

### EDITOR'S NOTE

We are delighted to present the first issue of Abstract Digest for this year. It has a collection of articles on various outcomes, determinants and interventions related to maternal and child nutrition, from around the world and India, in particular. In this issue, we feature a special [series](#) on the double burden of malnutrition from *The Lancet* journals and three systematic reviews – 1. Micronutrient supplementation and fortification interventions and health and developmental outcomes; 2. Effectiveness of interventions for managing acute malnutrition among children below five years; and 3. Preventive interventions among adolescents.

In addition, there are two unique global articles relevant for multiple contexts – the first one generates lessons about nutrition behaviour change from cluster-randomized evaluations in three countries, Bangladesh, Vietnam, and Ethiopia; and the second is based on research to improve nutrition in the context of an at-scale social protection program in Mexico, which has learnings for many developing countries. Given below is the list of articles included in this issue. Please click on the title if you wish to go straight to the article or scroll down to explore the abstract in the pages that follow.

Enjoy reading!

#### List of articles in this issue

**Dynamics of the double burden of malnutrition and the changing nutrition reality**

Popkin et al. 2019. *The Lancet* 395(10217): P65-74.

**The double burden of malnutrition: aetiological pathways and consequences for health**

Wells et al. 2019. *The Lancet* 395(10217): P75-88.

**Double-Duty Actions: Seizing Program and Policy Opportunities to Address Malnutrition in all its Forms**

Hawkes et al. 2019. *The Lancet* 395(10218): P142-155.

**Economic effects of the double burden of malnutrition**

Nugent et al. 2020. *The Lancet* 395(10218): P156-164.

**Mapping child growth failure across low- and middle-income countries**

Kinyoki et al. 2020. *Nature* 577:231-234.

**Identifying geospatial patterns in wealth disparity in child malnutrition across 640 districts in India**

Liou et al. 2020. *SSM - Population Health* 10: 100524.

**Using structural equation modelling to untangle sanitation, water and hygiene pathways for intervention improvements in height-for-age in children <5 years old**

Reese et al. 2019. *International Journal of Epidemiology* 48(6): 1992–2000.

**Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study**

Alam et al. 2020. *PLoS ONE* 15(1): e0227839.

**Community Determinants of Physical Growth and Cognitive Development among Indian Children in Early Childhood: A Multivariate Multilevel Analysis**

Heo et al. 2020. *International Journal of Environmental Research and Public Health* 17(1): 182.

**Micronutrient Supplementation and Fortification Interventions on Health and Development Outcomes among Children Under-Five in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis**

Tam et al. 2020. *Nutrients* 12(2): 10.3390/nu12020289.

**Effectiveness of Interventions for Managing Acute Malnutrition in Children under Five Years of Age in Low-Income and Middle-Income Countries: A Systematic Review and Meta-Analysis**

Das et al. 2020. *Nutrients* 12(1): 10.3390/nu12010116.

**Effects of Preventive Nutrition Interventions among Adolescents on Health and Nutritional Status in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis**

Salam et al. 2020. *Nutrients* 12(1): 10.3390/nu12010049.

**ICDS Striving for Holistic Development: Insights from a Field Study in Uttar Pradesh**

Kumar, N. P. 2019. *Economic & Political Weekly* 54(48).

**Effects of a scalable home-visiting intervention on child development in slums of urban India: evidence from a randomised controlled trial**

Andrew et al. 2019. *Journal of Child Psychology and Psychiatry*.

**Using mHealth to improve health care delivery in India: A qualitative examination of the perspectives of community health workers and beneficiaries**

Gopalakrishnan et al. 2020. *PLoS ONE* 15(1): e0227451.

**Lessons from using cluster-randomized evaluations to build evidence on large-scale nutrition behavior change interventions**

Menon et al. 2020. *World Development* 127: 104816.

**A Brief History of Evidence-Informed Decision Making for Nutrition in Mexico**

Neufeld et al. 2019. *The Journal of Nutrition* 149(Supplement\_1): 2277S–2280S.

## PEER-REVIEWED

---

### **Lancet series on The Double Burden of Malnutrition**

The double burden of malnutrition is the coexistence of overnutrition (overweight and obesity) alongside undernutrition (stunting and wasting), at all levels of the population—country, city, community, household, and individual. This four paper Series explores how this coexistence is affecting low-income and middle-income countries. Malnutrition in its many forms has previously been understood and approached as a separate public health issue, but the new emergent reality is that undernutrition and overnutrition are interconnected and, therefore, double-duty actions that simultaneously address more than one dimension must be implemented for policy solutions to be effective. In addition to policy recommendations, the Series includes a focus on both historical and biological contexts, and new economic analysis.

