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South Asia Nutrition Knowledge Initiative
Abstract Digest

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EDITOR'S NOTE

Welcome to the first edition of South Asia Nutrition Knowledge Initiative's (SANI) Abstract Digest! In each issue, we aim to curate a selection of the latest and relevant studies on maternal and child nutrition for the South Asia region. We conduct literature search across peer-reviewed journals and identify studies of relevance. The abstracts in this document are reproduced in their original form from their source, and without editorial commentary about specific articles. If this Abstract Digest was forwarded to you, we invite you to subscribe.

In this first edition, we include global studies on trends in malnutrition, health inequalities of common nutrition deficiencies in children and the importance of gender-sensitive social safety nets and nutrition-specific and -sensitive interventions in the low-and middle-income countries. There are interesting studies from South Asia with a focus on Bangladesh, India and Nepal on topics including geospatial and environmental determinants of undernutrition, dietary diversity assessment of pregnant adolescent girls and nutrition interventions such as mid-day meal program in India and Suaahara in Nepal.

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Happy reading!

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A multi-sectoral community development intervention has a positive impact on diet quality and growth in school-age children in rural Nepal.
Miller, Laurie C., et al. Maternal and Child Nutrition (2024): e13637.

PEER REVIEWED

Undernutrition in children under five associated with wealth-related inequality in 24 low and middle-income countries from 2017 to 2022

Birhanu, F., K. Yitbarek, F. T. Bobo, E. Atlantis, and M. Woldie. 2024. "Undernutrition in Children under Five Associated with Wealth-Related Inequality in 24 Low- and Middle-Income Countries from 2017 to 2022." *Scientific Reports* 14 (1): 3326. doi.org/10.1038/s41598-024-53280-0

Undernourishment is a persistent public health problem contributing to increased mortality in children under five in low-income countries, likely exacerbated by socio-economic disparities within communities. This paper aimed to examine the effect of wealth-related inequality on undernutrition in children under five in low, lower-middle, and upper-middle-income countries (LMICs). We analyzed cross-sectional data from the demographic and health survey program collected between 2017 and 2022 from 24 LMICs. Children born within 5 years preceding the survey were included in the analysis. Child undernutrition was the dependent variable (measured by stunting, wasting, and underweight) and country-level wealth-based inequality was the independent variable assessed by concentration index values stratified by the World Bank's income categories. Within country inequality of child undernutrition was determined by concentration index (C) values with 95% confidence intervals (95% CI) and sub-group analysis by place of residence and sex of the child. We then fit bootstrapped meta-regression to check the variation in inequality of child undernutrition across different income category countries. The analysis was controlled by potential confounding variables. From the total sample size of 334,502 children included in the study, 35% were undernourished. Wealth-related inequality in child undernutrition was observed in 11 countries, consistently across income categories. Child undernutrition was highly concentrated among the poor households of Türkiye [C: − 0.26, 95% CI − 0.31 to − 0.20], and Cameroon [C: − 0.19, 95% CI − 0.22 to − 0.17], and relatively it was less concentrated among the poor in Liberia [C: − 0.07, 95% CI − 0.11 to − 0.04], and Gambia [C: − 0.07, 95% CI − 0.11 to − 0.04]. There is no difference in undernutrition associated with inequality between the three broad LMIC categories. The wealth-related inequality in child undernutrition within many of the included countries is still very significant. However, the economic category of countries made no difference in explaining wealth-related inequality in child undernutrition. Inter-sectoral collaboration to fight poverty and render special attention to the disadvantaged population segments would potentially help to address the observed inequity.

Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population representative studies with 222 million children, adolescents, and adults

Phelps, N, H., R. K. Singleton, B. Zhou, R. A. Heap, A. Mishra, J. E. Bennett, C.J. Paciorek, V.P.F. Lhoste, R.M. Carrillo-Larco, G. A. Stevens and A. Rodriguez-Martinez. 2024. "Worldwide Trends in Underweight and Obesity from 1990 to 2022: A Pooled Analysis of 3663 Population-Representative Studies with 222 Million Children, Adolescents, and Adults." *The Lancet* 403 (10431). doi.org/10.1016/S0140-6736(23)02750-2

Background: Underweight and obesity are associated with adverse health outcomes throughout the life course. We estimated the individual and combined prevalence of underweight or thinness and obesity, and their changes, from 1990 to 2022 for adults and school-aged children and adolescents in 200 countries and territories. **Methods:** We used data from 3663 population-based studies with 222 million participants that measured height and weight in representative samples of the general population. We used a Bayesian hierarchical model to estimate trends in the prevalence of different BMI categories, separately for adults (age ≥20 years) and school-aged children and adolescents (age 5–19 years), from 1990 to 2022 for 200 countries and territories. For adults, we report the individual and combined prevalence of underweight (BMI <18·5 kg/m2) and obesity (BMI ≥30 kg/m2). For school-aged children and adolescents, we report thinness (BMI <2 SD below the median of the WHO growth reference) and obesity (BMI >2 SD above the median). **Findings:** From 1990 to 2022, the combined prevalence of underweight and obesity in adults decreased in 11 countries (6%) for women and 17 (9%) for men with a posterior probability of at least 0·80 that the observed changes were true decreases. The combined prevalence increased in 162 countries (81%) for women and 140 countries (70%) for men with a posterior probability of at least 0·80. In 2022, the combined prevalence of underweight and obesity was highest in island nations in the Caribbean and Polynesia and Micronesia, and countries in the Middle East and north Africa. Obesity prevalence was higher than underweight with posterior probability of at least 0·80 in 177 countries (89%) for women and 145 (73%) for men in 2022, whereas the converse was true in 16 countries (8%) for women, and 39 (20%) for men. From 1990 to 2022, the combined prevalence of thinness and obesity decreased among girls in five countries (3%) and among boys in 15 countries (8%) with a posterior probability of at least 0·80, and increased among girls in 140 countries (70%) and boys in 137 countries (69%) with a posterior probability of at least 0·80.

The countries with highest combined prevalence of thinness and obesity in school-aged children and adolescents in 2022 were in Polynesia and Micronesia and the Caribbean for both sexes, and Chile and Qatar for boys. Combined prevalence was also high in some countries in south Asia, such as India and Pakistan, where thinness remained prevalent despite having declined. In 2022, obesity in school-aged children and adolescents was more prevalent than thinness with a posterior probability of at least 0·80 among girls in 133 countries (67%) and boys in 125 countries (63%), whereas the converse was true in 35 countries (18%) and 42 countries (21%), respectively. In almost all countries for both adults and school-aged children and adolescents, the increases in double burden were driven by increases in obesity, and decreases in double burden by declining underweight or thinness. **Interpretation:** The combined burden of underweight and obesity has increased in most countries, driven by an increase in obesity, while underweight and thinness remain prevalent in south Asia and parts of Africa. A healthy nutrition transition that enhances access to nutritious foods is needed to address the remaining burden of underweight while curbing and reversing the increase in obesity.

Unpacking the intractability of childhood stunting: an introduction to the UKRI GCRF Action Against Stunting Hub

Jobarteh, M. L., K. Conway-Moore, D. Yadav, D. T. Tata, U. Fahmida, B. Faye, B. Kulkarni, D. Saxena, and C. Heffernan. 2024. "Unpacking the Intractability of Childhood Stunting: An Introduction to the UKRI GCRF Action against Stunting Hub." *BMJ Paediatrics Open* 8 (Suppl 1): e002333–33. doi.org/10.1136%2Fbmjpo-2023-002333

Despite concerted efforts, the global community is off-track in its ambition to reduce the number of stunted children under 5 years by 40% by 2025. Stunting in children is thought to be a result of adversities in early life with multiple contributors including inadequate nutritional intake, environmental insults and intergenerational transmission of risk. While we know the pathways to stunting are numerous, our understanding of the convergence of these pathways remains a critical block. As such, childhood stunting can be described as a 'mosaic' where there is knowledge of the individual components, but inadequate understanding of the interactions or inter-relationships between the individual elements/drivers comprising the whole. In addition, the current definition of stunting is based on the measurement of child length, calculated as Length-for-Age-Z score (LAZ) 2 SDs below the median of the WHO growth standard. While this is important in adopting a universally accepted standard definition, the approach is rather too simplistic. The definition does not take into consideration the profoundly complex pathophysiology of stunting and its far-reaching consequences on the growth and development, future health and well-being of the affected children, communities and nations. Accordingly, research on stunting tends to focus on a single outcome or at best, parts of a system, with inadequate holistic exploration of underlying interconnections. Indeed, by defining childhood stunting as a single outcome, it may be argued that we have fostered a lack of understanding of the pathway each child has been on to reach such an outcome. The Action Against Stunting Hub (AASH), a partnership of 18 institutions, funded by the UK Research and Innovation's Global Challenges Research Fund aims to generate a holistic understanding of the complex drivers of stunting and their interactions to better inform prevention and treatment strategies. This article introduces AASH, the related workstreams and interdisciplinary synergies.

