creation of context-adaptable implementation guidance

- While research is currently exploring whether IFA supplementation should be replaced by MMS during adolescence and the optimal amount of folic acid, future research will need to determine barriers to transitioning between the two formulations (including supply chains, funding and scalability), alongside sensitisation and acceptability at school and community levels
- Evidence on the prevalence of anaemia and micronutrient deficiencies during middle childhood (5–9 years) in LMICs is scarce, as is evidence on the impact of supplementation programmes targeting this age group

Way forward

Research Question 2.1: What are the minimum standards for school feeding programmes associated with improved school attendance and child health, growth and well-being outcomes, and how should these be tailored by context, age and sex?

- Study design: literature review and meta-analysis
- Intervention: school feeding of different quantities and qualities (macro and micronutrient). Should include information on fortified foods and if/how they should be used alongside micronutrient supplements
- Context: primary and secondary schools in a variety of regions

Research Question 2.2: How should WIFAS programmes be contextualised across diverse settings, including overcoming delivery barriers at scale?

- Study design 1: qualitative research to explore barriers and facilitators across diverse contexts
- Follow-on study design 2, building on existing work: pilot implementation, followed by adaptation and scale-up

Research Question 2.3: Should WIFAS programmes be replaced with programmes providing MMS to school-going adolescents, and what is the cost-effectiveness of this?

- Study design: cluster RCTs in various contexts, followed by use of secondary data to model cost differences vs effectiveness
- Intervention: MMS vs IFA, such as in the ongoing SAMIA trial

Research Question 2.4: What is the burden of anaemia and other micronutrient deficiencies (iron, vitamin A, zinc, iodine, etc.) during middle childhood and how does this differ by context?

- Study design: cross-sectional/surveys
- Context: a wide variety of contexts; Africa and Asia

Research Question 2.5: What are the benefits of micronutrient supplementation for the risk of anaemia and micronutrient deficiencies, as well as on other health, growth and well-being outcomes, during middle childhood and how does this differ by context?

- Study design: cluster RCT at the school level
- Intervention: WIFAS vs MMS vs placebo (control) and impact on haemoglobin levels, micronutrient status and other outcomes of interest (including, but not limited to, school attendance, retention and performance)
- Primary and secondary schools

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Research Area 3.

What strategies are effective at involving SAC and adolescents in defining their own context-specific solutions to nutrition problems, and does their involvement result in more effective interventions?

Background

Consistent with the emphasis on patient and public involvement in health research and policy agendas, as well as with the United Nations Convention on the Rights of the Child, youth voices are increasingly prioritised when designing solutions to health and nutrition challenges.[67] Young people are playing a particularly prominent role in movements targeting the nexus between climate change and healthy, sustainable food systems, using their initiative to develop and drive adolescent-responsive strategies and to advocate for change across various global platforms and campaigns.[68] In the lead-up to the 2021 United Nations Food Systems Summit, Western Sydney University and the United Nations Children's Fund (UNICEF) engaged young people in dialogues around their experiences of food systems and their visions for change.[69] During these dialogues, adolescents aged 10–19 from 18 countries showed awareness of the need for healthy and nutritious food to support their growth, development and learning, but recognised the limitations of existing food systems (alongside the impacts of climate change and of the Covid-19 pandemic) to support appropriate food choices. These limitations would be further exacerbated by conflict and recurrent natural disasters in affected countries. Adolescents emphasised the need for societal change towards improved food systems and planetary health, expressing their desire to advocate with, rather than to, researchers, programmers and policy-makers to achieve these ends. However, despite progress, many researchers feel unsure about how best to engage SAC and adolescents in defining their own solutions to nutrition problems, as well as how to sustain their involvement.

What we know

The *2018 Global Consensus Statement* described meaningful adolescent and youth engagement as *"an inclusive, intentional, mutually respectful partnership between young people and adults, supporting the integration of young people's ideas, perspectives, skills, and strengths into the design and delivery of programmes, strategies, policies, funding mechanisms, and organisations that affect their lives and their communities, countries, and world."*[70]

The *2021 Lancet series on adolescent nutrition* supported the need to empower adolescents as advocates for transformative change.[6] This has been reiterated by other research entities, civil society organisations, policy-makers, United Nations organisations and donors through efforts to incorporate youth engagement in their various workstreams. For example, youth engagement is increasingly reflected in research guidance and funding requirements, with the Wellcome Trust's latest strategy including a focus on involving young people in their research agendas[71] and The Lancet Child & Adolescent Health convening a Youth Advisory Panel in 2021 to advise on, and contribute to, content development.[72] UNESCO have also designed a toolkit to promote meaningful youth engagement across the work of the United Nations[73] and, more recently, the United States Agency for International Development (USAID) Advancing Nutrition has released guidance for programme planners and implementers on conducting formative research on nutrition behaviours with adolescents.[74]