#### **Dynamics of the double burden of malnutrition and the changing nutrition reality**

Popkin, B. M., C. Corvalan, and L. M. Grummer-Strawn. 2019. “Dynamics of the double burden of malnutrition and the changing nutrition reality”. *The Lancet* 395(10217): P65-74. [https://doi.org/10.1016/S0140-6736\(19\)32497-3](https://doi.org/10.1016/S0140-6736(19)32497-3)

The double burden of malnutrition (DBM), defined as the simultaneous manifestation of both undernutrition and overweight and obesity, affects most low-income and middle-income countries (LMICs). This Series paper describes the dynamics of the DBM in LMICs and how it differs by socioeconomic level. This Series paper shows that the DBM has increased in the poorest LMICs, mainly due to overweight and obesity increases. Indonesia is the largest country with a severe DBM, but many other Asian and sub-Saharan African countries also face this problem. We also discuss that overweight increases are mainly due to very rapid changes in the food system, particularly the availability of cheap ultra-processed food and beverages in LMICs, and major reductions in physical activity at work, transportation, home, and even leisure due to introductions of activity-saving technologies. Understanding that the lowest income LMICs face severe levels of the DBM and that the major direct cause is rapid increases in overweight allows identifying selected crucial drivers and possible options for addressing the DBM at all levels.

#### **The double burden of malnutrition: aetiological pathways and consequences for health**

Wells, J. C., A. L. Sawaya, R. Wibaek, M. Mwangome, M. S. Poullas, C. S. Yajnik, and A. Demaio. 2019. “The double burden of malnutrition: aetiological pathways and consequences for health”. *The Lancet* 395(10217): P75-88. [https://doi.org/10.1016/S0140-6736\(19\)32472-9](https://doi.org/10.1016/S0140-6736(19)32472-9)

Malnutrition has historically been researched and addressed within two distinct silos, focusing either on undernutrition, food insecurity, and micronutrient deficiencies, or on overweight, obesity, and dietary excess. However, through rapid global nutrition transition, an increasing proportion of individuals are exposed to different forms of malnutrition during the life course and have the double burden of malnutrition (DBM) directly. Longlasting effects of malnutrition in early life can be attributed to interconnected biological pathways, involving imbalance of the gut microbiome, inflammation, metabolic dysregulation, and impaired insulin signalling. Lifecourse exposure to early undernutrition followed by later overweight increases the risk of non-communicable disease, by imposing a high metabolic load on a depleted capacity for homeostasis, and in women increases the risk of childbirth complications. These life-course trajectories are shaped both by societal driving factors—ie, rapidly changing diets, norms of eating, and physical activity patterns—and by broader ecological factors such as pathogen burden and extrinsic mortality risk. Mitigation of the

DBM will require major societal shifts regarding nutrition and public health, to implement comprehensive change that is sustained over decades, and scaled up into the entire global food system.

### **Double-Duty Actions: Seizing Program and Policy Opportunities to Address Malnutrition in all its Forms**

Hawkes, C., M. Ruel, L. Salm, B. Sinclair, and F. Branca. 2019. "Double-Duty Actions: Seizing Program and Policy Opportunities to Address Malnutrition in all its Forms". *The Lancet* 395(10218): P142-155.

[https://doi.org/10.1016/S0140-6736\(19\)32506-1](https://doi.org/10.1016/S0140-6736(19)32506-1)

Actions to address different forms of malnutrition are typically managed by separate communities, policies, programmes, governance structures, and funding streams. By contrast, double-duty actions, which aim to simultaneously tackle both undernutrition and problems of overweight, obesity, and diet-related non-communicable diseases (DR-NCDs) have been proposed as a way to effectively address malnutrition in all its forms in a more holistic way. This Series paper identifies ten double-duty actions that have strong potential to reduce the risk of both undernutrition, obesity, and DR-NCDs. It does so by summarising evidence on common drivers of different forms of malnutrition; documenting examples of unintended harm caused by some undernutrition-focused programmes on obesity and DR-NCDs; and highlighting examples of double-duty actions to tackle multiple forms of malnutrition. We find that undernutrition, obesity, and DR-NCDs are intrinsically linked through early-life nutrition, diet diversity, food environments, and socioeconomic factors. Some evidence shows that programmes focused on undernutrition have raised risks of poor quality diets, obesity, and DR-NCDs, especially in countries undergoing a rapid nutrition transition. This Series paper builds on this evidence to develop a framework to guide the design of double-duty approaches and strategies, and defines the first steps needed to deliver them. With a clear package of double-duty actions now identified, there is an urgent need to move forward with double-duty actions to address malnutrition in all its forms.

### **Economic effects of the double burden of malnutrition**

Nugent, R., C. Levin, J. Hale, and B. Hutchinson. 2020. "Economic effects of the double burden of malnutrition". *The Lancet* 395(10218): P156-164.