Trends estimation of obesity prevalence among South Asian young population: a systematic review and meta-analysis

Bansal, D., M. Safeer, N. Devi, C. Boya, K. D. Babu, and P. Dutta. 2024. "Trends Estimation of Obesity Prevalence among South Asian Young Population: A Systematic Review and Meta-Analysis." *Scientific Reports* 14 (1): 596. doi.org/10.1038/s41598-023-50973-w

The premise for effective prevention and treatment of obesity is the availability of accurate prevalence figures. However, the prevalence of pediatric obesity and overweight in South Asian countries has seldom been analyzed. This article provides a comprehensive review and meta-analysis of studies on overweight and obesity to provide a more precise prevalence estimate. The study protocol was registered on PROSPERO (CRD42022320625). PubMed and Embase databases were comprehensively searched from inception till September 2023. The random-effects model was utilized to derive the pooled prevalence of obesity and overweight. Subgroup meta-analysis was used to assess variations in prevalence estimates across subgroups. A meta-regression analysis was also performed to assess the trend of overweight and obesity over the years.

152 studies were included with 489,525 participants. The pooled prevalence was 12.4 (95% CI 11.1–13.6) for overweight, 6.6% (95% CI 5.6–7.8) for obesity, and 19.3% (95% CI 17.1–21.7) for obesity and overweight. In subgroup analysis, Bangladesh reported a higher prevalence for both obesity (8.9%; 95% CI 4.9–13.9) and overweight (13.6%; 95% CI 9.2–18.8). Meta-regression analysis found a significant association between obesity prevalence and the publication year (β = 0.004; p = 0.03; R2 = 2.74%). The results of this study indicate a relatively higher prevalence of childhood obesity in South Asia, emphasizing the necessity for large-scale awareness efforts and context-specific preventative methods.

Geospatial and environmental determinants of stunting, wasting, and underweight: Empirical evidence from rural South and Southeast Asia

Bahadur, D.R., R. Mishra, and S. Bera. 2024. "Geospatial and Environmental Determinants of Stunting, Wasting, and Underweight: Empirical Evidence from Rural South and Southeast Asia." *Nutrition*, April, 112346–120. doi.org/10.1016/j.nut.2023.112346

Objective: Child malnutrition, comprising of undernutrition and obesity, is a global concern with severe implications for survival, leading to acute and chronic diseases that adversely affect the productivity of individuals and society. Asia shoulders the greatest burden, with 7 out of 10 undernourished children residing in the region. Despite the decline in global child stunting, particularly in Asia, its prevalence remains significant. In 2017, an estimated 151 million children under five experienced stunting, and an additional 38 million were overweight, with Africa and Asia accounting for 25% and 46% of the global figures, respectively. Therefore, this paper aims to analyze the geospatial and environmental determinants of undernutrition in rural South and Southeast Asia. **Methods:** To explore the geospatial and environmental determinants of undernutrition (stunting, wasting, and underweight), we use Poisson regression and the data from recent rounds of the Demographic and Health Survey (DHS) from India, Bangladesh, Pakistan, Nepal, Cambodia, and Timor-Leste. **Results:** This study found a high prevalence of stunting, wasting, and underweight among children aged 0 to 59 months in rural areas of South and Southeast Asia, with considerable variation between countries and clusters/primary sampling units. Results show a positive association between child malnutrition and factors such as maternal illiteracy, unsafe drinking water, and dirty cooking fuel in South and Southeast Asia. Children from impoverished households in India, Pakistan, and Cambodia were disproportionately affected. In addition to socio-economic factors, climatic risks such as temperature increase and rainfall variations also emerged as important determinants of child malnutrition in India, Bangladesh, and Timor-Leste. **Conclusions:** This paper emphasizes the role of environmental and climatic factors on child nutrition, underscoring their significance regardless of socio-economic conditions. As the impacts of climate change continue to intensify, and agrarian societies bear the brunt, these factors will play a critical role in shaping child nutritional outcomes. Thus, amid growing climate change, nutritional security should be prioritized, considering the spatial domain and targeting climate distress areas along with other socio-economic and demographic aspects.

Prevalence of overweight and obesity and associated demographic and health factors in India: Findings from Comprehensive National Nutrition Survey (CNNS)

Sethi, V., S. Bassi, D. Bahl, A. Kumar, T. Choedon, N. Bhatia, A. de Wagt, W. Joe, and M. Arora. 2024. "Prevalence of overweight and obesity and associated demographic and health factors in India: Findings from Comprehensive National Nutrition Survey (CNNS)." *Pediatric Obesity,* e13092. doi.org/10.1111/ijpo.13092

Background: Childhood obesity (5–9 years) in India is likely to contribute 11% to the global burden by 2030. **Methods:** Data from India's Comprehensive National Nutrition Survey (CNNS, 2016–2018) was used to assess the prevalence and key associated factors of overweight and obesity. Multivariable logistic regression models were applied to identify potential determinants associated with being overweight and obese. **Results:** Overweight prevalence (including obesity) varied from 1.6% (0–4 years) to 4.8% (10–19 years). The majority of states reported a higher proportion of adolescents overweight and obese, than younger age group 5–9 years. A significantly higher prevalence of children and adolescents with obesity was reported in higher wealth quintiles and residents of urban areas. The prevalence of overweight and obesity and associated demographic and health factors in India included: the presence of NCD risk factor (adolescents: 1.68, 95% CI [1.31–2.14]), micronutrient deficiency (5–9 years children: 1.72, 95% CI [1.30–2.28]), mother's education (5–9 years children: 4.84, 95% CI [2.92–8.03]; adolescents: 2.17, 95% CI [1.42–3.32]), wealth (adolescents: 1.92, 95% CI [1.16–3.19]), place of residence (5–9 years children: 1.68, 95% CI [1.39–2.03]; adolescents: 1.39, 95% CI [1.16–1.66]), child age (5–9 years children: 1.64, 95% CI [1.40–1.93], and screen-time (adolescents: 1.63, 95% CI [1.22–2.19]. **Conclusion:** The findings set out policy and research recommendations to pave the path for curtailing the increasing prevalence of overweight and obesity and achieving the World Health Assembly's Global Nutrition target of 'no increase in childhood overweight (Target 4) by 2025'.

Nutritional status of infants and young children in India across three decades: Analysis of five national family health surveys

Kundu, R.N., R. K. Gautam, A. Chatterjee, P. Bharati, G. Liczbińska, and R. M. Malina. 2024. "Nutritional status of infants and young children in India across three decades: Analysis of five national family health surveys." *European Journal of Clinical Nutrition,* 1-16. doi.org/10.1038/s41430-024-01427-7

Background: Three indicators of early childhood undernutrition and associated factors are evaluated among under-5 children in five National Family Health Surveys in India spanning 1992 to 2021. **Methods:** Data for 533,495 children under 5 years of age (U-5) were analyzed in the context of three commonly used indicators of early childhood undernutrition – wasting, stunting and underweight. In addition to descriptive and inferential statistics, binary logistic regression was used to estimate the effects of specific explanatory factors on the three indicators using adjusted odds ratios. **Results:** Over the three-decade interval, stunting was reduced by 22.1% in boys and 20.9% in girls, followed by underweight, 19.3% in boys and 17.4% in girls; wasting, in contrast, was reduced to a considerably lesser extent, 2.8% in boys and 0.9% in girls. Demographic, maternal and socioeconomic factors were associated with the incidence of early childhood undernutrition, specifically among young mothers and those with less education in low-income families, and among children from Scheduled Tribes or Scheduled Castes. Stunting and underweight declined significantly over the past three decades while wasting changed negligibly. The disparity in the occurrence of early childhood undernutrition was apparent throughout socioeconomic categories and regions of India. **Conclusion:** The results highlight the need for special programs aimed at reducing waste among children and also the need for customized initiatives focused on the improvement of maternal education and wealth in addition to other ancillary factors related to regional variation.