A growing body of evidence demonstrates the benefits of youth engagement for research outputs, as well as for young people and their communities.[75] Involving young people in research enables them to identify and/or prioritise needs, tailor research to their experiences, interests and priorities, and better access and engage their peers.[75] Participatory approaches also generate data to adapt and improve interventions and programmes, becoming more responsive to the unique barriers that children and adolescents face to improving nutrition-related behaviours.[76] This, in turn, can encourage and enable young people to improve their own nutrition, as well as that of their families and their current or future children.[77] Engaging with and seeking the perspectives of young people has been shown to improve their critical thinking abilities, strengthen their social standing and relationships with adults and empower them as change agents through building their self-esteem and leadership skills.[77] Placing adolescents at the centre of health, education and development strategies aiming to increase gender equality may also contribute to social inclusion, increase nutrition and health equity and disrupt the perpetuation of gender norms for the next generation, particularly when targeting the early adolescent period (10–14 years).[78]

To date, young people have been engaged in research relating to several health issues affecting adolescents, with a substantial focus on mental health, substance use and SRH, particularly in high-income countries.[75,79] Engagement has primarily focused on research design, with more limited evidence of adolescents' involvement in other aspects, such as conducting research, agenda-setting and the dissemination of findings.[67,75] Methods of engaging young people in research have varied substantially regarding group size, frequency of engagement and types of activity. However, common models include engaging children and adolescents in qualitative and participatory formative research to inform intervention design, affording them decision-making roles on boards, including them in youth advisory groups, training them as peer and/or community-level educators and facilitators, involving them in programme installations and promotion activities, and empowering them to lead campaigns (e.g. through social media).[80–82] For example, the international non-governmental organisation Girl Effect has used a mobile-based research tool, Technology Enabled Girl Ambassadors, to enable girls and young women (18–24 years) to collect information on nutrition, health and well-being from peers and other community members in several African and Asian countries, contributing to formative research, concept testing and monitoring and evaluation assessments.[83] Similar approaches should be explored to engage boys and girls across middle childhood and adolescence to inform research, policies and programmes that respond to their specific needs.

Barriers to youth engagement

Despite the global narrative and momentum around youth engagement, in many cases only older, urban, educated and well-connected young people are afforded opportunities to contribute, and sometimes in relatively tokenistic

Photo credit: ©Tyler Lagalo, 2020/Unsplash

ways.[84] Inadequate acknowledgement and poor compensation for their efforts are common, and their contributions are rarely measured to demonstrate their value. Several other barriers to the design and implementation of effective youth engagement strategies have been identified in the growing body of literature, including the below.

Design-level barriers: There is a lack of clarity on how youth can participate/be engaged; a lack of monitoring and evaluation frameworks and indicators for youth engagement; a lack of buy-in from facilitators; and a lack of creative and engaging platforms and tools.

Organisational barriers: There is a lack of resources (time and money); challenges in accessing young people; delays if ethical approvals or safeguards are needed; and a lack of understanding of, and buy-in to, the benefits of youth participation within professional workspaces.

Financial barriers: There is a lack of funds available during formative research phases, despite the mandated need to incorporate youth engagement in research proposals, as well as insufficient funds to sustain and scale up youth engagement and participation.

Accessibility barriers: There is a lack of family/parental support for youth engagement; gender barriers limit the engagement of girls; and power imbalances make youth and/or girls less able to vocalise their views, especially the most disadvantaged or nutritionally vulnerable.

Strategies to promote and sustain engagement

Various strategies have been suggested to address barriers to effective and sustained youth engagement, including tapping into the interests, desires, aspirations and strengths of children and adolescents; building their capacity; ensuring they are trained by motivated, enthusiastic and trusted community members; providing incentives for participation; developing peer support networks; using diverse and innovative platforms that are relevant, accessible and tailored to children and adolescents; considering power dynamics and addressing tokenistic engagement; and ensuring that the contributions of children and adolescents are adequately credited. In Uganda, qualitative formative research has explored how youth would like to be engaged in nutrition programmes, with results focusing on their desire to be reached in

places/spaces that they frequent, as well as the need to engage them in entertaining ways and to share real-life stories they can relate to.[85]

Evidence gaps

While existing strategies and guidelines (e.g. the USAID guidelines on youth engagement in formative research)[74] may provide useful platforms to build on, more evidence is needed on the barriers and enablers to youth engagement in LMICs, as well as on relevant and effective context-specific implementation strategies. Specifically, there is:

- A lack of strategies, models and tools for effective youth engagement specifically in nutrition interventions and programmes in LMICs, including the relevance and effectiveness of creative and innovative platforms/tools by context, age and gender (e.g. social media and other youth-friendly/youth-dominated platforms)
- Limited data on context-specific barriers and enablers to youth engagement and to sustaining youth participation in nutrition interventions and programmes
- A lack of consensus on how to describe youth engagement in research and how to measure impact. Currently, there are no standard indicators for assessing the effectiveness of youth engagement. Some research suggests a need for mandated reporting of youth involvement in research studies during protocol development and publication of results, which would allow for better monitoring and comparison across studies
- Limited understanding of how to ensure that youth have expertise in nutrition and health topics, as well as training in research methodology, while tapping into their lived experiences and priorities. Strategies must strike a balance between what is healthy and what is desirable/aspirational for children and adolescents, while providing children and adolescents with an understanding of the research processes that they contribute to and the pathways to behaviour change

Way forward

Research Question 3.1: What are the optimal strategies for engaging children and adolescents in nutrition interventions in LMICs, and how do they vary by context, age and sex?

- Study design: compilation of case studies and exemplars, including any reported impacts on nutrition outcomes
- Intervention: using different methods of engaging youth (such as participatory workshops and creative methods including photos, graffiti walls, drawings, games, etc.) at different scales, frequencies and timepoints)
- Context: from a variety of contexts and scenarios, including research and programming

Research Question 3.2: What are the barriers and enablers to sustainably engaging children and adolescents in nutrition interventions in LMICs, and how do they vary by context, age and sex?

- Study design: qualitative study
- Methods should be relevant to the context and sample should include a range of ages and sexes to assess the needs of different groups
- Context: a wide variety are needed – Africa and Asia, urban and rural

Photo credit: ©Mulugeta Ayene, UNICEF State of the World Children/Flickr

Research Area 4.

What are effective, context-specific SBCC strategies to improve the diets and nutritional status of SAC and adolescents?

Background

As children and adolescents age, they gain independence and the determinants of their behaviours (including dietary practices and physical activities) broaden.[86] The behaviours adopted during middle childhood and adolescence can persist into adulthood, influencing the risk of developing non-communicable diseases, as well as affecting the health and well-being of the next generation.[86,87] These behaviours are influenced by a range of factors, including existing habits, social and cultural norms and aspirations, access to resources, self-efficacy and structural constraints and opportunities, particularly in the context of household food security.[86–88] SBCC strategies are increasingly utilised in nutrition programmes, employing interpersonal communication, social change and community mobilisation activities to promote positive behaviour change, particularly related to maternal, infant and young child nutrition.[88]

What we know

Various studies have incorporated or focused on strategies to improve nutrition-related knowledge, attitudes and behaviours during middle childhood and adolescence. These interventions have mostly targeted undernutrition or overweight/obesity (depending on the context) and have involved various communication-based approaches to promote behaviour change, including nutrition education and counselling, experiential learning, community mobilisation, social marketing and mass media/public engagement campaigns.

Evidence supports using a combination of approaches to reach various audiences via channels that are easily accessible, relevant and engaging. Using multiple channels to target children and adolescents directly, as well as targeting the people that influence their behaviours (e.g. parents, educators, health workers and community and religious leaders), ensures wide reach, while balancing the intensity and resource needs of specific SBCC activities. For example, individual, interpersonal and community-based participatory approaches – such as education, counselling and skills development; support groups; exercise programmes; and competitions – are targeted strategies to promote and support behaviour change but may have limited reach and require significant resources and time. On the other hand, mass media campaigns and social media engagement have wider reach but create challenges in targeting key beneficiaries and measuring impact.[89] It is important to select the messaging channel(s) carefully to reflect the behaviour change objective – whether it be knowledge, attitude or practice – and any associated complexities.

Strategies and toolkits for effective adolescent SBCC exist, for example the *Johns Hopkins Urban Adolescent Sexual and Reproductive Health SBCC Implementation Kit*.[90] *Nutrition International's Behaviour Change Intervention Toolkit*[91] is designed to guide implementation of effective evidence-based behaviour change interventions for health and nutrition, but this is not tailored to children and adolescents. While we are not aware of a toolkit for nutrition messaging that specifically targets middle childhood and/or adolescence, a pilot project by UNICEF and the Government of Indonesia provides examples of comprehensive, sex-responsive and school-based SBCC strategies.[92,93] The strategic approach of the project was based on six SBCC intervention modalities for improving adolescent nutrition: (1) materials development; (2) school mobilisation; (3) community engagement; (4) capacity strengthening; (5) social and mass media; and (6) advocacy. Similar modalities have been utilised across other programmes, thus providing a useful framework for presenting existing evidence on specific SBCC strategies.

Materials development: Programme experiences and guidance recommend that SBCC activities should be built around simple, evidence-based key messages that can be delivered and reinforced across a range of channels to promote behaviour change. For example, in the 2019/20 pilot programme in Indonesia,[92,93] key messages focused on just three themes: increasing iron consumption, healthy dietary practices and increasing physical activity. While the fundamental nutrition-related behaviours targeted by SBCC interventions may be similar across contexts, research has emphasised the need to incorporate context-specific and culturally relevant content. In addition, content and delivery materials should be tailored by age and sex.