[https://doi.org/10.1016/S0140-6736\(19\)32473-0](https://doi.org/10.1016/S0140-6736(19)32473-0)

Observations from many countries indicate that multiple forms of malnutrition might coexist in a country, a household, and an individual. In this Series, the double burden of malnutrition (DBM) encompasses undernutrition in the form of stunting, and overweight and obesity. Health effects of the DBM include those associated with both undernutrition, such as impaired childhood development and greater susceptibility to infectious diseases, and overweight, especially in terms of increased risk of added visceral fat and increased risk of non-communicable diseases. These health effects have not been translated into economic costs for individuals and economies in the form of lost wages and productivity, as well as higher medical expenses. We summarise the existing approaches to modelling the economic effects of malnutrition and point out the weaknesses of these approaches for measuring economic losses from the DBM. Where population needs suggest that nutrition interventions take into account the DBM, economic evaluation can guide the choice of so-called double-duty interventions as an alternative to separate programming for stunting and overweight. We address the evidence gap with an economic analysis of the costs and benefits of an illustrative double-duty intervention that addresses both stunting and overweight in children aged 4 years and older by providing school meals with improved

quality of diet. We assess the plausibility of our method and discuss how improved data and models can generate better estimates. Double-duty interventions could save money and be more efficient than single-duty interventions.

---

### Mapping child growth failure across low- and middle-income countries

Kinyoki, D. K, A. E. Osgood-Zimmerman, B. V. Pickering, K. Ahmadi, Local Burden of Disease Child Growth Failure Collaborators, N.J. Kassebaum, and S.I. Hay. 2020. "Mapping child growth failure across low- and middle-income countries". *Nature* 577:231-234.  
<https://doi.org/10.1038/s41586-019-1878-8>

Childhood malnutrition is associated with high morbidity and mortality globally. Undernourished children are more likely to experience cognitive, physical, and metabolic developmental impairments that can lead to later cardiovascular disease, reduced intellectual ability and school attainment, and reduced economic productivity in adulthood. Child growth failure (CGF), expressed as stunting, wasting, and underweight in children under five years of age (0–59 months), is a specific subset of undernutrition characterized by insufficient height or weight against age-specific growth reference standards. The prevalence of stunting, wasting, or underweight in children under five is the proportion of children with a height-for-age, weight-for-height, or weight-for-age z-score, respectively, that is more than two standard deviations below the World Health Organization's median growth reference standards for a healthy population. Subnational estimates of CGF report substantial heterogeneity within countries, but are available primarily at the first administrative level (for example, states or provinces); the uneven geographical distribution of CGF has motivated further calls for assessments that can match the local scale of many public health programmes. Building from our previous work mapping CGF in Africa, here we provide the first, to our knowledge, mapped high spatial-resolution estimates of CGF indicators from 2000 to 2017 across 105 low- and middle-income countries (LMICs), where 99% of affected children live, aggregated to policy-relevant first and second (for example, districts or counties) administrative level units and national levels. Despite remarkable declines over the study period, many LMICs remain far from the ambitious World Health Organization Global Nutrition Targets to reduce stunting by 40% and wasting to less than 5% by 2025. Large disparities in prevalence and progress exist across and within countries; our maps identify high-prevalence areas even within nations otherwise succeeding in reducing overall CGF prevalence. By highlighting where the highest-need populations reside, these geospatial estimates can support policy-makers in planning interventions that are adapted locally and in efficiently directing resources towards reducing CGF and its health implications.

---

### Identifying geospatial patterns in wealth disparity in child malnutrition across 640 districts in India

Liou, L., R. Kim, and S. V. Subramanian. 2020. "Identifying geospatial patterns in wealth disparity in child malnutrition across 640 districts in India". *SSM - Population Health* 10: 100524.  
<https://doi.org/10.1016/j.ssmph.2019.100524>

We assessed district-level geospatial trends in precision weighted prevalence and absolute wealth disparity in stunting, underweight, wasting, low birthweight, and anemia among children under five in India. The largest wealth disparities were found for anthropometric failures and substantial variation existed across states. We identified statistically significant ( $p < 0.001$ ) geospatial patterns in district-wide wealth disparities for all outcomes, which differed from geospatial patterns for the overall prevalence. We characterized each district as either a "Disparity", "Pitfall", "Intensity", or "Prosperity" area based on its overall burden and wealth disparity, as well as discuss the importance of considering both measures for geographically-targeted public health interventions to improve health equity.

---

### Using structural equation modelling to untangle sanitation, water and hygiene pathways for intervention improvements in height-for-age in children <5 years old

Reese, H., S. S. Sinharoy, and T. Clasen. 2019. "Using structural equation modelling to untangle sanitation, water and hygiene pathways for intervention improvements in height-for-age in children <5 years old". *International Journal of Epidemiology* 48(6): 1992–2000.