Prevalence and determinants of anemia due to micronutrient deficiencies among children aged 12-59 months in India-Evidence from Comprehensive National Nutrition Survey, 2016-18

Yadav, K., G. Ramaswamy, S. Puri, K. Vohra, T. Achary, A. Jaiswal, R. Kaur, M. Bairwa, A. Singh, and V. Sethi. 2024. "Prevalence and Determinants of Anemia due to Micronutrient Deficiencies among Children Aged 12–59 Months in India–Evidence from Comprehensive National Nutrition Survey, 2016–18." *PLOS Global Public Health* 4 (1): e0002095–95. doi.org/10.1371/journal.pgph.0002095

The present study aimed to estimate the prevalence of anemia, and anemia with micronutrient deficiencies (iron/ vitamin B12/ folic acid) and their determinants among children aged 12–59 months in India. Comprehensive National Nutritional Survey (2016–2018) is Asia's largest nutrition survey conducted among 0–19 years aged children in India. We used generalized linear model (modified Poisson) with adjusted prevalence ratio (aPR) to assess the socio-economic and biochemical factors associated with anemia and anemia with micronutrient deficiencies amongst children aged 12 to 59 months. Out of the total of 11,237 children included in the study, 40.5% (95%CI:38·6–42·6) were anemic, 30.0% (95% CI: 27·8–32·4) had anemia with micronutrient deficiencies and 60.9% (95%CI:58·2–63·5) had micronutrient deficiencies with or without anemia. Younger age (aPR (95%CI) for one year old: 1.9(1.5–2.4), two year old: 1.8(1.5–2.2), three year old: 1.4 (1.2–1.7) compared to four year old children) and lower educational status of the mother (mothers without formal schooling aPR (95%CI):1.4(1.1–1.8); 1–9 standards: 1.4(1.2–1.7)) vs mother educated with high school and above, consumption of less than 100 iron-folic acid tablets during pregnancy (aPR (95%CI):1.3(1.0–1.7) vs consumption of ≥ 180 tablets, any self-reported illness among children within two weeks preceding the interview (aPR (95%CI):1.2(1.1–1.4) vs no-illnesses, iron deficiency (aPR (95%CI):2.2(2.0–2.6)) and zinc deficiency (aPR (95%CI):1.3(1.1–1.4)) were associated with anemia in children. Among anemic, the children from scheduled tribe (aPR (95%CI):1.4(1.1–1.8)) vs other caste categories, and those following unsafe child faeces disposal practices (aPR (95%CI):1.2(1.0–1.4)) vs those who follow safe faeces disposal practices had higher chance of having micronutrient deficiency. One third of children aged 12–59 months had anemia with micronutrient deficiency (iron/ folic acid/ vitamin B12). More than half of children had micronutrient deficiencies irrespective of anemia. Micronutrient deficiencies, antenatal IFA intake, safe hygiene practices need to be strengthened to leave no stone unturned in control of anemia among under-five children in India.

Prevalence and determinants of anemia among women of reproductive age in Aspirational Districts of India: an analysis of NFHS 4 and NFHS 5 data

Let, S., S. Tiwari, A. Singh, and M. Chakrabarty. 2024. "Prevalence and Determinants of Anaemia among Women of Reproductive Age in Aspirational Districts of India: An Analysis of NFHS 4 and NFHS 5 Data." *BMC Public Health* 24 (1) doi.org/10.1186/s12889-024-17789-3

Background: Over one-third of women worldwide suffer from anemia. The prevalence of anemia is particularly pronounced among women of reproductive age (WRA) in developing countries, such as India. No prior study has ever exclusively studied the prevalence of anemia across the Aspirational Districts of India. Therefore, the purpose of this study was to examine the prevalence of anemia across Aspirational Districts of India and to identify the determinants of anemia among WRA in these districts. **Methods:** From the National Family Health Survey (NFHS)-4 (2015-16) and NFHS-5 (2019-21), data on 114,444 and 108,782 women aged 15–49 from Aspirational Districts were analyzed in our study, respectively. Bivariate statistics and multivariable binary logistic regression were used to identify the determinants of anemia. **Results:** The national prevalence of anemia among WRA has increased from 53% in NFHS-4 to 57% in NFHS-5 whereas anemia among WRA in Aspirational Districts has increased from 58.7% in NFHS-4 to 61.1% in NFHS-5. Between 2015 and 2021, over 60% of Aspirational Districts experienced an increase in the prevalence of anemia and one-fourth, specifically 29 out of 112, observed a rise by at least 10 percentage points (pp). Notably, there are significant variations in anemia prevalence among districts, with Simdega and Udalgiri having the highest anemia prevalence in NFHS-4 and NFHS-5 at 78.2% and 81.5%, respectively. During this period, Barpeta followed by Udalgiri of Assam have witnessed the maximum increase with 29.4% and 26.7% respectively. Moreover, pooled regression results show women with three to four children [AOR: 1.13, 95% CI: 1.08–1.17], women who breastfeed [AOR: 1.17, 95% CI: 1.13–1.20], Scheduled Tribe women [AOR: 1.39, 95% CI: 1.35–1.44], poorest women [AOR: 1.27, 95% CI: 1.22–1.33] and women those who consume fish occasionally [AOR: 1.14, 95% CI: 1.12–1.17] were more likely to be anemic. **Conclusion:** The significant increase in anemia among WRA in Aspirational Districts of India is a matter of concern. Given the rise in anemia among WRA, determinants-based and district-specific measures must be designed and implemented to reduce the prevalence of anemia among Aspirational Districts of India.

Spatial Clustering of Malnutrition and Anemia Among Reproductive Women and Its Associated Risk Factors in India: Evidence from National Family Health Survey-5

Ghosh, K., A. S. Chakraborty, B. Haloi, and S. Zakir. 2024. "Spatial Clustering of Malnutrition and Anemia among Reproductive Women and Its Associated Risk Factors in India: Evidence from National Family Health Survey-5." *Food and Nutrition Bulletin* (Tokyo. Print), March. doi.org/10.1177/03795721241234086

Background: Malnutrition and anemia are 2 severe public health concerns, predominantly in low-and middle-income nations. Malnutrition is defined as poor nutritional condition that encompass both under nutrition and over nutrition. The prevalence of overweight or obesity and anemia has increased in India from 2016 to 2021. The study aims to investigate the spatial clustering and factors responsible for underweight, overweight/obesity, and anemia among reproductive women (15-49 years) in India using the data from National Family and Health Survey-5 (2019-2021). **Methods:** We conducted hot-spot analysis using Moran's Index (MI) with the help spatial analysis software (i.e., GeoDa 1.18 and ArcGIS 10.8). It also demonstrates the autocorrelation. Multivariable logistic regression analysis has been performed to examine different determinants and risk associated with underweight, overweight/obesity, and anemia with various dependent variable by using Stata-14 software. **Results:** Moran's Index for underweight (MI = 0.68), overweight/obesity (MI = 0.72), and anemia (MI = 0.62) indicates a high level of spatial-autocorrelation ($P < .001$) exists across the districts in India. As a result, a total of 156, 143, and 126 hot-spot districts are detected for underweight, overweight/obesity, and anemia, respectively. The burden of undernutrition and anemia is higher in rural areas. Risk of under nutrition and anemia are both reduced by media exposure and eating habits. Moreover, low income and low education level raises the risk of anemia and undernutrition, while obesity shows an inverse trend with income and education level. **Conclusion:** The study recommends targeting hot-spot districts for malnutrition and anemia, and policy level initiatives by addressing the responsible risk factors.

Cross-country health inequalities of four common nutritional deficiencies among children, 1990 to 2019: data from the Global Burden of Disease Study 2019

Jiang, W., X. Li, R. Wang, Y. Du, and W. Zhou. 2024. "Cross-Country Health Inequalities of Four Common Nutritional Deficiencies among Children, 1990 to 2019: Data from the Global Burden of Disease Study 2019." *BMC Public Health* 24 (1): 486. doi.org/10.1186/s12889-024-17942-y

Background: Nutritional deficiencies remain serious medical and public health issues worldwide, especially in children. This study aims to analyze cross-country inequality in four common nutritional deficiencies (protein-energy malnutrition, dietary iron deficiency, vitamin A deficiency and iodine deficiency) among children from 1990 to 2019 based on Global Burden of Disease (GBD) 2019 data. **Methods:** Prevalence and disability-adjusted life years (DALYs) data as measures of four nutritional deficiency burdens in people aged 0 to 14 years were extracted from the GBD Results Tool. We analyzed temporal trends in prevalence by calculating the average annual percent change (AAPC) and quantified cross-country inequalities in disease burden using the slope index. **Results:** Globally, the age-standardized prevalence rates of dietary iron deficiency, vitamin A deficiency and iodine deficiency decreased, with AAPCs of -0.14 (-0.15 to -0.12), -2.77 (-2.96 to -2.58), and -2.17 (-2.3 to -2.03) from 1999 to 2019, respectively. Significant reductions in socio-demographic index (SDI)-related inequality occurred in protein-energy malnutrition and vitamin A deficiency, while the health inequality for dietary iron deficiency and iodine deficiency remained basically unchanged. The age-standardized prevalence and DALY rates of the four nutritional deficiencies decreased as the SDI and healthcare access and quality index increased. **Conclusions:** The global burden of nutritional deficiency has decreased since 1990, but cross-country health inequalities still exist. More efficient public health measures are needed to reduce disease burdens, particularly in low-SDI countries/territories.