School mobilisation: Many of the diet and physical activity behaviours adopted, or reinforced, during middle childhood and adolescence are shaped in and around the school environment. Within schools, evidence suggests that SBCC strategies (including nutrition education and health promotion activities) are more effective when embedded within the school curriculum. While curriculum-based education on its own can improve knowledge, effective strategies to promote behaviour change tend to incorporate experiential learning methods such as school gardens, cooking lessons, taste testing and food provision.

While schools are platforms to engage large proportions of children and adolescents, it is important that those out of school are not neglected and that similar strategies are explored to access this vulnerable group (see **Research Area 6**). As part of a multi-sector nutrition project in Ethiopia, an adolescent nutrition SBCC programme targeted out-of-school adolescent girls and boys via community-based platforms such as youth centres and adolescent-responsive reproductive health services.[94] Similarly, strategies that incorporate SBCC strategies for rural populations need to be explored.

Community engagement: Within and outside the school environment, the diet and activity

behaviours of children and adolescents are influenced by a range of stakeholders, including parents/family members, peers, educators, health workers, community elders and religious leaders. Better engagement of community members, particularly parents, in interventions has been identified as important in ensuring sustained behaviour change outside school. In some cases, targeting male caregivers in some contexts has been shown to increase their involvement in their children's nutrition at household level. Community engagement is critical to encourage participation in any SBCC programme; allowing community members to voice their perspectives during programme design, implementation and evaluation fosters ownership and ensures programmes are contextualised. Engaging role models may be particularly effective, tapping into the values and aspirations of children and adolescents.

Capacity strengthening: Many SBCC nutrition interventions are delivered by teachers and other school staff. Research suggests that investing in the learning and development of teachers through adequate and ongoing training, as well as continuous professional development strategies, improves their motivation and confidence in delivering interventions and increases engagement. Some SBCC programmes have trained adolescents, parents, food providers, health workers and community leaders to either deliver or reinforce key messages.

Social and mass media: There have been few examples of using innovative approaches (e.g. social media platforms and game-based approaches) to effectively engage children and adolescents in LMICs. However, some studies have shown positive effects of incorporating electronic health strategies, computer-based feedback, media (e.g. radio or television shows) or messaging on food choices. For social media specifically, there are benefits relating to its wide reach and accessibility, as well as its ability to facilitate interactive engagement. It may also serve as a useful platform for monitoring and evaluation. However, research emphasises that these platforms should be used in conjunction with more traditional face-to-face engagement, and messages should be age-, sex- and context-appropriate.

Advocacy: SBCC strategies should incorporate advocacy to improve policy environments. *The Youth Leaders for Nutrition Advocacy Toolkit*[95] was created through a participatory and collaborative process with Scaling Up Nutrition Youth Leaders for Nutrition, supported by Save the Children and the Global Alliance for Improved Nutrition, to support youth advocates to design, develop and implement advocacy strategies for improving adolescent nutrition. Advocacy efforts should be contextualised according to the barriers that limit access to healthy diets and activity levels during middle childhood and adolescence, with a particular focus on vulnerable groups, such as those out of school. Successful behaviour change requires complementary approaches that consider the wider food environment and address the many factors influencing diet and activity behaviours during middle childhood and adolescence, including availability of, and access to, healthy food.[50,88] Research targeting the school food environment to support healthy dietary behaviours is explored in more detail below (**Research Area 5**).

Evidence gaps

- There is a need to better understand mechanisms of behaviour change that support improved diets during middle childhood and adolescence. More guidance is needed on how to develop context-specific content and intervention materials that are age and sex appropriate
- School mobilisation strategies are needed that consider the wider school environment and are contextually adapted to address barriers. Complementary approaches that target out-of-school adolescents require exploration, as does the tailoring of such strategies for adolescents living in rural settings
- There are few examples of robust, multi-level strategies that engage community members across all stages of programme design, implementation and evaluation, while tapping into their unique roles within community structures
- Guidance is needed on how to provide SBCC training for teachers and other staff at scale. More research is also needed on the most effective targets and strategies for capacity strengthening across contexts where community roles may differ
- There are few examples of feasible, acceptable and effective media-based approaches in LMICs, with the limited evidence from media-based interventions demonstrating modest effect sizes. More research is also needed on how best to pair these approaches with face-to-face SBCC

strategies, on how to ensure the target audience is reached and on how to tailor messages by age, sex and context

- There is little evidence of advocacy strategies being incorporated into SBCC interventions. Consensus is needed on how the policy environment can support healthy behaviours in children and adolescents

Way forward

Research Question 4.1: What common framework can be used to design contextualised and effective SBCC programmes for improving nutrition in middle childhood and adolescence?

