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Socio-ecological Factors and the Double Burden of Malnutrition Among Children and Adolescents in Low- and Middle-Income Countries

NICHD Global Health Conference
October 19-20, 2022 | 12:30PM – 5:30PM EDT

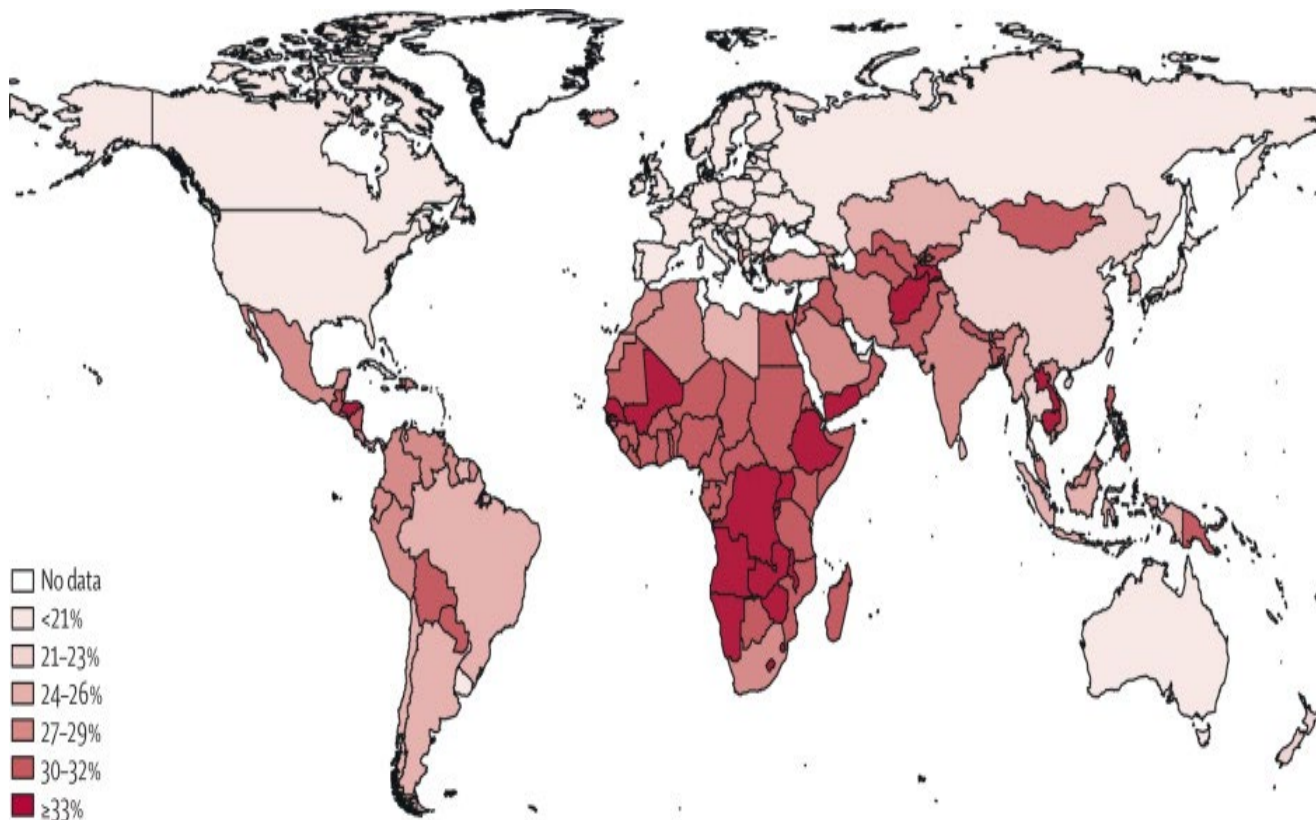
School-based interventions addressing adolescent malnutrition in LMICs

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19 October 2022



Distribution of people aged 10-24 years as a proportion of the population



Source: Sawyer et al., Lancet, 2012

Nine in ten adolescents live in LMICs

70% of sub-Saharan Africa under the age of 30

Sub-Saharan Africa projected to have more adolescents than any other SDG Region by 2050

Limited data to inform policies and programs that address the unique developmental and health needs of adolescents from SSA countries