Sex differences in growth and neurocognitive development in infancy and early childhood Proceedings of the nutrition society

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Undernutrition in early life remains a significant public health challenge affecting millions of infants and young children globally. Children who are wasted, stunted or underweight are at increased risk of morbidity and mortality. Undernutrition at critical periods also impacts on aspects of neurodevelopment, with longer-term consequences to educational performance and mental health outcomes. Despite consistent evidence highlighting an increased risk of neonatal and infant mortality among boys, a common assumption held across many disciplines is that girls are more vulnerable with respect to early-life exposures. In relation to undernutrition, however, recent evidence indicates the reverse, and in contexts of food insecurity, boys are at increased risk of undernutrition in early life compared to girls, with sex-specific risks for neurodevelopmental deficits. These effects appear independent of social factors that may favour boys, such as gender disparities in infant feeding practices and health-seeking behaviours. The observed vulnerability among boys may therefore be underpinned by biological processes such as differential energy requirements during periods of rapid growth. As boys have greater needs for growth and maintenance, then, in times of nutritional hardship, these needs may not be met resulting in risk of undernutrition and subsequent health consequences. In view of this emerging evidence, a greater understanding of the mechanisms behind this vulnerability among boys is needed and policy considerations to protect boys should be considered. This review will explore sex differences in risk of undernutrition and consider these in the context of existing programmes and policies.

Prevalence of Children Aged 6 to 23 Months Who Did Not Consume Animal Milk, Formula, or Solid or Semisolid Food During the Last 24 Hours Across Low- and Middle-Income Countries

Karlsson, O., R. Kim, and S. V. Subramanian. 2024. "Prevalence of Children Aged 6 to 23 Months Who Did Not Consume Animal Milk, Formula, or Solid or Semisolid Food during the Last 24 Hours across Low- and Middle-Income Countries." *JAMA Network Open* 7 (2): e2355465–65. doi.org/10.1001/jamanetworkopen.2023.55465

Importance: The introduction of solid or semisolid foods alongside breast milk plays a vital role in meeting nutritional requirements during early childhood, which is crucial for child growth and development. Understanding the prevalence of zero-food children (defined for research purposes as children aged 6 to 23 months who did not consume animal milk, formula, or solid or semisolid food during the last 24 hours) is essential for targeted interventions to improve feeding practices. **Objective:** To estimate the percentage of zero-food children in 92 low- and middle-income countries. **Design, Setting and Participants:** This cross-sectional study analyzed nationally representative cross-sectional household data of children aged 6 to 23 months from the Demographic and Health Surveys and the Multiple Indicator Cluster Surveys conducted between May 20, 2010, and January 27, 2022. Data were obtained from 92 low- and middle-income countries. Standardized procedures were followed to ensure data comparability and reliability. Both percentage and number of zero-food children were estimated. **Main Outcomes and Measures:** The outcome studied was defined as a binary variable indicating children aged 6 to 23 months who had not been fed any animal milk, formula, or solid or semisolid foods during the 24 hours before each survey, as reported by the mother or caretaker. **Results:** A sample of 276 379 children aged 6 to 23 months (mean age, 14.2 months [95%CI, 14.15- 14.26 months]) in 92 low- and middle-income countries was obtained, of whom 51.4%(95%CI, 51.1%-51.8%) were boys. The estimated percentage of zero-food children was 10.4% (95%CI, 10.1%- 10.7%) in the pooled sample, ranging from 0.1% (95%CI, 0%-0.6%) in Costa Rica to 21.8% (95%CI, 19.3%-24.4%) in Guinea. The prevalence of zero-food children was particularly high in West and Central Africa, where the overall prevalence was 10.5% (95%CI, 10.1%-11.0%), and in India, where the prevalence was 19.3% (95%CI, 18.9%-19.8%). India accounted for almost half of zero-food children in this study. **Conclusions and Relevance:** In this cross-sectional study of 276 379 children aged 6 to 23 months, substantial disparities in the estimates of food consumption across 92 low- and middle-income countries were found. The prevalence of zero-food children underscores the need for targeted interventions to improve infant and young child feeding practices and ensure optimal nutrition during this critical period of development. The issue is particularly urgent in West and Central Africa and India.

Association between household food insecurity and stunting in children aged 0–59 months: Systematic review and meta-analysis of cohort studies

Patriota, É. S.O, L. CS. Abrantes, A. Figueiredo, N. Pizato, G. Buccini, and V. S.S Gonçalves. 2024. "Association between Household Food Insecurity and Stunting in Children Aged 0–59 Months: Systematic Review and Meta-Analysis of Cohort Studies." *Maternal and Child Nutrition* (Print), January. doi.org/10.1111/mcn.13609

Household food insecurity (HFI) during childhood is associated with poor dietary diversity and malnutrition, placing children's growth at risk. Children with growth disorders, such as stunting, are more likely to have poor cognition and educational performance, lower economic status, and an increased risk of nutrition-related chronic diseases in adulthood. Our study aimed to systematically review and conduct a meta-analysis of cohort studies investigating the association between HFI and stunting in children aged 0–59 months. Peer-reviewed and grey literature were systematically searched in electronic databases with no language or date restrictions. Two reviewers independently assessed the studies for pre-established eligibility criteria. Data were extracted using a standard protocol. Random-effects meta-analysis models were used, and I2 > 40% indicated high heterogeneity across studies. We used the Grading of Recommendations Assessment, Development, and Evaluation system to assess the quality of the evidence. Nine cohort studies comprising 46,300 children were included. Approximately 80% (n = 7) of the studies found a positive association between HFI and stunting. Pooled odds ratio was 1.00 (95% confidence interval [CI]: 0.87–1.14; I2: 76.14%). The pooled hazard ratio between moderate and severe HFI and stunting was 1.02 (95% CI: 0.84–1.22; I2: 85.96%). Due to high heterogeneity, the quality of evidence was very low. Individual studies showed an association between HFI and stunting in children aged 0–59 months; however, this association was not sustained in the pooled analysis, possibly because of high heterogeneity across studies.

Assessing association of household diet diversity with mother's time use on productive and reproductive activities: a case for gender sensitive social safety nets

Chaturvedi, S., S. Swaminathan, S. Makkar, A. T. John, and T. Thomas. 2024. "Assessing Association of Household Diet Diversity with Mother's Time-Use on Productive and Reproductive Activities - a Case for Gender Sensitive Social Safety Nets." *Public Health Nutrition* (Wallingford), January, 1–22. doi.org/10.1017/S1368980023002963

Objective: In South Asia, while women make substantial economic contributions through their participation in agricultural sector, these contributions are undercounted as most of their work is underpaid or unpaid. This paper examines how mothers allocate their time to productive and reproductive activities and its association with a household's ability to achieve high household diet diversity score. **Design:** The analysis uses data on household consumption and expenditure including food during the kharif (June to October) season (seeds are sown) and a modular time-use survey. **Setting:** Two districts of rural Bihar, India. **Participants:** Mothers with children less than 5 years of age and supported by the head of the household from 2026 households. **Results:** The estimates indicate that the high household diet diversity (High HDDS ≥ 10) is associated with greater time spent in reproductive activities by all women (OR = 1·12, 95 % CI: 1·06, 1·18). However, with increasing time spent in productive activities by the women the odds of achieving 'High HDDS' reduced (OR = 0·83, 95 % CI: 0·77, 0·89) in adjusted logistic regression analysis. **Conclusion:** The findings highlight propensity to achieve 'High HDDS' in Bihar increased with mothers allocating time towards reproductive activities, while it had an opposing effect with mothers allocating time on productive activities. Our study highlights that the policies that encourage women's participation in agriculture or livestock should acknowledge the unpaid nature of some of the productive activities and design programs to improve economic agency of women to actuate the true potential of agriculture-nutrition pathways.