- Study design: systematic review of current strategies, examples, evidence and toolkits that effectively promote behaviour change during middle childhood and adolescence
- This should include lessons learnt from other sectors, such as SRH, as well as frameworks that promote gender equity and girls' empowerment (such as the GAGE Conceptual Framework),[96] and should be used to build a common framework to guide nutrition SBCC programming for middle childhood and adolescence
- RCTs that trial the use of this framework in a variety of contexts will then be needed, such as the ongoing Engaging Adolescents in Changing Behaviour Background study in the UK.[97] These should include cost-effectiveness analyses.
- National-scale pilot programmes should then follow, documenting lessons learnt in scaling up

Research Question 4.2: What SBCC strategies are effective for rural adolescents and out-of-school adolescents?

- Study design: cluster RCT and cost-effectiveness analysis
- Intervention: different multifaceted SBCC strategies are needed that are specific to adolescents in rural communities and those out of school, and should be compared considering the specific barriers faced by these populations to accessing information
- Outcomes should extend beyond anthropometry and include changes in knowledge, empowerment, diet and physical activity levels
- Context: Africa and Asia, rural

Research Question 4.3: What is the feasibility, acceptability and effectiveness of large-scale media-based campaigns on nutrition outcomes during middle childhood and adolescence in LMICs?

- Study design: cluster RCT randomised at community level
- Intervention: school-based SBCC vs school-based SBCC and media-based campaigns, including exploration into whether the media campaign/ messaging reached the target audience, what platforms were most effective and whether there were additional benefits on nutrition outcomes when compared to school-based, face-to-face strategies alone (e.g. does push messaging around key messages prompt/reinforce behaviour change?)

Research Area 5.

What improvements can be made to local food systems to support access to healthy diets in schools?

Background

In recent years, increased attention has been paid to the role of food systems in determining the diets of children and adolescents.[98] In a series published in Global Food Security in late 2020, child-centred food systems were defined as systems that guide children towards healthier diets by making them available, affordable, appealing and aspirational.[99] However, existing food systems often overlook the nutritional needs of children and adolescents, failing to provide the quantity, frequency and quality of food they require to grow and develop.[98,100] Since the majority of children and adolescents aged 5–19 spend a substantial amount of time in school, the food environments within and surrounding schools are a key driver of their dietary practices.[100] More research is needed to identify improvements that can be made to local food systems to support healthier school food environments.

What we know

Good food systems for schools should promote the availability of healthy, micronutrient-dense foods and restrict access to less healthy food items that are high in fat and sugar, while incorporating behavioural components.[101] Most research exploring restriction of unhealthy foods still comes from high-income settings, where the following policies have positively influenced dietary practices: (1) enforcing closed campuses during lunch times; (2) limiting availability of unhealthy/snack foods sold in schools; (3) regulating the time spent in lunch areas; (4) limiting the hours during which certain items (e.g. sugar-sweetened beverages) can be purchased; and (5) preventing a focus on unhealthy food items in school activities, competitions and fundraisers.[46,102] Research from South Africa has identified associations between children's diets and the number of vendors selling unhealthy food products nearby.[103] In Ethiopia, a study found that almost 80% of adolescents consumed sweets and sugar-sweetened beverages at least once a week, and that consumption was influenced by a combination of their awareness of healthy foods and their concerns about food safety, as well as by financial limitations.[104,105]

Marketing of unhealthy food and drinks in and around schools has been associated with increased consumption in high-income settings,[106] although there is less evidence for this in LMICs. While urban settings in LMICs still have pervasive marketing of unhealthy foods and drinks around schools, low purchasing power often limits associations with adolescent diets.[105] In settings where adolescents are financially unable to purchase food/snacks, the provision of healthy school meals is even more important. School gardens are increasingly being used as platforms for providing nutrition education, developing skills and generating healthy produce for school meals with very short supply chains.[103] Food chains that link local fruit and vegetable farms with school meal providers also have the potential to successfully improve nutrition outcomes for children and adolescents.[107]

In summary, the following interventions should be considered to improve school food systems.

- Healthy food standard regulations should be implemented on all foods consumed at school, including direct provision of food in classrooms and/or cafeterias, food brought to school by students and purchases made from tuck shops and vending machines
- Unhealthy food/beverage vendors and marketing in and around schools should be restricted
- The affordability, availability and desirability of health foods in and around schools should be

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improved through nutrition education and food systems interventions with local producers. This may include school gardens and rearing of small livestock, as well as improving supply chain links

- Good water, sanitation and hygiene practices should be implemented
- Adequate food storage facilities to ensure adequate food safety and hygiene should be implemented

Healthy food environment policies need to be complemented by healthy school meal programmes (**Research Area 1**), curriculum-based nutrition education/information, comprehensive school health services and communication with children and parents to support healthy dietary choices (**Research Area 4**). Current evidence suggests that knowledge and perceptions of healthy diets have a large influence on adolescents' snack choices – hence effective, large-scale interventions that tackle this angle could be very effective (**Research Area 4**).