<https://doi.org/10.1093/ije/dyz202>

**Background:** Despite a strong theoretical rationale for combining water, sanitation and hygiene (WaSH) interventions to improve child health, study findings are heterogeneous with little understanding of the mechanisms for these effects. Our study objective was to demonstrate the utility of structural equation modeling (SEM) to assess intervention effects on height-for-age z score (HAZ) through the complex system of WaSH pathways. **Methods:** We used data from a matched cohort effectiveness evaluation of a combined on-premise piped water and improved sanitation intervention in rural Odisha, India. Height/length was measured in children 0–59 months old ( $n = 1826$ ) from 90 matched villages in February–June 2016. WaSH behaviours and infrastructure were assessed through household surveys and observation, respectively. We used SEM to calculate the standardized path coefficients and the total contributions of WaSH pathways to HAZ. **Results:** Intervention improvements on HAZ were through the sanitation pathway (coverage  $\rightarrow$  use  $\beta$ : 0.722; use  $\rightarrow$  HAZ  $\beta$ : 0.116), with piped water coverage indirectly affecting HAZ through improved sanitation use ( $\beta$ : 0.148). Although the intervention had a positive association with handwashing station coverage, there was no evidence of a total hygiene pathway effect on HAZ or further direct effects through the water pathways. **Conclusions:** This study demonstrates the utility of SEM to assess the mechanisms through which combined WaSH interventions impact HAZ as a system of pathways, providing a more nuanced assessment than estimation of the total intervention effect. Our finding, that water impacts HAZ through the sanitation pathway, is an important and actionable insight for WaSH programming.

---

### Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study

Alam, M. A., S. A. Richard, S. M. Fahim, M. Mahfuz, B. Nahar, S. Das, B. Shrestha, B. Koshy, E. Mduma, J. C. Seidman, L. E. Murray-Kolb, L. E. Caulfield, and T. Ahmed. 2020. "Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study". *PLoS ONE* 15(1): e0227839.

<https://doi.org/10.1371/journal.pone.0227839>.

**Background:** Globally more than 150 million children under age 5 years were stunted in 2018, primarily in low- and middle-income countries (LMICs), and the impact of early-onset, persistent stunting has not been well explored. To explore the association between early-onset persistent stunting in children and cognitive development at 5 years of age, and to identify the factors associated with early-onset stunting. **Methods and findings:** Children from the MAL-ED cohort study were followed from birth to 5 years of age in six LMICs. The Wechsler Preschool Primary Scales of Intelligence (WPPSI) was used to assess cognitive abilities (fluid reasoning) at 5 years and was adapted for each culture. Stunting was categorized as early-onset persistent (first stunted at 1–6 months and persisting at 60 months), early-onset recovered (first stunted at 1–6 months and not stunted at 60 months), late-onset persistent (first stunted at 7–24 months and persisting at 60 months), late-onset recovered (first stunted at 7–24 months and not stunted at 60 months), and never (never stunted). Mixed effects linear models were used to estimate the relationship between stunting status and cognitive development. Children with early-onset persistent stunting had

significantly lower cognitive scores (-2.10 (95% CI: -3.85, -0.35)) compared with those who were never stunted. Transferrin receptor (TfR) was also negatively associated with cognitive development (-0.31 (95% CI: -0.49, -0.13)), while the HOME inventory, an index of quality of the home environment (0.46 (95% CI: 0.21, 0.72)) and socio-economic status (1.50 (95% CI: 1.03, 1.98)) were positively associated with cognitive development. **Conclusions:** Early-onset persistent stunting was associated with lower cognitive development in children at 5 years of age in this cohort of children.

---

### Community Determinants of Physical Growth and Cognitive Development among Indian Children in Early Childhood: A Multivariate Multilevel Analysis

Heo, J., A. Krishna, J. M. Perkins, H-Y. Lee, J-K. Lee, S. V. Subramanian, and J. Oh. 2020. "Community determinants of physical growth and cognitive development among Indian children in early childhood: A multivariate multilevel analysis". *International Journal of Environmental Research and Public Health* 17(1): 182.

<https://doi.org/10.3390/ijerph17010182>

Inadequate child physical growth and cognitive development share common individual-level risk factors. Less understood is how outcomes co-cluster at the community level and to what extent certain community-level characteristics influence the clustering. This study aims to quantify the extent to which child growth and development co-occur across communities, and to identify community-level characteristics associated with the clustering of the two development dimensions. We used longitudinal data from 1824 children (aged 5 years) across 98 communities in Andhra Pradesh, India in round 2 (2006) of the Young Lives study, who were followed up 3 years later in round 3 (2009). A multivariate, multilevel statistical model was estimated wherein the responses were nested within individuals, and communities. We used z-scores of height-for-age, weight-for-age, Peabody Picture Vocabulary Test, and a mathematics test in 2009 as outcome variables. At the community level, we included compositional variables representing community characteristics while controlling for child socio-demographic characteristics at the individual level. At the community level, children's physical growth and cognitive development were strongly correlated (coefficient: 0.55–0.76) and, even after controlling for individual-level covariables, a more pronounced correlation was shown at the community level than individual level correlation. Greater local healthcare resources were associated with better physical growth. More local programs run by government and NGOs/charities were associated with higher child language skills. Local social problems were inversely associated with math scores. Our study showed that physical growth and cognitive development tended to be clustered and co-occurred within communities as well as individual children.