Defining a Dichotomous Indicator for Population-Level Assessment of Dietary Diversity Among Pregnant Adolescent Girls and Women: A Secondary Analysis of Quantitative 24-h Recalls from Rural Settings in Bangladesh, Burkina Faso, India, and Nepal

Verger, E.O., S. Eymard-Duvernay, D. Bahya-Batinda, G.T. Hanley-Cook, A. Argaw, E. Becquey, L. Diop, A. Gelli, H. Harris-Fry, S. Kachwaha, S. S. Kim, P. H. Nguyen, N. M. Saville, L. M. Tran, R.R. Zagré, E. Landais, M. Savy, Y. Martin-Prevel, and C. Lachat. 2024. "Defining a Dichotomous Indicator for Population-Level Assessment of Dietary Diversity among Pregnant Adolescent Girls and Women: A Secondary Analysis of Quantitative 24-h Recalls from Rural Settings in Bangladesh, Burkina Faso, India, and Nepal." *Current Developments in Nutrition* 8 (1): 102053–53. doi.org/10.1016/j.cdnut.2023.102053

Background: The Minimum Dietary Diversity for Women of Reproductive Age (MDD-W) indicator was validated as a proxy of micronutrient adequacy among nonpregnant women in low- and middle-income countries (LMICs). At that time, indeed, there was insufficient data to validate the indicator among pregnant women, who face higher micronutrient requirements. **Objective:** This study aimed to validate a minimum food group consumption threshold, out of the 10 food groups used to construct MDD-W, to be used as a population-level indicator of higher micronutrient adequacy among pregnant women aged 15–49 y in LMICs. **Methods:** We used secondary quantitative 24-h recall data from 6 surveys in 4 LMICs (Bangladesh, Burkina Faso, India, and Nepal, total n = 4909). We computed the 10-food group Women's Dietary Diversity Score (WDDS-10) and calculated the mean probability of adequacy (MPA) of 11 micronutrients. Linear regression models were fitted to assess the associations between WDDS-10 and MPA. Sensitivity, specificity, and proportion of individuals correctly classified were used to assess the performance of MDD-W in predicting an MPA of >0.60. **Results:** In the pooled sample, median values (interquartile range) of WDDS-10 and MPA were 3 (1) and 0.20 (0.34), respectively, whereas the proportion of pregnant women with an MPA of >0.60 was 9.6%. The WDDS-10 was significantly positively associated with MPA in each survey. Although the acceptable food group consumption threshold varied between 4 and 6 food groups across surveys, the threshold of 5 showed the highest performance in the pooled sample with good sensitivity (62%), very good specificity (81%), and percentage of correctly classified individuals (79%). **Conclusions:** The WDDS-10 is a good predictor of dietary micronutrient adequacy among pregnant women aged 15–49 y in LMICs. Moreover, the threshold of 5 or more food groups for the MDD-W indicator may be extended to all women of reproductive age, regardless of their physiologic status.

Association between maternal experiences of intimate partner violence and child stunting: a secondary analysis of the Demographic Health Surveys of four South Asian countries

Lakhdir, M. P. A., S. Ambreen, S. Sameen, M. Asim, S. Batool, I. Azam, B. A.Usmani, and R. Iqbal. 2024. "Association between Maternal Experiences of Intimate Partner Violence and Child Stunting: A Secondary Analysis of the Demographic Health Surveys of Four South Asian Countries." *BMJ Open* 14 (1): e071882–82. doi.org/10.1136/bmjopen-2023-071882

Objectives: To determine the association between maternal exposure to intimate partner violence (IPV) and child stunting using the Demographic Health Survey (DHS) data comparing four South Asian countries. **Design:** A secondary analysis. **Setting:** Data from the seventh round of the DHS data of four South Asian countries; Pakistan, Nepal, India and Maldives. **Participants:** Married women of reproductive age (15–49 years) from each household were randomly selected, having at least one child less than 5 years of age for whom all anthropometric measures were available. **Outcome measure:** The exposure variable was maternal IPV including, sexual violence, physical violence or both. The outcome variable was moderate or severe stunting, measured based on the height-for-age Z-score of children aged 6–59 months old . Multiple Cox proportional regression analyses were used separately on each country's data to determine the association between maternal IPV and child stunting. **Results:** The prevalence of IPV among women ranged from 10.17% in the Maldives to 31% in India. The burden of child stunting was the lowest in the Maldives at 14.04% and the highest in Pakistan at 35.86%. The number of severely stunted children was the highest in Pakistan (16.60%), followed by India (14.79%). In India, children whose mothers were exposed to IPV showed a 7% increase in the prevalence of moderate to severe child stunting (OR 1.07; 95% CI 1.01 to 1.14). Additionally, in Nepal, severe stunting was strongly associated with the prevalence of physical IPV (OR 1.66; 95% CI 1.01 to 2.87). **Conclusion:** Our study findings suggest that maternal exposure to IPV is associated with child stunting. Further research investigating the relationship between IPV and child outcomes using improved and advanced statistical analyses can provide substantial evidence to enhance public awareness and potentially reduce the burden of child stunting in South Asian countries.

Temporary childbirth migration and maternal health care in India

Diamond-Smith, N., L. Gopalakrishnan, S. Patil, L. Fernald, P. Menon, D. Walker, and A. M. El Ayadi. 2024. "Temporary Childbirth Migration and Maternal Health Care in India." *PloS One* 19 (2): e0292802–2. doi.org/10.1371/journal.pone.0292802

Background: Women in South Asia often return to their natal home during pregnancy, for childbirth, and stay through the postpartum period—potentially impacting access to health care and health outcomes in this important period. However, this phenomenon is understudied (and not even named) in the demographic or health literature, nor do we know how it impacts health. **Objective:** The aim of this study is to measure the magnitude, timing, duration, risk factors and impact on care of this phenomenon, which we name Temporary Childbirth Migration. **Methods:** Using data from 9,033 pregnant and postpartum women collected in 2019 in two large states of India (Madhya Pradesh and Bihar) we achieve these aims using descriptive statistics and logistic regression models, combined with qualitative data from community health workers about this practice. **Results:** We find that about one third of women return to their natal home at some point in pregnancy or postpartum, mostly clustered close to the time of delivery. Younger, primiparous, and non-Hindu women were more likely to return to their natal home. Women reported that they went to their natal home because they believed that they would receive better care; this was born out by our analysis in Bihar, but not Madhya Pradesh, for prenatal care. **Conclusions:** Temporary childbirth migration is common, and contrary to expectations, did not lead to disruptions in care, but rather led to more access to care.

The role of dairy consumption in the relationship between wealth and early life physical growth in India: evidence from multiple national surveys

George, F., L. N. Rajeev, S. Bandyopadhyay, J. Baby, S. Sinha, H. S. Sachdev, A. V. Kurpad, and T. Thomas. 2024. "The Role of Dairy Consumption in the Relationship between Wealth and Early Life Physical Growth in India: Evidence from Multiple National Surveys." *BMC Public Health* 24 (1). doi.org/10.1186/s12889-023-17520-8

Introduction: Prevalence of undernutrition continues to be high in India and low household wealth is consistently associated with undernutrition. This association could be modified through improved dietary intake, including dairy consumption in young children. The beneficial effect of dairy on child growth has not been explored at a national level in India. The present analyses aimed to evaluate the direct and indirect (modifying association of household level per adult female equivalent milk and milk product consumption) associations between household wealth index on height for age (HAZ) and weight for age (WAZ) in 6-59 months old Indian children using data from of nationally representative surveys. **Methods:** Two triangulated datasets of two rounds of National Family Health Survey, (NFHS-3 and 4) and food expenditure (National Sample Survey, NSS61 and 68) surveys, were produced by statistical matching of households using Non-Iterative Bayesian Approach to Statistical Matching technique. A Directed Acyclic Graph was constructed to map the pathways in the relationship of household wealth with HAZ and WAZ based on literature. The direct association of wealth index and its indirect association through per adult female equivalent dairy consumption on HAZ and WAZ were estimated using separate path models for each round of the surveys. **Results:** Wealth index was directly associated with HAZ and WAZ in both the rounds, but the association decreased from NFHS-3 (βHAZ: 0.145; 95% CI: 0.129, 0.16) to NFHS-4 (βHAZ: 0.102; 95%CI: 0.093, 0.11). Adult female equivalent milk intake (increase of 10gm/day) was associated with higher HAZ (β_NFHS-3=0.001;95% CI: 0, 0.002; β_NFHS-4=0.002;95% CI: 0.002, 0.003) but had no association with WAZ. The indirect association of wealth with HAZ through dairy consumption was 2-fold higher in NFHS-4 compared to NFHS-3. **Conclusions:** The analysis of triangulated survey data shows that household level per-adult female equivalent dairy consumption positively modified the association between wealth index and HAZ, suggesting that regular inclusion of milk and milk products in the diets of children from households across all wealth quintiles could improve linear growth in this population.

Examining the Influence of Child Nutritional Disorders on Early Childhood Development in Bangladesh: Insights from the Multiple Indicator Cluster Survey

Khanam, S. J., and M. N. Khan. 2024. "Examining the Influence of Child Nutritional Disorders on Early Childhood Development in Bangladesh: Insights from the Multiple Indicator Cluster Survey." *Public Health Nutrition*, February, 1–21. doi.org/10.1017/S1368980024000521

Objective: The objective of this study was to explore the relationship between various forms of child nutritional disorders and early childhood development in Bangladesh. **Design:** We analyzed data from the nationally representative cross-sectional 2019 Multiple Indicator Cluster Survey. Early childhood development was evaluated using the Early Childhood Development Index (ECDI), which comprised 10 yes-or-no questions across four domains: literacy-numeracy, physical well-being, socio-emotional development, and learning abilities. Nutritional disorders (e.g. stunting, wasting, and underweight) were measured based on the World Health Organization's height and weight guidelines. To investigate the relationships between child development and nutritional disorders, we used multilevel logistic regression models. **Setting:** Bangladesh. **Participants:** Data of 9,455 children aged 3 and 4 years. **Results:** Approximately 38 % of the children analysed experienced a nutritional disorder, with stunting being the most prevalent at 28·15 %. Overall, 25·27 % did not meet expected developmental progress measured by the ECDI. Stunted children were more likely to be off track developmentally, while those without any nutritional disorder were more likely to be on track. Socio-demographic factors, including age, sex, attendance in early childhood education programme, maternal education, maternal functional difficulties, region, and income, were identified as determinants of ECDI. **Conclusions:** Childhood nutrition and socio-demographic factors significantly affect multiple developmental domains and overall ECDI among children aged 3–4 years. Prioritising policies and programmes that improve nutrition and address these determinants are crucial for fostering optimal development in children.