Way forward

Research Question 5.1: Which aspects of school food environments are associated with dietary/ anthropometric outcomes in LMICs?

- Study design: systematic review (initially), including observational and intervention research. This will guide future interventions and identify gaps in knowledge
- Context: all LMICs, ideally

Research Question 5.2: Can school regulation interventions (restricting marketing, setting regulations on what foods are allowed in schools, etc.) impact adolescent diet and nutrition outcomes in urban LMIC settings?

- Study design: cluster RCT, multi-armed
- Intervention: implementing healthy food standard regulations on all foods consumed at school; restricting unhealthy food/beverage vendors and marketing in and around schools
- Context: primary and secondary schools

Research Question 5.3: Can interventions to support supply chains between local farming systems and school feeding programmes (in primary and secondary schools) increase farming income and improve nutrition outcomes for children and adolescents?

- Study design: cluster RCT
- Intervention: supporting local producers of healthy foods (fruits, vegetables, legumes and animal-source foods) to supply schools for school meals programmes
- Context: primary and secondary schools

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Research Area 6.

What are the optimal cross-sector partnerships and delivery platforms (health, education, social protection, digital platforms, media/technology, etc.) for the effective uptake of nutrition interventions for SAC and adolescents, considering scale, sustainability and youth engagement?

Background

This research area was ranked by CHNRI respondents as the highest priority for out-of-school children and adolescents. Since prior research areas in this roadmap have addressed many aspects of school-based interventions, this area will focus on delivery platforms beyond schools. A range of other platforms are available, including public and private health facilities, mobile clinics, pharmacies, community/youth centres, e/m-health platforms and outreach services.[108] However, the level of expert agreement between CHNRI respondents was lowest for delivery questions relating to out-of-school children and adolescents, suggesting poor consensus on the optimal platforms for this group.

As has been previously mentioned, effective nutrition and health interventions must be adolescent-responsive. This requires delivery platforms and partnerships to make services available, accessible and appropriate, and to provide implementers with the right skills and competencies; and requires ensuring they are supported by appropriate financial resources for mainstream and specialised services and have strong governance structures.[108,109] Current knowledge and barriers to making services adolescent-responsive are discussed above (in relation to ANC services – **Research Area 1**). However, more evidence is needed on how to extend intervention strategies beyond schools to ensure the availability of, and access to, healthy diets, and to promote and maintain behaviour change, including long-term sustainability.

What we know

The *2016 Lancet Commission on Adolescent Health and Well-being*[109] described effective actions for adolescent health and well-being as multicomponent interventions, including structural, media, e/m-health, community and school-based elements alongside access to comprehensive health services. Since health service platforms, media/social marketing and e/m-health have already been covered, this research area focuses on the use of structural and community-based interventions to improve nutrition and health in children and adolescents.

Structural interventions

Structural nutrition interventions include legislation, taxation and the implementation of policies promoting and supporting the consumption of healthy, nutrient-dense foods and engagement in physical activity, while restricting less healthy diet and activity behaviours. As in school environments, such interventions are needed to support adoption and maintenance of healthy behaviours across settings in which children and adolescents live and interact. Supply-side interventions (e.g. agricultural interventions and subsidies) and food regulations (e.g. banning trans-fats, reducing salt content of foods, front-of-pack labelling regulations and sugar-sweetened beverage taxation) have been shown to influence food access and consumption at the population level.[109–111] In Niger, the Sawki programme aimed to increase household access to nutritious foods by diversifying the agricultural activity and income of rural households, with positive impacts on land and livestock productivity at the household and community level, while supporting women to initiate income-generating activities or provide social safety nets for their families.[112] However, evidence of the impact of such programmes on food access and consumption during middle childhood and adolescence specifically is scarce.[109]

Marketing bans, particularly targeting digital media platforms, have been implemented in some countries to restrict the exposure of children and adolescents to the marketing of unhealthy foods and beverages (and thereby restricting the consumption of these items). For example, in Chile, a regulation implemented in 2016 to restrict child-directed marketing of products high in energy, saturated fats, sodium and sugars was found to reduce adolescents' exposure to related television food advertising by almost 60% in the following year.[113] Most food marketing policies target adolescents aged 12–15 or younger children, and limit advertising during children's television programmes.[114] Policies that restrict advertising via other media platforms (e.g. mobile phones, print media and the internet) are rare. In addition, few countries currently have such policies in place, and evidence is lacking on their impact on children's and adolescents' food purchases and intakes, weight status and body composition.[109,114]