---

### Micronutrient Supplementation and Fortification Interventions on Health and Development Outcomes among Children Under-Five in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis

Tam, E., E. C. Keats, F. Rind, J. K. Das, and Z. A. Bhutta. 2020. "Micronutrient Supplementation and Fortification Interventions on Health and Development Outcomes among Children Under-Five in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis". *Nutrients* 12(2): 10.3390/nu12020289.

<https://doi.org/10.3390/nu12020289>

Micronutrient deficiencies continue to be widespread among children under-five in low- and middle-income countries (LMICs), despite the fact that several effective strategies now exist to prevent them. This kind of malnutrition can have several immediate and long-term consequences, including stunted growth, a higher risk of acquiring infections, and poor development outcomes, all of which

may lead to a child not achieving his or her full potential. This review systematically synthesizes the available evidence on the strategies used to prevent micronutrient malnutrition among children under-five in LMICs, including single and multiple micronutrient (MMN) supplementation, lipid-based nutrient supplementation (LNS), targeted and large-scale fortification, and point-of-use-fortification with micronutrient powders (MNPs). We searched relevant databases and grey literature, retrieving 35,924 papers. After application of eligibility criteria, we included 197 unique studies. Of note, we examined the efficacy and effectiveness of interventions. We found that certain outcomes, such as anemia, responded to several intervention types. The risk of anemia was reduced with iron alone, iron-folic acid, MMN supplementation, MNPs, targeted fortification, and large-scale fortification. Stunting and underweight, however, were improved only among children who were provided with LNS, though MMN supplementation also slightly increased length-for-age z-scores. Vitamin A supplementation likely reduced all-cause mortality, while zinc supplementation decreased the incidence of diarrhea. Importantly, many effects of LNS and MNPs held when pooling data from effectiveness studies. Taken together, this evidence further supports the importance of these strategies for reducing the burden of micronutrient malnutrition in children. Population and context should be considered when selecting one or more appropriate interventions for programming.

---

### **Effectiveness of Interventions for Managing Acute Malnutrition in Children under Five Years of Age in Low-Income and Middle-Income Countries: A Systematic Review and Meta-Analysis**

Das, J. K., R. A. Salam, M. Saeed, F. A. Kazmi, and Z. A. Bhutta. 2020. "Effectiveness of Interventions for Managing Acute Malnutrition in Children under Five Years of Age in Low-Income and Middle-Income Countries: A Systematic Review and Meta-Analysis". *Nutrients* 12(1): 10.3390/nu12010116. <https://doi.org/10.3390/nu12010116>

Childhood malnutrition is a major public health concern, as it is associated with significant short- and long-term morbidity and mortality. The objective of this review was to comprehensively review the evidence for the management of severe acute malnutrition (SAM) and moderate acute malnutrition (MAM) according to the current World Health Organization (WHO) protocol using facility- and community-based approaches, as well as the effectiveness of ready-to-use therapeutic food (RUTF), ready-to-use supplementary food (RUSF), prophylactic antibiotic use, and vitamin A supplementation. We searched relevant electronic databases until 11 February 2019, and performed a meta-analysis. This review summarizes findings from a total of 42 studies (48 papers), including 35,017 children. Limited data show some benefit of integrated community-based screening, identification, and management of SAM and MAM on improving recovery rate. Facility-based screening and management of uncomplicated SAM has no effect on recovery and mortality, while the effect of therapeutic milk F100 for SAM is comparable to RUTF for weight gain and mortality. Local food and whey RUSF are comparable to standard RUSF for recovery rate and weight gain in MAM, while standard RUSF has additional benefits to CSB. Prophylactic antibiotic administration in uncomplicated SAM improves recovery rate and probably improves weight gain and reduces mortality. Limited data suggest that high-dose vitamin A supplementation is comparable with low-dose vitamin A supplementation for weight gain and mortality among children with SAM.

---

### **Effects of Preventive Nutrition Interventions among Adolescents on Health and Nutritional Status in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis**

Salam, R. A., J. K. Das, W. Ahmed, O. Irfan, S. S. Sheikh, and Z. A. Bhutta. 2020. "Effects of Preventive Nutrition Interventions among Adolescents on Health and Nutritional Status in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis". *Nutrients* 12(1): 10.3390/nu12010049. <https://doi.org/10.3390/nu12010049>