Factors associated with child and maternal dietary diversity in the urban areas of Bangladesh

Haque, S., M. Salman, M. S. Hossain, S. M. Saha, S. Farquhar, M. N. Hoque, N. Zaman, F. Z. Hira, and M. M. Hasan. 2023. "Factors Associated with Child and Maternal Dietary Diversity in the Urban Areas of Bangladesh." *Food Science and Nutrition,* October.doi.org/10.1002/fsn3.3755

Dietary diversity is an indicator of nutrition that has been found positively associated with diet quality, micronutrient adequacy, and improved maternal health and child growth. Due to the cultural responsibility of women in providing food at the household level, their status is very important to perform this role. Hence, this study has been conducted on the status of dietary diversity of the mother and child to understand how it relates to various factors of women in urban settings. Data were obtained from 1978 mother–child pairs living in different cities in Bangladesh. The foods taken by the women and children were categorized into 10 and 7 groups to measure women's dietary diversity (WDD) and children's dietary diversity (CDD), respectively. The study found that more than three-fourths of the mothers and half of the children had low dietary diversity. The household wealth holdings and access to resources by the women were found inadequate, while two-thirds of them had the lowest to medium level of nutritional knowledge. The binomial logistic regression model was used to measure the factors influencing WDD and CDD. The findings also indicated that children's dietary diversity was influenced by the mother's age, education, supportive attitude and behavior of husband, and access to and control over resources. While the household wealth index can enhance both child and mother's dietary variety, nutrition knowledge, dietary counseling, and access to and control over resources can improve maternal dietary diversity. This study recommends improving women's socioeconomic status by increasing their wealth and access to resources and enhancing their nutrition knowledge by providing food and nutrition counseling.

Assessing risk factors for malnutrition among women in Bangladesh and forecasting malnutrition using machine learning approaches

Turjo, E A., and M.H. Rahman. 2024. "Assessing Risk Factors for Malnutrition among Women in Bangladesh and Forecasting Malnutrition Using Machine Learning Approaches." BMC Nutrition 10 (1). doi.org/10.1186/s40795-023-00808-8

Background: This paper presents an in-depth examination of malnutrition in women in Bangladesh. Malnutrition in women is a major public health issue related to different diseases and has negative repercussions for children, such as premature birth, decreased infection resistance, and an increased risk of death. Moreover, malnutrition is a severe problem in Bangladesh. Data from the Bangladesh Demographic Health Survey (BDHS) conducted in 2017-18 was used to identify risk factors for malnourished women and to create a machine learning-based strategy to detect their nutritional status. **Methods:** A total of 17022 women participants are taken to conduct the research. All the participants are from different regions and different ages. A chi-square test with a five percent significance level is used to identify possible risk variables for malnutrition in women and six machine learning-based classifiers (Naïve Bayes, two types of Decision Tree, Logistic Regression, Random Forest, and Gradient Boosting Machine) were used to predict the malnutrition of women. The models are being evaluated using different parameters like accuracy, sensitivity, specificity, positive predictive value, negative predictive value, F1 score, and area under the curve (AUC). **Results:** Descriptive data showed that 45% of the population studied were malnourished women, and the chi-square test illustrated that all fourteen variables are significantly associated with malnutrition in women and among them, age and wealth index had the most influence on their nutritional status, while water source had the least impact. Random Forest had an accuracy of 60% and 60.2% for training and test data sets, respectively. CART and Gradient Boosting Machine also had close accuracy like Random Forest but based on other performance metrics such as kappa and F1 scores Random Forest got the highest rank among others. Also, it had the highest accuracy and F1 scores in k-fold validation along with the highest AUC (0.604). **Conclusion:** The Random Forest (RF) approach is a reasonably superior machine learning-based algorithm for forecasting women's nutritional status in Bangladesh in comparison to other ML algorithms investigated in this work. The suggested approach will aid in forecasting which women are at high susceptibility to malnutrition, hence decreasing the strain on the healthcare system.

Assessing the relationship of maternal short stature with coexisting forms of malnutrition among neonates, infants, and young children of Pakistan

Khaliq, A., S. Nambiar, Y.D. Miller, and D. Wraith. 2024. "Assessing the Relationship of Maternal Short Stature with Coexisting Forms of Malnutrition among Neonates, Infants, and Young Children of Pakistan." *Food Science & Nutrition*, January. doi.org/10.1002/fsn3.3945

Evidence from previous studies suggests a strong association between pediatric undernutrition and maternal stature. However, there's a scarcity of evidence regarding the relationship between maternal stature and pediatric coexisting forms of malnutrition (CFM). This study examined the prevalence and trends of CFM at the individual, household, and community levels, using data from the Demographic & Health Surveys (DHS) of Pakistan. Furthermore, this study assessed the association between pediatric CFM and short maternal stature while adjusting for multiple covariates. A panel cross-sectional analysis was conducted using data from the 2012–2013 and 2017–2018 Pakistan Demographic & Health Survey (PDHS). We included data from 6194 mother–child dyads aged 15–49 years and 0–59 months, respectively, while excluding data from pregnant mothers and dyads with incomplete anthropometric variables and anthropometric outliers. Across the two survey periods, our findings reveal a significant decline in pediatric malnutrition, including CFM, alongside a concurrent increase in maternal overweight/obesity. Three out of four households had either a malnourished mother, and/or a malnourished child, and/or both. Our study demonstrates that short maternal stature increased the odds of various forms of pediatric undernutrition by two-to-threefolds ($p < .041$), but we did not find an association with wasting, overweight/obesity, and nutritional paradox. This underscores the heightened vulnerability of children born to short-stature mothers to various forms of pediatric undernutrition. Addressing the high prevalence of pediatric undernutrition among children of short-stature mothers necessitates a comprehensive approach that considers an individual's nutritional status throughout their entire life cycle.

The Association Between Women's Education and Employment and Household Food Security in Afghanistan

Zhu, Y., M. R. Azami, M. Fazal, D. Khuram, L. Iannotti, G. Babulal, and J. Trani. 2024. "The Association between Women's Education and Employment and Household Food Security in Afghanistan." *The European Journal of Development Research*, January. doi.org/10.1057/s41287-023-00614-9

Food insecurity persists in Afghanistan, with 24 million Afghans lacking sufficient food in 2022. Malnourishment affects over 7 million children and mothers (WFP in Afghan Emergency. Retrieved 1.30 from https://www.wfp.org/emergencies/afghanistan-emergency). Women's rights have been severely undermined by the Taliban regime, with bans on education and employment restrictions. Using data from the 2017 Afghanistan Food Security Survey (n = 5027 households), we examined the relationship between women's education, employment, and household food security. Results indicate that households where both men and women have formal education were 52% more likely to be food secure and 50% more likely to have dietary diversity compared to a household lacking anyone with formal education. Women play a vital role in increasing household income and distributing resources towards improving dietary diversity. The rollback and censorship of women's rights under the current regime is bound to exacerbate the catastrophic rates of food insecurity, further worsening the well-being of all Afghans.