Little is known on the rate at which the double burden of malnutrition has unfolded among adolescents and young adults in SSA region

Africa Research, Implementation Science and Education (ARISE) Network

- Launched in 2014 to advance collaborative education and research activities in Africa
- Brings together 21 institutions from seven countries in Africa



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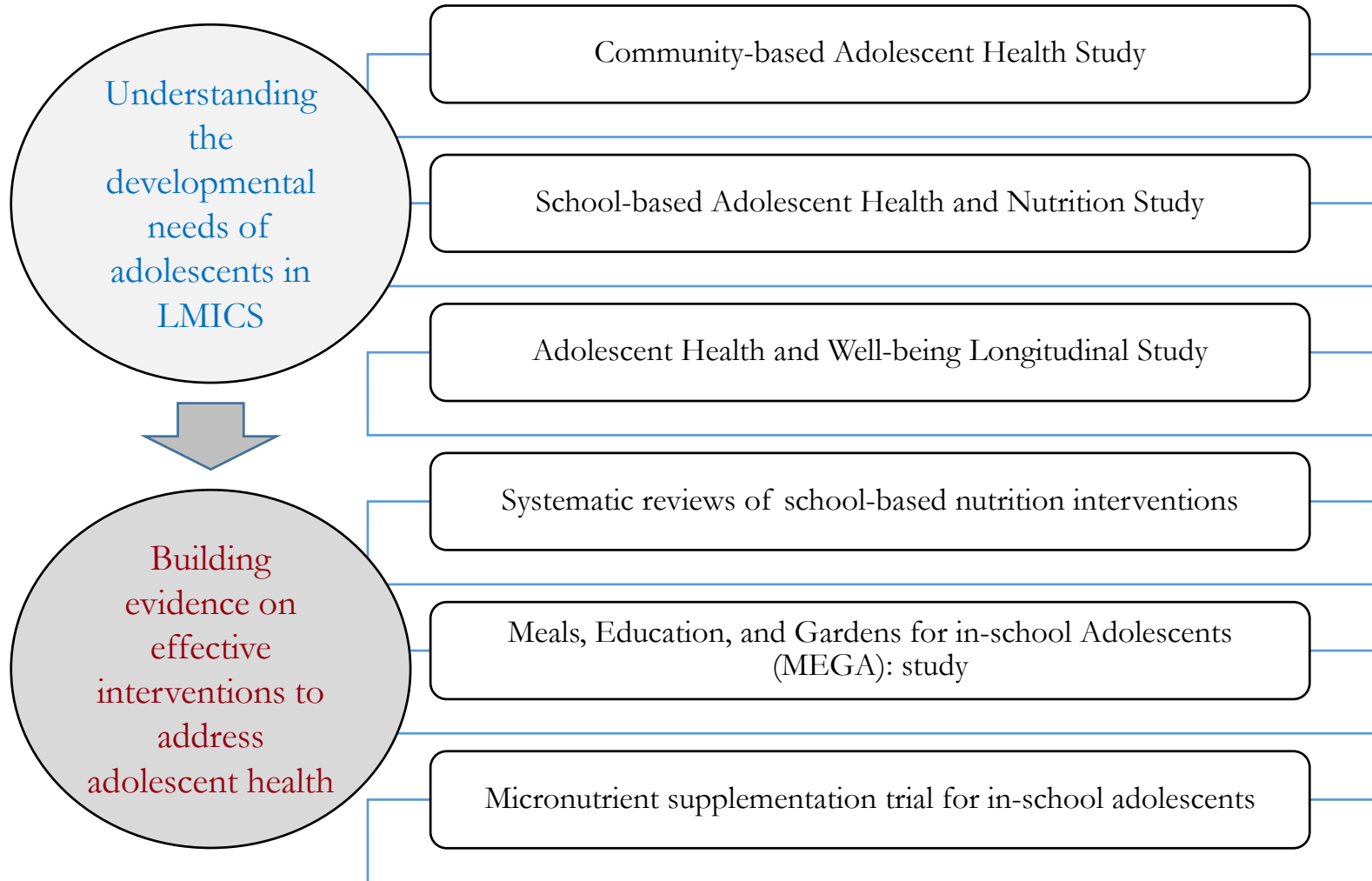
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SCHOOL OF PUBLIC HEALTH
Harvard University