The objective of this review was to assess the impact of preventive nutrition interventions on health and nutritional status of adolescents aged 10–19 years in low- and middle-income countries (LMICs). We searched the databases until 5 February 2019 without any restrictions on publication, date, language, or publication status. A total of 10 studies (15 papers) including 10,802 participants assessing the impact of micronutrient supplementation/fortification were included in this review. We did not find any study assessing the impact of nutrition education and counseling or macronutrient supplementation among adolescents. Among primary outcomes, we are uncertain of the effect of iron supplementation with or without folic acid on anemia (daily supplementation; relative risk (RR): 1.04, 95% confidence interval (CI) 0.42, 2.57; one study; 1160 participants; low-quality evidence; weekly supplementation; RR: 1.07, 95% CI: 0.46, 2.52; one study; 1247 participants; low-quality evidence). We are also uncertain of the effect of various micronutrient supplementation/fortification on body mass index (BMI) (calcium/vitamin D supplementation; (MD: -0.01 kg/m<sup>2</sup>; 95% CI: -1.20, 1.17; two studies; 730 participants; I<sup>2</sup> 94%; very-low-quality evidence, iron supplementation with or without folic acid; MD: 0.47 kg/m<sup>2</sup>; 95% CI: -0.17, 1.11; two studies; 652 participants; I<sup>2</sup> 37%; very-low-quality evidence, zinc supplementation; MD: 0.35 kg/m<sup>2</sup>; 95% CI: -0.15, 0.85; one study; 382 participants; very-low-quality evidence) and multiple micronutrient (MMN) fortification; MD: 0.23 kg/m<sup>2</sup>, 95% CI: -0.11, 0.57; two studies; 943 participants; I<sup>2</sup> 22%; very-low-quality evidence). None of the included studies reported any other primary outcomes including morbidity or adverse effects. Among secondary outcomes, iron supplementation with or without folic acid may improve hemoglobin concentrations, and calcium/vitamin D supplementation may improve serum 25(OH)D levels, while calcium only supplementation and calcium and vitamin D supplementation may marginally improve total body bone mineral density (BMD). We are uncertain of the effect of MMN fortification on hemoglobin concentrations, calcium supplementation on total body bone mineral content (BMC), calcium + vitamin D supplementation on total body BMC, and zinc supplementation on zinc levels. There is limited evidence of micronutrient supplementation/fortification among adolescents, especially adolescent boys, on health and nutritional status in LMICs. These findings should be interpreted with caution due to the low quality and limited number of studies.

---

### **ICDS Striving for Holistic Development: Insights from a Field Study in Uttar Pradesh**

Kumar, N. P. 2019. "ICDS Striving for Holistic Development: Insights from a Field Study in Uttar Pradesh". *Economic & Political Weekly* 54(48).

<https://www.epw.in/journal/2019/48/special-articles/icds-striving-holistic-development.html>

As a national flagship programme, the Integrated Child Development Services is well-conceived. However, more attention has been paid to increasing its coverage than to improving the quality of service delivery, and to distributing food rather than changing existing family-based food habits and caregiving. This inertia has resulted in poor outcomes. Past studies have reiterated Uttar Pradesh's status as an incorrigible offender. Drawing on findings from field surveys administered in nine districts in UP and data from 90 anganwadis, the constraints to the effective functioning of the ICDS are revealed.

---

### **Effects of a scalable home-visiting intervention on child development in slums of urban India: evidence from a randomised controlled trial**

Andrew, A., O. Attanasio, B. Augsburg, M. Day, S. Grantham-McGregor, C. Meghir, F. Mehrin, S. Pahwa, and M. Rubio-Codina. 2019. "Effects of a scalable home-visiting intervention on child development in slums of urban India: evidence from a randomised controlled trial". *Journal of Child Psychology and Psychiatry*.

<https://doi.org/10.1111/jcpp.13171>

**Background:** An estimated 63.4 million Indian children under 5 years are at risk of poor development. Home visits that use a structured curriculum to help caregivers enhance the quality of the home stimulation environment improve developmental outcomes. However, achieving effectiveness in poor urban contexts through scalable models remains challenging. **Methods:** Using a cluster randomised controlled trial, we evaluated a psychosocial stimulation intervention, comprising weekly home visits for 18 months, in urban slums of Cuttack, Odisha, India. The intervention is complementary to existing early childhood services in India and was run and managed through a local branch of a national NGO. The study ran from August 2013 to July 2015. We enrolled 421 children aged 10–20 months from 54 slums. Slums were randomised to intervention or control. Primary outcomes were children’s cognitive, receptive language, expressive language and fine motor development assessed using the Bayley-III. Prespecified intent-to-treat analysis investigated impacts and heterogeneity by gender. Trial registrations: ISRCTN89476603, AEARCTR-0000169. **Results:** Endline data for 378 (89.8%) children were analysed. Attrition was balanced between groups. We found improvements of 0.349 of a standard deviation (SD;  $p = .005$ , stepdown  $p = .017$ ) to cognition while impacts on receptive language, expressive language and fine motor development were, respectively, 0.224 SD ( $p = .099$ , stepdown  $p = .184$ ), 0.192 SD ( $p = .085$ , stepdown  $p = .184$ ) and 0.111 ( $p = .385$ , stepdown  $p = .385$ ). A child development factor improved by 0.301 SD ( $p = .032$ ). Benefits were larger for boys. The quality of the home stimulation environment also improved. **Conclusions:** This study shows that a potentially scalable home-visiting intervention is effective in poor urban areas.