The effect of nutrition-specific and nutrition-sensitive interventions on the double burden of malnutrition in low-income and middle-income countries: a systematic review

Escher, N.A., G. C. Andrade, S. Ghosh-Jerath, C. Millett, and P. Seferidi. 2024. "The Effect of Nutrition-Specific and Nutrition-Sensitive Interventions on the Double Burden of Malnutrition in Low-Income and Middle-Income Countries: A Systematic Review." *The Lancet Global Health*, January. doi.org/10.1016/S2214-109X(23)00562-4

Background: Low-income and middle-income countries (LMICs) experiencing nutrition transition face an increasing double burden of malnutrition (DBM). WHO has urged the identification of risks and opportunities in nutrition interventions to mitigate the DBM, but robust evidence is missing. This review summarises the effect of nutrition-specific and nutrition-sensitive interventions on undernutrition and overnutrition in LMICs. **Methods:** We searched four major databases and grey literature for publications in English, French, Portuguese, and Spanish from Jan 1, 2000, to Aug 14, 2023. Eligible studies evaluated nutrition-specific or nutrition-sensitive interventions on both undernutrition and overnutrition, employing robust study designs (individually randomised, cluster randomised, and non-randomised trials; interrupted time series; controlled before–after; and prospective cohort studies). Studies were synthesised narratively, and classified as DBM-beneficial, potentially DBM-beneficial, DBM-neutral, potentially DBM-harmful, and DBM-harmful, using vote counting. This review is registered with PROSPERO (CRD42022320131). **Findings:** We identified 26 studies evaluating 20 nutrition-specific (maternal and child health [MCH] and school-based programmes) and six nutrition-sensitive (conditional cash transfers and other social policies) interventions. Seven of eight MCH interventions providing food-based or nutritional supplements indicated possible DBM-harmful effects, associated with increased maternal or child overweight. Most school-based programmes and MCH interventions that target behavioural change were considered potentially DBM-beneficial. Two studies of conditional cash transfers suggested DBM-beneficial effects in children, whereas one indicated potentially harmful effects on maternal overweight. A study on a family planning service and one on an education reform revealed possible long-term harmful effects on obesity. **Interpretation:** There is considerable scope to repurpose existing nutrition interventions to reduce the growing burden of the DBM in LMICs. In settings undergoing rapid nutrition transition, specific policy attention is required to ensure that food-based or supplement-based MCH programmes do not unintentionally increase maternal or child overweight. Consistent reporting of undernutrition and overnutrition outcomes in all nutrition interventions is essential to expand the evidence base to identify and promote interventions maximising benefits and minimising harms on the DBM.

Behavior Change Interventions to Address Unhealthy Food Consumption: A Scoping Review

Kachwaha, S., S.S. Kim, J.K. Das, S. Rasheed, S.M. Gavaravarapu, P.P. Rana, and P.Menon. 2024. "Behavior Change Interventions to Address Unhealthy Food Consumption: A Scoping Review." *Current Developments in Nutrition*, February, 102104–4. doi.org/10.1016/j.cdnut.2024.102104

High intakes of sodium, sugar, saturated fats, and trans–fats contributed to 187.7 million disability adjusted life years from noncommunicable diseases globally. Understanding of the global evidence on interventions to reduce consumption of various types of unhealthy food across diverse contexts is needed. We conducted a scoping review to examine the existing evidence on behavior change interventions (BCIs) to address unhealthy food consumption. Through a systematic search of 3 databases conducted in December 2022, 2730 records were retrieved, and 145 studies met the eligibility criteria for review. Only 19% of the studies (n = 28) were from low- and middle-income countries. The key target group for most BCIs was adults ≥20 y (n = 79). Interventions were conducted across 7 types of settings: schools (n = 52), digital (n = 30), community (n = 28), home (n = 14), health facility (n = 12), worksite (n = 6), and market (n = 3). There were 4 mutually inclusive intervention types—information, education, and communication (n = 141); food/beverage substitution (n = 10); interactive games (n = 7); and labeling/warnings at point-of-purchase (n = 3). The study outcomes included consumption of sugar-sweetened beverages (n = 74), packaged salty snacks/fast food (n = 61), sweets (n = 43), and saturated fat (n = 41). Drivers of food choice behaviors, such as knowledge, attitudes, and beliefs; motivation and expectancies; and self-efficacy were reported in 43% of studies. On the basis of reported impact of BCIs on study outcomes, more interventions targeted at adults had positive impacts compared with those targeted at children; intervention packages, including multiple information, education, and communication components also reported impacts more often than single informational interventions. Interpretation of the findings was complicated by the lack of comparability in interventions, evaluation designs, outcome measures of unhealthy food consumption, duration of interventions, and study contexts. Future studies should invest in critical yet underrepresented regions, examine behavioral determinants of unhealthy food consumption and the sustainability of behavior change, and conduct further analysis of effectiveness from experimental studies.

Do timing and frequency of antenatal care make a difference in maternal micronutrient intake and breastfeeding practices? Insights from a multi-country study in South Asia

Islam, M. J. and K. M. Zobair. 2024. "Do Timing and Frequency of Antenatal Care Make a Difference in Maternal Micronutrient Intake and Breastfeeding Practices? Insights from a Multi-Country Study in South Asia." *PLOS Global Public Health* 4 (3): e0002993–93. doi.org/10.1371/journal.pgph.0002993

Despite the established benefits of vitamins and minerals for maternal and neonatal health, global micronutrient deficiency remains a significant concern. As such, the World Health Organization advocates timely antenatal care (ANC) initiation and micronutrient supplementation for expectant mothers. This study investigates the association between ANC timing and frequency and maternal health behaviours, specifically iron-folic acid (IFA) intake, early breastfeeding initiation, and exclusive breastfeeding among married women in South Asia. By utilizing recent Demographic and Health Survey data, this study focuses on married women aged 15–49 in Bangladesh (N = 966), India (N = 89,472), and Pakistan (N = 1,005), specifically primiparous women with children aged 0–23 months living with the mother. Multivariable analysis revealed that women receiving ≥4 ANC visits were more likely to consume IFA ≥90 days compared to those with fewer visits in Bangladesh (AOR: 1.85, 95% CI [1.30, 2.63]), India (AOR: 1.87, 95% CI [1.81, 1.94]), and Pakistan (AOR: 1.92, 95% CI [1.24, 2.97]). Women receiving first ANC in the second or third trimester were less likely to consume IFC for ≥90 days compared to those with first-trimester ANC. While the ANC timing did not significantly influence early breastfeeding initiation, ANC frequency was inversely associated with delayed initiation in all countries. Breastfeeding advice during ANC visits was significantly associated with reduced odds of delayed breastfeeding initiation. Neither ANC timing nor frequency significantly predicted exclusive breastfeeding, except for breastfeeding advice in India. This study highlights the importance of ANC in maternal and child health outcomes. ANC timing and frequency, along with breastfeeding advice during ANC, notably influence maternal IFA consumption and early breastfeeding initiation. These findings underscore the need for targeted interventions during ANC visits to enhance maternal and child health practices in low- and middle-income countries.

Maternal and child nutrition services associated with nutritional knowledge and practices, India

Andersen, C.T., P.K. Chopra, N.Dave, D. Hariprasad, M.Kak, R. Pandey, D.Tanwar, and D.N. Chaudhery. 2024. "Maternal and Child Nutrition Services Associated with Nutritional Knowledge and Practices, India." *Bulletin of the World Health Organization* 102 (1): 9–21. doi.org/10.2471/BLT.22.289129

Objective: To evaluate whether maternal and child nutrition activities provided through the Indian Integrated Child Development Services scheme in India were associated with improved nutritional knowledge and practices among beneficiary women. **Methods:** We used a multistage sampling design to randomly select 4400 pregnant women or mothers of children younger than 2 years for a cross-sectional telephone survey. The respondents were beneficiaries of the scheme from across 11 Indian states. We used multivariate regression models controlling for sociodemographic factors to estimate the association between: scheme activities and nutrition messages heard; and scheme activities and nutrition practices. We also estimated the proportion of the total association with nutrition practices which was mediated by nutrition messages. **Results:** Among 110 regression models testing unique pairs of seven activities and 18 nutrition messages, 103 showed a statistically significant positive relationship (median risk ratio, RR: 1.14). For activities and nine nutrition practices, 39 out of 54 tested pairs were significantly associated (median RR: 1.16). We observed statistically significant mediation through nutrition messages for 28 out of 42 tested pairs of activities and nutrition practices. **Conclusion:** Receipt of the scheme's activities was associated with improved nutrition knowledge and practices. Improvements in practices were statistically mediated by improvements in knowledge. These findings suggest that a large-scale nutrition scheme with a strong counselling component could successfully change beneficiary behaviours.

Integrated child development service (ICDS) coverage among severe acute malnourished (SAM) children in India: A multilevel analysis based on national family health survey-5

Chakraborty, R., W. Joe, U. S. Mishra, and S. Rajpal. 2024. "Integrated Child Development Service (ICDS) Coverage among Severe Acute Malnourished (SAM) Children in India: A Multilevel Analysis Based on National Family Health Survey-5." *PLOS ONE* 19 (2): e0294706–6. doi.org/10.1371/journal.pone.0294706

Severe acute malnutrition (SAM) can be fatal for children, and potentially limit their cognitive and physical growth. The last three National Family Health Survey (NFHS) in India shows an increase in the prevalence of SAM among under-five children. Given the specific mandates under ICDS (Integrated Child Development Service) for SAM children, it is important to validate the coverage efficiency of ICDS on SAM children. This paper examines a possible association between the coverage efficiency of ICDS on SAM children. The study further aims to identify the determinants of ICDS service utilization among SAM children. We used data from the fifth round of the National Family Health Survey. Descriptive statistics was used to estimate the SAM coverage under ICDS. Multilevel Logistic Regression was used to identify the determinants of ICDS service utilization among SAM children. The burden of SAM is higher among older children (3+ age). Coverage of ICDS was more among younger children and the poorest households in the rural areas. Results from multilevel logistic regression showed that age had a significant relationship with the outcome variable. SAM children living in the rural areas had a significantly higher odds of being covered under ICDS service (OR 1.57; CI: (1.35, 1.82)) than their urban counterparts. Pregnant and lactating mothers who received ICDS services were significant determinants of SAM coverage under ICDS. There is no evidence that ICDS is more efficient in identifying and covering SAM children than non-SAM children. Despite special provisioning in place for SAM children, coverage of different ICDS services was similar to that of non-SAM children, and were in fact lower than non-SAM children for some categories. The study suggests that improving coverage of ICDS services among pregnant and lactating mothers would increase the coverage of ICDS services among SAM children.