Global Adolescent Health and Nutrition Workshop ARISE Network



ARISE Network's Adolescent Health and Nutrition Efforts



Community-based Adolescent Health Study

- A cross-sectional community-based survey of 8,075 adolescents aged 10–19 in 9 communities in 7 countries
- Goal of generating community-based data on health-related behaviors and associated risk factors in adolescents, to identify disease burdens and health intervention opportunities
- Communities selected using population cohorts maintained by health and demographic surveillance systems (HDSSs)
- Data collected on: physical activity, substance use, mental health, sexual and reproductive health, food security and food diversity, hygiene practices, injuries and violence, health care, health status assessment and life satisfaction, network, media and cell phone use and socio-demographic and economic background characteristics



School-based Adolescent Health and Nutrition Study

- A school-based study aimed at understanding young people's health risks and disease burdens, school food and nutrition environments, and overview of national, regional and school-level health and nutrition policies and programs in five SSA countries
- Methods
 - A cross-sectional survey with 4,988 adolescents aged 10-15 years
 - Quantitative survey of school food vendors
 - Situational analysis of school food and nutrition environments
 - Qualitative investigation on adolescents' food habits and environments
 - Desk review of country-specific school health and nutrition policies and programs

Adolescent quantitative assessment

1. Socio-demographics
2. WASH practices
3. Anti-microbial resistance
4. Physical activity
5. Diet & nutrition
6. Socio-emotional development and mental health
7. Educational outcomes
8. Social media use
9. Anthropometry and hemoglobin assessment

School assessment

1. School-size & resources
2. Food and nutrition services & programs
3. Physical activity
4. Education
5. Counseling
6. Capacity building and training of teachers

Food vendors Survey

1. Number of food outlets around school
2. Availability of specific food items

Adolescent qualitative assessment

Perceived health, food choices, preferences, and access

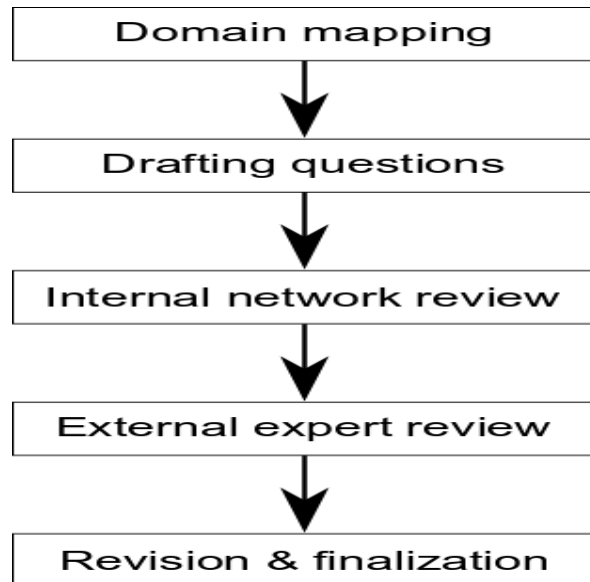
Desk review of policy and program documents



Adolescent Health and Well-being Longitudinal Study

Data and indicators central in setting priorities for investments in adolescent health, education, and social development

Developing adolescent health and well-being indicators and a questionnaire



Integrating adolescent health and well-being measures into population-based data surveillance systems

- 2 rounds of surveys with adolescents (10-19 years old) in 9 countries
- A cohort of 1200 adolescents in each site
- 2 school-based surveys and 9 community-based surveys, using the existing platforms of HDSS
- Completed 1st round of survey with 12,000+ adolescents

6 Domains: Health awareness and behaviors, nutrition and anthropometry and hemoglobin assessment, mental health, sexual and reproductive health, substance use, and healthcare utilization and satisfaction

Key findings

7-18%
Underweight

3-12%
Overweight
& obese

8-48 %
Stunted

11-58 %
Anemic

- Males more likely to be underweight and stunted than females
- Females more likely to be overweight and/or obese and anemic than males

- Inadequate fruit and vegetable consumption
 - High consumption of whole grains and vegetable oils
- High consumption of soft drinks and processed food items
- Low prevalence of at least 1 h of physical activity per day
 - Females less likely to exercise for 1 h or more per day