---

### Using mHealth to improve health care delivery in India: A qualitative examination of the perspectives of community health workers and beneficiaries

Gopalakrishnan, L., L. Buback, L. Fernald, D. Walker, N. Diamond-Smith, and The CAS Evaluation Consortium. 2020. “Using mHealth to improve health care delivery in India: A qualitative examination of the perspectives of community health workers and beneficiaries”. *PLoS ONE* 15(1): e0227451.

<https://doi.org/10.1371/journal.pone.0227451>

**Background:** mHealth technologies are proliferating globally to address quality and timeliness of health care delivery by Community Health Workers (CHWs). This study aimed to examine CHW and beneficiaries’ perceptions of a new mHealth intervention (Common Application Software [CAS] for CHWs in India. The objectives of the study were to seek perspectives of CHWs and beneficiaries on the uptake of CAS, changes in CHW-beneficiary interactions since the introduction of CAS and potential barriers faced by CHWs in use of CAS. Further, important contextual factors related to CHW-beneficiary interface and dynamics that may have a bearing on CAS have been described. **Methods:** A qualitative study was conducted in two states of India (Bihar and Madhya Pradesh) from March–April 2018 with CHWs ( $n = 32$ ) and beneficiaries ( $n = 55$ ). All interviews were conducted and recorded in Hindi, transcribed and translated into English, and coded and thematically analysed using Dedoose. **Findings:** The mHealth intervention was acceptable to the CHWs who felt that CAS improved their status in the communities where they worked. Beneficiaries’ views were a mix of positive and negative perceptions. The divergent views between CHWs and beneficiaries surrounding the use and impact of CAS highlight an underlying mistrust, socio-cultural barriers in engagement, and technological barriers in implementation. All these contextual factors can influence the perception and uptake of CAS. **Conclusions:** mHealth interventions targeting CHWs and beneficiaries have the potential to improve performance of CHWs, reduce barriers to information and potentially change the behaviors of beneficiaries. While technology is an enabler for CHWs to improve their service delivery, it does not necessarily help overcome social and cultural barriers that impede CHW-beneficiary interactions to bring about improvements in knowledge and

health behaviors. Future interventions for CHWs including mHealth interventions should examine contextual factors along with the acceptability, accessibility, and usability by beneficiaries and community members.

---

### **Lessons from using cluster-randomized evaluations to build evidence on large-scale nutrition behavior change interventions**

Menon, P., M. T. Ruel, P. H. Nguyen, S. S. Kim, K. Lapping, E. A. Frongillo, and S. Alayond. 2020. *World Development* 127: 104816.

<https://doi.org/10.1016/j.worlddev.2019.104816>

The recent Nobel Prize in Economics for the use of experimental research to identify solutions to a range of development issues resonates with our work in nutrition. For over a decade, our research team has worked with a global nutrition social and behavior change initiative and used cluster-randomized evaluations, with other methods, to generate lessons about nutrition behaviour change at scale in three countries: Bangladesh, Vietnam, and Ethiopia. We also tested adaptations in other countries. We learned that large-scale behavior change interventions delivered through diverse platforms (government health systems, community-based platforms, and mass media) had substantial impacts but that these impacts differ by context. A body of evidence, based on these evaluations, now informs approaches to shaping nutrition behaviors around the world. Working closely with implementers, sharing research findings and lessons in many forums, and publishing widely, Alive & Thrive has benefited millions of women and children and their communities and influenced millions of dollars of spending on nutrition programs. We conclude that carefully done collaborative program evaluations that use randomized controlled trials together with other methods can support effective learning about solutions, even those that operate at scale.

---

### **A Brief History of Evidence-Informed Decision Making for Nutrition in Mexico**

Neufeld, L. M., R. Grados, A. V. de la Vega, C. Steta, F. Regalia, and J. A. Rivera-Dommarco. 2019. "A Brief History of Evidence-Informed Decision Making for Nutrition in Mexico". *The Journal of Nutrition* 149(Supplement\_1): 2277S–2280S.

<https://doi.org/10.1093/jn/nxz188>

The Progresa Conditional Cash Transfer program in Mexico began in 1997, with a strong evidence-based design. The program's ultimate objective was to foster the development of human capital through 3 components—education, health, and food. Rigorous impact evaluation generated evidence of impact on several outcomes, including child growth, but also aspects of program design and implementation challenges that may have limited impact. The objective of this supplement is to present research that led to the redesign of the health component, its implementation and evaluation at pilot scale, and its scale-up to national level, representing >15 y of collaboration among evaluators, program implementers, and funders. The studies used various methodologies, including process evaluation, cohort studies, ethnographic assessments, and a cluster-randomized trial, among others. The articles report previously unpublished results and citations of published literature. Article 1 uses an impact pathway to highlight gaps and bottlenecks that limited potential for greater impact, the original recognition of which was the impetus for this long collaboration. Article 2 explores the social and cultural factors that influence decisions to participate in programs and to adopt the actions proposed by them. Article 3 presents a cluster-randomized trial implemented to inform the choice of nutritional supplements for pregnant and lactating women and children 6–59 mo of age and how this and other evidence from the studies were used to redesign the health component of the program. Articles 4 and 5 present results of the development and pilot testing of the modified health component, the Integrated Strategy for Attention to Nutrition

(abbreviated to EslAN from its name in Spanish) (article 4), and the process and challenges of training and supervision in taking the EslAN to scale (article 5). The final article provides reflections on the relevance of this body of work for implementation research in nutrition.