Malnutrition among children in India: exploring the contribution of the integrated child development service scheme

Singh, S. K., Gudakesh. and D. Vishwakarma. 2024. "Malnutrition among Children in India: Exploring the Contribution of the Integrated Child Development Service Scheme." *SN Social Sciences* 4 (2) doi.org/10.1007/s43545-023-00811-7

In India, the current nutritional transition illustrates a noteworthy decline in the incidence of undernutrition among children under the age of 5 over the past decade. Decline in under-nutrition may be attributed to the various nutrition interventions. Nevertheless, the provision of nutrition supplementation under Integrated Child Development Services (ICDS) is hypothesized to contribute significantly. This study examines the factors influencing the decrease in undernutrition among children and assesses the contribution of ICDS based on data from the two rounds of the National Family Health Surveys conducted during 2005–2016. The results indicate a noteworthy reduction in the level of stunting and underweight among children. This decline was found to be positively associated with maternal nutrition, while it was negatively associated with utilization of ICDS. Decomposition results portray wealth index, caste and religion as the factors, significantly reducing undernutrition. Propensity Score Matching (PSM) portrays a substantial reduction in the estimated prevalence of stunting among those using ICDS (40%), which would have been 47% otherwise. After matching 7% difference exist in the prevalence of stunting among children using the ICDS in comparison to those who were not using the ICDS. Results indicate that the ICDS in its present form contributes to a considerable reduction in undernutrition among children, despite of selectivity bias in registration with Anganwadi centres. Therefore, the service provisions under ICDS need to be strengthening to break the detrimental cycle of undernutrition through intensification of counseling by prioritized home visits of anganwadi workers and reaching to the critical age-groups including pregnant women and lactating mothers.

The effect of the Mid-Day Meal programme on the longitudinal physical growth from childhood to adolescence in India

Gharge, S., D. Vlachopoulos, A.M. Skinner, C.A. Williams, R. R. Iniesta, and S. Unisa. 2024. "The Effect of the Mid-Day Meal Programme on the Longitudinal Physical Growth from Childhood to Adolescence in India." *PLOS Global Public Health* 4 (1): e0002742–42. doi.org/10.1371/journal.pgph.0002742

The study aims to examine the effect of the world's largest school-feeding programme, the Mid-Day Meal (MDM) programme, on the changes in the underweight prevalence among school-children in India. Data from the Indian Human Development Survey (IHDS) Rounds 1 (2004–05) and 2 (2011–12) were utilized. The sample included individual-level information of children aged 6 to 9 years in IHDS-1 who then turned 13 to 16 years in IHDS-2. The sample was categorised into four groups based on their MDM consumption history (Group 1: no MDM support in IHDS-1 and IHDS-2, Group 2: MDM support in IHDS-1, Group 3: MDM support in IHDS-2, Group 4: persistent MDM support in IHDS-1 and IHDS-2). The dependent variable was underweight status as defined by the World Health Organisation Child Growth Standards Body Mass Index for age (BMI Z-score) < -2 SD of the median. Bivariate analysis was used to examine the prevalence of underweight and establish associations between underweight status and socio-demographic characteristics. Logistic regression was performed to assess the strength of the association of socio-demographic characteristics and MDM consumption patterns with underweight across poor and non-poor asset groups. The findings suggest that early and persistent MDM support among respondents reduced the likelihood of low BMI Z-scores compared to those without MDM support. Respondents from the poor asset group who received MDM support in at least one of the two survey rounds had higher odds of being underweight in comparison with those who did not receive MDM support at all. Girls and adolescents residing in the Eastern region of India were less likely to be underweight. The study shows that the MDM programme was effective in reducing the rate of underweight among school children. However, continuous programme upscaling with a special focus on children from poor households will significantly benefit India's school-aged children.

Impact of Suaahara, an integrated nutrition programme, on maternal and child nutrition at scale in Nepal

Frongillo, E. A., S. Suresh, D. K. Thapa, K. Cunningham, P.P. Rana, R. P. Adhikari, S. Kole, B. Pun, I. Kshetri, D. P. Adhikari and R. Klemm. 2024. "Impact of Suaahara, an Integrated Nutrition Programme, on Maternal and Child Nutrition at Scale in Nepal." *Maternal and Child Nutrition*, February. doi.org/10.1111/mcn.13630

Suaahara was an innovative, complex, multi-sectoral, large-scale, nutrition programme in Nepal to increase exposure to nutrition-related information and services, improve nutrition-related knowledge and practices among pregnant women and mothers of infants and young children, and improve their nutrition. This study evaluated the effectiveness of Suaahara to improve nutrition and nutrition-related practices by comparing changes over 10 years between intervention and comparison districts. The samples of households at baseline in 2012 and endline in 2022 were 2040 and 2480, respectively, from 120 old wards. The impact was estimated using intent-to-treat regression models in which survey year, arm and their interaction were fixed effects, accounting for district clustering, with the interaction estimating differences between arms in changes over time. The intervention, relative to comparison, reduced maternal underweight by 8.43 percentage points ($p < 0.001$), consistent with improved maternal and fetal condition that was manifested as the greater length of 0.761 z-scores ($p = 0.004$) of infants 0–5.9 months. Complementary feeding practices with children between 6 and 23.9 months of age improved more in the intervention than comparison districts: child dietary diversity by 0.294 food groups ($p = 0.072$) and minimum dietary diversity by 9.51 percentage points ($p = 0.028$), feeding sick child more ($p = 0.002$) and administering oral rehydration solution and zinc for diarrhoea ($p = 0.057$) by about 17 percentage points each, and minimum meal frequency ($p = 0.004$) and minimum acceptable diet ($p = 0.022$) by about 15 percentage points each. Substantial impacts were demonstrated despite political restructuring, earthquakes, and other major challenges that Nepal and Suaahara faced and limitations in statistical power because of the reduced number of districts that then could be included in the study. Registered at clinicaltrials.gov with identifier NCT05448287.

A multi-sectoral community development intervention has a positive impact on diet quality and growth in school-age children in rural Nepal

Miller, L. C., S. Neupane, N. Joshi, and M. Lohani. 2024. "A Multi-Sectoral Community Development Intervention Has a Positive Impact on Diet Quality and Growth in School-Age Children in Rural Nepal." *Maternal and Child Nutrition* (Print), March. doi.org/10.1111/mcn.13637

Poor diet quality (diet diversity and animal-source food [ASF] consumption) during childhood negatively affects growth, development, behaviour and physiologic function in later life. Relatively less is known about the impact of poor diet on the growth of school-age children compared to children <5 years of age, especially in low/middle-income countries. A better understanding of delivery strategies for effective interventions to improve diet and hence growth in school-age children is needed. A 36-month longitudinal controlled impact evaluation in rural Nepal assessed the nutrition and growth of children <5 years of age in families assigned via community clusters to full package intervention (community development, training in nutrition [during pregnancy and for children <5 years] and livestock husbandry), partial package (training only) or control (no inputs). Concurrent data were collected prospectively (baseline plus additional four rounds) on school-age children (5–8 years at baseline) in these households; the present study analysed findings in the cohort of school-age children seen at all five study visits (n = 341). Diet quality improved more in the full package school-age children compared to those in partial package or control households. full package children consumed more ASF (β +0.40 [CI 0.07,0.73], $p < 0.05$), more diverse diets (β +0.93 [CI 0.55,1.31], $p < 0.001$) and had better head circumference z-scores (β +0.21 [CI 0.07,0.35], $p < 0.01$) than control children. In conclusion, a multi-sectoral community development intervention was associated with improvements in diet and growth of school-age children in rural Nepal even though the intervention focused on the diet of children <5 years of age. The diet and growth of school-age children can be favourably influenced by community-level interventions, even indirectly.

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When: June 12-14, 2024
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When: June 29 - July 02, 2024
Where: Chicago, USA
For more information: Click here!

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International Conference on Food Science and Human Nutrition aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Food Science and Human Nutrition. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Food Science and Human Nutrition.

When: April 11-24, 2024
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IFPRI-SOUTH ASIA REGIONAL OFFICE
NASC Complex, CG Block
Dev Prakash Shastri Road, Pusa
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IFPRI-HEADQUARTERS
1201 Eye St., NW
Washington DC 20005-3915 USA