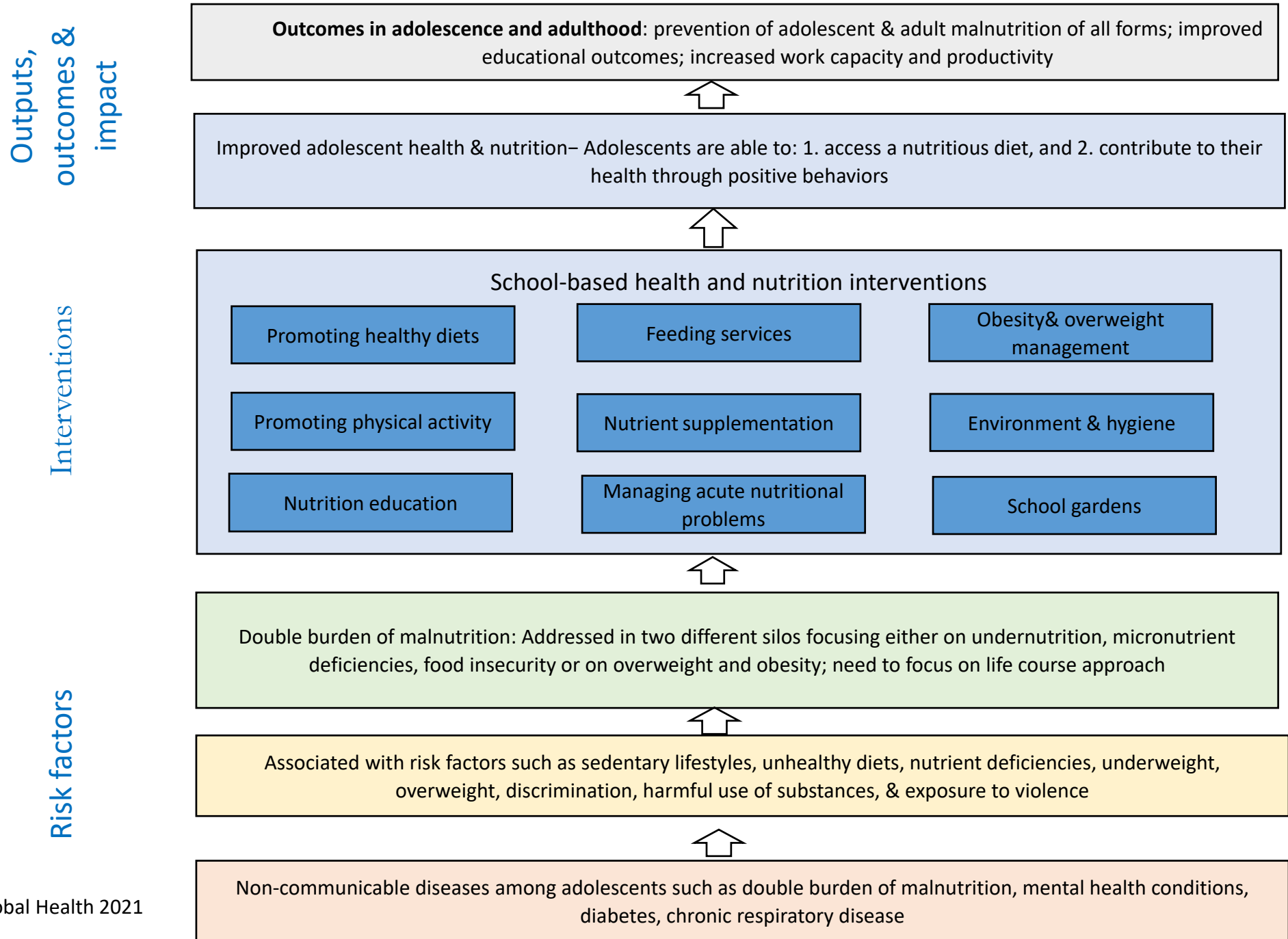


School food and nutrition environments



- 95% SSA countries with school meal programs, reaching approx. 30% of all children of primary school age
- School meal programs grapple with inadequate and unpredictable budgets and challenges related to supply chains and logistics
- Low awareness about existing health-related policies and guidelines at school-level
- Inadequate depth in addressing adolescent malnutrition through school-based programs in existing policies and programs
- Low awareness and implementation of comprehensive school food and nutrition environments interventions
- Inadequate provision of health, nutrition, physical activity and WASH services in schools