## NON-PEER REVIEWED

---

### Mapping Foods for Community Based Management of Children with Severe Acute Malnutrition in India

Kalawati Saran Children's Hospital (KSCH), New Delhi, National Institute of Nutrition (NIN), Hyderabad, and UNICEF. 2019. *Mapping Foods for Community Based Management of Children with Severe Acute Malnutrition in India*. New Delhi.

Kalawati Saran Children's Hospital in collaboration with National Institute of Nutrition, Hyderabad and UNICEF reviewed the literature to identify and map the profile energy and nutrient dense food items that have been used to manage different forms of undernutrition in community settings in India.

---

### Rural transformation and the double burden of malnutrition among rural youth in developing countries

Kadiyala, S., E. Aurino, C. Cirillo, C.S. Srinivasan, and G. Zanello. 2019. "Rural transformation and the double burden of malnutrition among rural youth in developing countries". *The IFAD Research Series*. ISBN 978-92-9072-967-9.

<https://www.ifad.org/en/web/knowledge/publication/asset/41489862>

Adolescence and early adulthood are periods of major biological, economic and social transitions for rural youth. They provide a critical window of opportunity for addressing chronic nutritional deficits from childhood, for "catch-up" growth, for providing a solid foundation for a healthy productive and reproductive life, and for arresting the intergenerational transmission of malnutrition. In this study we show that rural transformation processes are associated with improvements in rural youth nutrition – malnutrition and underweight – in nearly all regions, although the pace of change varies considerably across countries. Most low- and middle-income countries (LMICs) are faced with the double burden of malnutrition and overweight/obesity, and in some countries this double burden is increasing, with the prevalence of underweight and overweight/obesity rising concurrently.

## UPCOMING EVENTS & DEADLINES

---

### 7th International Conference on Nutrition and Growth

**Description:** The 7th International Conference on Nutrition and Growth brings together pediatricians, nutritionists, neonatologists, experts in child development and other specialists to discuss the challenges of the interplay between Nutrition and Growth in the pediatric age group. Exchange ideas and knowledge between the different disciplines for facilitating research and clinical interdisciplinary collaborations focusing on nutrition and growth.

**When:** 26–28, March 2020

**Where:** London, United Kingdom

**For more information:** <https://nutrition-growth.kenes.com/>

## ABOUT POSHAN

Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India (POSHAN) is a multi-year initiative that aims to build evidence on effective actions for nutrition and support the use of evidence in decision-making. It is supported by the Bill & Melinda Gates Foundation and led by IFPRI in India.

## ABOUT ABSTRACT DIGEST

In each issue, the POSHAN Abstract Digest brings you some of the new and noteworthy studies on maternal and child nutrition. It focuses on India-specific studies and also brings to you other relevant global or regional literature with broader implications for maternal and child nutrition. The Abstract Digest is based on literature searches to identify selected studies that we think are most relevant to nutrition issues in India and to Indian programs and policies. We share with you a collection of abstracts from articles published in peer-reviewed journals, as well as selected non-peer-reviewed articles by researchers in reputed academic and/or research institutions and which demonstrated rigor in their research objectives, methodology, and analysis. The abstracts in this document are reproduced in their original form from their source, and without editorial commentary about specific articles.

## CONTACT US

Email us at [IFPRI-POSHAN@cgiar.org](mailto:IFPRI-POSHAN@cgiar.org)

### IFPRI-NEW DELHI

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

NASC Complex, CG Block, Dev Prakash Shastri Road, Pusa, New Delhi 110012, India

T +91.11.66166565; F +91.11.66781699

<http://poshan.ifpri.info/>

### IFPRI-HEADQUARTERS

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW, Washington, DC 20006-1002 USA

T. +1.202.862.5600 F. +1.202.467.4439

Skype: IFPRIhomeoffice; Email: [ifpri@cgiar.org](mailto:ifpri@cgiar.org)

[www.ifpri.org](http://www.ifpri.org)

This publication has been prepared by POSHAN with research assistance from Pratima Mathews, IFPRI, and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies of the International Food Policy Research Institute. Please contact [Dr. Rasmi Avula](#) for any questions.

Copyright © 2020 International Food Policy Research Institute. All rights reserved. For permission to republish, contact [ifpri-copyright@cgiar.org](mailto:ifpri-copyright@cgiar.org).