Interventions that reduce demand-side barriers to accessing healthy foods also play an important role, particularly in contexts where levels of poverty and food insecurity are high. For example, social protection programmes (including conditional and unconditional cash transfers, and in-kind benefits such as food baskets) have been shown to improve diets, to provide entry points for interventions such as nutrition education and counselling, and to promote and sustain behaviours such as attending schools or health services.[31,115] As previously mentioned, incentive/cash-based transfers have been effective in improving diets and access to ANC for pregnant adolescents.[31] However, much of the available research focuses on maternal, infant and young child outcomes, and it is rare to find programmes targeting non-pregnant adolescents and those in middle childhood. In rapidly transitioning LMICs, there are also concerns that such programmes may inadvertently increase access to energy-dense processed foods high in sugar, salt and fat, with implications for obesity risks in the longer term.[116] Overall, the effectiveness of structural interventions depends on strong governance systems that facilitate implementation across multiple sectors and robust information systems to monitor outcomes.[109]

Community-based platforms

Community-based interventions provide opportunities to work with a range of local organisations to target social norms and environments that influence dietary choices and engagement in physical activity, particularly for out-of-school children and adolescents.[6] While interventions targeting other health behaviours and services (e.g. SRH, HIV prevention and substance use) have been delivered to adolescents by religious leaders and communities, non-governmental organisations, local businesses and youth clubs, few examples of delivering nutrition interventions via these platforms exist, particularly at scale.

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Most WIFAS programmes have been implemented in schools; however, some countries have incorporated community-based platforms to provide for adolescents who are not attending school. For example, WIFAS and nutrition education is being delivered to out-of-school adolescents in community outreach centres in India; in Ethiopia, community platforms have trained 'motivator' girls to provide information on nutrition and anaemia to their out-of-school peers and to encourage them to attend health facilities for supplementation.[58] A recent RCT in Ethiopia has demonstrated positive effects of providing IFA supplements to adolescent girls via weekly home visits on iron and folate deficiency over a three-month period.[117] Coverage of these programmes for out-of-school adolescents remains low; more effort is needed to understand optimal, context-specific strategies to reach out-of-school adolescents, who are often geographically scattered and have less access to health services and few financial resources.[58]

Within Niger's Sawki programme (mentioned above), a focus on empowering adolescent girls (10–18 years) was incorporated through 'Safe Spaces' where the girls were able to learn new skills, develop social networks, empower each other and heal from trauma. As part of the programme's activities, girls were taught about essential nutrition actions, SRH, the risks associated with early marriage and early pregnancy, and the importance of education and basic literacy. Some girls also received a livelihood component that provided training on livestock management, gardening and savings and loans activities. Findings from an evaluation of the programme showed that participation in Safe Spaces (with or without the livelihood component) prompted girls to share knowledge with other community members, including friends, siblings and parents.[77] Anthropometric and diet outcomes were not assessed.

PGB in Mozambique also incorporated specific out-of-school components to support adolescent SRH.[25] In this case, out-of-school adolescents were trained as community-based peer educators to facilitate conversations about SRH and to refer their peers to youth-friendly health services. The Ministry of Youth and Sports was responsible for the community-based activities, but strong referral linkages were established between community, school and health delivery platforms under the remit of the Ministry of Education and the Ministry of Health respectively.

While promising examples of community-based interventions for children and adolescents exist, evidence in most settings is scarce and insufficiently powered to assess impact,[21] particularly on nutrition outcomes. In addition, where programmes do exist, few have been taken to scale.

Evidence gaps

- Research is lacking on the impacts of legislative and taxation policies to improve the availability of, and access to, healthy nutritious foods and restrict that of unhealthy foods and beverages on diets and nutritional status during middle childhood and adolescence
- Examples of social protection programmes targeting middle childhood and adolescence, particularly for vulnerable children and adolescents who are out of school, are lacking. More research is needed on cash-based and/or in-kind strategies that reduce food insecurity, promote healthy diets and encourage and support school attendance for this age group, especially for the most vulnerable
- Qualitative evidence is needed on the barriers and enablers to accessing nutrition, health and social protection services for out-of-school children and adolescents
- More research is needed on the impact and accessibility of context-specific community-based platforms and implementation partners for nutrition interventions (such as WIFAS, nutrition counselling and behaviour change communication) beyond schools

Way forward

Research Question 6.1: Can social protection programmes targeting food security and nutrition outcomes be adapted to improve nutritional status during middle childhood and adolescence, particularly for those out of school?

- Study design: systematic review (initially) of current social protection programmes that effectively promote food security and improve dietary intake and quality. This will identify gaps in knowledge and inform future interventions
- Context: diverse LMICs, particularly targeting those where many children and adolescents are not in school

Research Question 6.2: What are the barriers and enablers that out-of-school children and adolescents experience to accessing nutrition, health and social protection services in LMICs, and how do they vary by context, age and sex?