Framework for evidence synthesis of interventions addressing adolescent malnutrition





School feeding interventions in LMICs

- Assess the impacts of school feeding on educational & health outcomes of children and adolescents in LMICs
- 44 RCTs and 13 controlled before-after studies of 39 interventions
- 31 studies of only school feeding interventions
 - 17 studies of in-school snacks
 - 8 studies of provision or modification of in-school breakfast
 - 7 studies of provision or modification of in-school lunch
 - 7 studies focused on more than one modality of school feeding
- High heterogeneity of the menus and modalities
- Complimentary interventions: deworming and/or health/nutrition education

Source: Wang et al, Journal of Global Health 2021

- 9 outcomes were included in three or more independent studies with sufficiently consistent outcome definitions
 - 1) height; 2) HAZ; 3) weight; 4) WAZ; 5) BAZ; 6) hemoglobin concentrations; 7) plasma/serum ferritin concentrations; 8) mathematical or arithmetic skills; and 9) school attendance
- Significant improvements in height (0.32 cm 95% CI 0.03, 0.61), weight (0.58 kg 95% CI 0.22, 0.93) and school attendance (2.6% days, 95%CI 1.2%, 3.9%)
- No significant benefits on indicators of undernutrition, hemoglobin and ferritin concentrations, dietary habit change, and academic performance
- Many programs did not include specific nutrition objectives, and often included poor-quality foods (both nutritionally and in their appeal to young people)
- Lack of clear consensus and guidance on the design of school meals in resource-limited settings
- Lack of consensus on assessing and improving quality of school feeding programs
- Need to better understand the key elements of successful programs for adolescents

School-based interventions addressing adolescent malnutrition in LMICs



- Characterize school-based health and nutrition interventions among adolescents in LMICs and analyze their effects on nutritional status and educational outcome
- 68 articles describing 58 interventions
- 41 CRCTs, 16 Controlled before-after studies, and 1 individually RCT
- 52% studies from Asia, 28% from South America & Caribbean countries and 20% Africa
- Interventions targeting grades 1 to 12 (5-19 years old)

Source: Shinde et al, Maternal & Child Nutrition, upcoming

Type of interventions

23 Nutrition Education

- Focused on increasing knowledge and change attitude towards diet and nutrition and teaching behavioral skills
- Weekly classroom-based sessions delivered by teachers
- 52% studies reported an improvement in at least one diet or nutrition related outcome

21 Multicomponent ints.

- Combination of two or more interventions including nutrition education, physical activity, WASH, school gardens, nutrition services including supplements, and counseling
- Focused on improving 'health and nutrition' environment in schools
- Student engagement through seminars, workshops, and interactive activities
- 76% studies reported positive impact on at least one diet or nutrition related outcome

8 Physical Activity

- Daily 30-90 minutes physical training classes led by physical education teachers
- Inclusion of aerobic exercises, sports, and dance with/without complementary classroom education
- 38% studies reported positive impact on at least one diet or nutrition related outcome
- One study reported positive impact on educational outcomes

5 WASH

- Primarily focused on 1) Infrastructure provision, and 2) behavioral changes
- Use of health hygiene education (booklets, kits, interactive activities) as complementary components
- All studies focused on educational outcomes, with none finding a positive impact

1 Food subsidy

- Use of nutrition subsidies to schools to reduce malnutrition
- With or without specific training to use the subsidies

Meals, Education and Gardens for in-school Adolescents (MEGA): a cluster randomized trial in Dodoma, Tanzania

School meals: School lunch to all students in the school; each lunch plate meeting at least 60% of the daily requirement of total energy intake for adolescents

School gardens: Two garden clubs in each school; 60 adolescents in each school; will grow leafy vegetables on school land to supplement school lunch menu/support education

Nutrition education: Five modules covered over 41 weeks; (1) health and nutrition, (2) agriculture and school gardening, (3) health benefits of vegetables, (4) physical activity and body size and (5) WASH

Community workshops: School garden as a hub for community workshops on agricultural best practices, nutrition, hygiene and the use of sustainable gardening technologies

2 Schools

Outcomes:

Adolescents: Hemoglobin concentrations & anemia status; anthropometry, KAP regarding nutrition & diet, & WASH, educational outcomes;

Parents: KAP regarding agriculture, nutrition and WASH

2 Schools

Participants: 750 students from Form 1 and 2 students (14 to 17 years)

Assessment timepoints: Baseline and endline

2 Schools: No Intervention

Source: Wang et al, BMJ Open 2022

Scaling-up high-impact micronutrient supplementation interventions to improve adolescents' nutrition and health in Tanzania and Burkina Faso

Weekly IFA supplement
with education program

Daily MMS supplements
with education program

Control arm
(no intervention)

14 schools per country
100 eligible adolescents per
school (10-17 years old)

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Teachers provide the supplements with physical monthly visits
from nurses or community health workers

Intervention implementation in two academic years with baseline and
endline assessments in each year with most effective intervention scaled up
in all schools in year II

Outcomes: Haemoglobin
concentrations & anemia status;
anthropometry, adolescent
development outcomes, micronutrient
status & school performance

Source: Cliffer et al, BMJ Open (Under review)

What works in school-based adolescent nutrition interventions?

- Not only focusing on education and skills building but investing in multifaceted and integrated interventions (e.g., Health Promoting Schools and Nutrition Friendly School Initiatives)
- Emphasizing environmental exposures and syndemic nexus of risk factors, pathways, and protective factors
- Resonating with adolescents' values and social context
- Harnessing food environments, autonomy, and peer approval and norms
- Involving family members and wider community

Research needs to support better actions for adolescent nutrition

Neglected age groups

- Data and research on nutrition challenges and determinants lacking for males and 10-14 years age group although this age group is focused through school-based programs
- Programmatically, older and vulnerable adolescents (e.g., migrants, ethnic groups, socially disadvantaged, etc.) most neglected

Intervention area

- Large gaps in understanding of the full range of effects of multifaceted interventions for low-income countries
- Bi-directional links between health and nutrition and education
- Need of tailored and context-specific research efforts informing policies and programs in LMICs

Platforms

- Critical need to reach out-of-school adolescents
- Explore the effectiveness of reaching adolescents through alternate platforms as well as delivery of interventions through a range of health and non-health human resources (e.g., roles of virtual networks and international social movements)

Need to build partnerships North to South organizations and institutes and develop capacity of young researchers in developing and evaluating multifaceted interventions to address adolescent health and nutrition

Acknowledgements

- Ali Sie, Director, Nouna Health Research Center, Burkina Faso
- Ouhouiré Millogo, Nouna Health Research Center, Burkina Faso
- Yemane Berhane, Director, Addis Continental Institute of Public Health, Ethiopia
- Amare Worku Tadesse, Addis Continental Institute of Public Health, Ethiopia
- Nega Assefa, Haramaya University, Ethiopia
- Seth Adu-Afarwuah, University of Ghana, Ghana
- Abu Manu, University of Ghana, Ghana
- Ayoade Oduola, Director, University of Ibadan Research Foundation, Nigeria
- Angela Chukwu, University of Ibadan, Nigeria
- Mosa Moshabela, Dean, University of Kwazulu-Natal, South Africa
- Huda Sharfi, Dean, Ahfad University for Women, Sudan
- Anne Marie Darling, Harvard T H Chan School of Public Health, USA
- Amani Tinkasimile, Africa Academy for Public Health, Tanzania
- Dominic Mosha, Africa Academy for Public Health, Tanzania
- Mary Mwayinka-Sando, Africa Academy for Public Health, Tanzania
- David Guwatudde, Makerere University School of Public Health, Uganda
- Justine Bukenya, Makerere University School of Public Health, Uganda
- Alain Vandormael, Heidelberg Institute of Global Health, Germany
- Ramadhani Abdallah Noor, UNICEF, Ethiopia
- Guy Harling, University College of London, UK
- Till Bärnighausen, Heidelberg Institute of Global Health, Germany
- Dongqing Wang, George Mason University, USA

Wafaie W Fawzi, Harvard T H Chan School of Public Health, USA