- Study design: qualitative study
- Methods should be relevant to the context, and the sample should include a range of ages and sexes to assess the needs of different groups
- Context: a wide variety are needed – Africa and Asia, urban and rural

Research Question 6.3: What are the optimal community-based platforms for delivering nutrition interventions to children and adolescents beyond schools at scale, and how do they vary by context, age and sex?

- Study design: compilation of case studies and exemplars, including any reported impacts on nutrition outcomes
- Context: a variety of contexts and scenarios, including research and programming

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Cross-cutting considerations for nutrition research during middle childhood and adolescence

Funding and cost-effectiveness

- Across research areas, funding limitations were highlighted as key barriers to the implementation and/or sustainability of nutrition interventions/programmes during middle childhood and adolescence
- Nutrition interventions in secondary schools rather than primary schools, and interventions targeting out-of-school children and adolescents, are especially under-researched
- The cost-effectiveness of adolescent-tailored ANC/PNC services was specifically emphasised in **Research Area 1**. However, the need to incorporate estimations of cost-effectiveness is critical across the research to assess suitability, sustainability and scalability across LMICs. For example, incorporating an estimate of the cost of care per adolescent girl for a tailored intervention package vs routine care (control), or WIFAS vs MMS, would help in assessing the scalability of the proposed intervention/programme and

support advocacy efforts for adolescent nutrition programmes. Some emerging research is incorporating these assessments, for example by estimating the costs and cost-effectiveness of the intervention from a provider perspective/ via cost-consequence analysis. The MMS cost–benefit tool launched in October 2019 provides governments with a context-specific method to determine whether antenatal MMS is better value for money than IFA in their maternal nutrition programmes.[118] Such assessments and tools need to become routine in future research

Monitoring and evaluation

- Many interventions/programmes across high-, middle- and low-income settings fail to incorporate the adequate, long-term monitoring and evaluation components essential to assess impact, identify effective intervention strategies, establish formal standards for nutrition-related policies and guidelines in schools and coordinate various intervention components. Specifically, research on school nutrition programmes emphasised the need for large-scale evaluations in LMICs to inform scalability and sustainability, including assessment of the cost-effectiveness and development of standardised indicator measures
- Overall, more research is needed on what indicators and outcomes to measure, as well as on the optimal timing and platforms for the monitoring and evaluation of nutrition interventions/programmes during middle childhood and adolescence. This will also allow for better comparison between contexts
- In particular, understanding what indicators should be used to assess the effectiveness of youth engagement by programmes and research, for example through an expert consultation around indicators from similar sectors and/or a stakeholder survey, would be useful

Multi-sector engagement

- While the focus of many school-based interventions has been on implementation via the education sector, the increasing focus on multicomponent strategies to holistically address malnutrition relies on effective engagement across sectors – for example, incorporating social protection systems to address food insecurity, ensuring access to basic health services and facilitating access to healthy food via engagement with the agricultural and commercial sectors
- As emphasised by the WHO/UNESCO Health-Promoting Schools initiative, current, single-focus, nutrition-specific interventions need to be adapted/incorporated into broader, whole-school approaches that provide: a healthy environment; school health education and services; school/ community projects and outreach; health promotion programmes for staff; nutrition and food safety programmes; opportunities for physical education and recreation; and programmes for counselling, social support and mental health promotion. For example, in Tanzania, the Meals, Education, and Gardens for In-School Adolescents trial[119] is testing the implementation of an integrated, school-based nutrition intervention package in secondary schools that includes school meals, school gardens, school education and community workshops to improve adolescent nutrition status and food security, while building sustainable skill sets

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Conclusion

One of the 10 recommendations from the 2021 Lancet series on adolescent nutrition was that *"donors and research funding agencies … invest in and prioritize the knowledge gaps thwarting action for adolescent nutrition."* While this research roadmap is not exhaustive, it provides detailed background evidence on priority research areas, identifies evidence gaps and outlines specific research questions to guide the efforts of researchers, funders and governments over the next 10 years.

Opportunities for collaboration and coordination

To streamline and optimise efforts to address these (and other) research gaps related to improved nutrition during middle childhood and adolescence, collaboration and coordination between partners is key. The Global Adolescent Nutrition Network (GANN) is a network of researchers, programmers, government representatives, donors, and United Nations agencies, coordinated by ENN, that provides a platform to identify emerging research, share operational experiences and disseminate information.

The GANN would welcome expressions of interest to co-develop concept notes around the research questions outlined in this roadmap with group members. We would also appreciate hearing any details from researchers on how content in this report is being used to shape research plans, whether within or external to the GANN. This is both to improve the coordination of future activities and to understand the utility of this type of report. Any feedback on the content is welcome and can be shared with the GANN coordinator at **natasha@ennonline.net** or **office@ennonline.net**.

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