

EDITOR'S NOTE

In this issue of Abstract Digest, we present to you a collection of articles on various aspects of nutrition, including its determinants, tools of measurement, and strategic responses through policy and program. Here are some of the highlights:

- Two studies have examined the influences of maternal depression on children's growth:
 - Based on evidence from rural India, [Nguyen and colleagues \(2018\)](#) demonstrated that maternal depressive symptom is significantly associated with both child undernutrition and development delay, calling for practical interventions to address maternal depression to simultaneously target multiple outcomes for both women and children.
 - From a birth cohort in India, [Babu and colleagues \(2018\)](#) found an association between antepartum depression and small for gestational age (SGA) babies, thus highlighting the need to explore implementation of screening, diagnostic services and evidence-based antenatal mental health services by modifying the provisions of ongoing national programs.
- [Harding and colleagues \(2018\)](#) explored the factors associated with wasting among children aged 0 to 59 months and found that the underlying determinants of wasting and stunting in South Asia are similar, therefore cost-effective interventions to prevent both stunting and wasting, and to treat severe wasting, need to be scaled up urgently without separating these two manifestations of child undernutrition.
- Using nationally representative data from the Multiple Indicator Cluster Surveys in 31 low- and middle-income countries (LMICs), [Jeong and colleagues \(2018\)](#) found links between birth registration and children's early growth and development outcomes, emphasizing that efforts to increase birth registration may be promising for promoting early childhood development in LMICs.
- From a systematic review of cohort studies and a meta-analysis, [Khalil and colleagues \(2018\)](#) demonstrated that there is a causal relation between childhood diarrhoea caused by Cryptosporidium infection and childhood growth, calling for interventions designed to prevent and effectively treat infection in children younger than five years.
- [Richter and colleagues \(2018\)](#) analysed longitudinal data from four birth cohort studies in low- and middle-income countries and found that early child growth faltering is determined by both biological and social factors, underscoring the need for interventions that address both biological and social determinants over the long and short term.
- Using country-level data and an ecological study design, [Harding and colleagues \(2018\)](#) explored the global associations between women's educational attainment and the micronutrient status of children, women and the general population, drawing policy-relevant connections between formal education, anemia and micronutrient status globally.
- [Knowles and colleagues \(2018\)](#) conducted regression analyses of data from stratified, cluster sample, and household iodine surveys in four countries to identify factors associated with household access to adequately iodised salt and concluded that improving household access to refined iodised salt in sealed packaging would improve iodine intake from household salt.
- [Dror and Allen \(2018\)](#) conducted a review of current knowledge and summarized how nutrient concentrations change through the initiation and progression of lactation, and how

modifiable and nonmodifiable factors, including interventions, influence breast milk nutrient concentrations.

- Based on the review of current knowledge on methods used for analyzing water- and fat-soluble vitamins as well as iron, copper, zinc, iodine, and selenium in human milk and their different forms in milk, the tools available for quality control and assurance, and guidance for preanalytical considerations, [Hampel and colleagues \(2018\)](#) have recommended preferred methodologic approaches for analysis of specific milk micronutrients.
- The following three studies have looked at the tools of nutrition related measurements:
 - [Grellety and Golden \(2018\)](#) analysed the statistical distributions of the derived anthropometric parameters from 1843 surveys to assess the scale of malnutrition, conducted by 19 agencies between 1986 and 2015, to determine if the changes in methodology over recent decades have resulted in higher quality surveys.
 - A study by [Das and colleagues \(2018\)](#) looked at the validity of mid-upper arm circumference (MUAC) as an indicator of low BMI in population screening among adult slum dwellers in eastern India for undernutrition and supported the validity of the WHO-recommended MUAC cut-offs for adults.
 - [Taneja and colleagues \(2018\)](#) assessed the performance of Mid Upper Arm Circumference (MUAC) as a predictor of mortality in children aged 6–59 months from Delhi, India, one year after their initial MUAC measurements were taken, and concluded that MUAC is a significant predictor of subsequent mortality in under-five children.
- [Hambidge and Krebs \(2018\)](#) reviewed the importance of maternal nutrition and strategies for optimizing maternal nutrition to promote infant development and presented an impelling rationale for improving the maternal and in-utero environment of low resource populations to achieve improved fetal and post-natal growth and development.
- [Sharma and colleagues \(2018\)](#) assessed the effectiveness of community intervention model to improve the maternal healthcare service uptake of young married couples (15-24 years) in rural India.
- In a commentary, following the 30th anniversary of the launch of global Safe Motherhood Initiative, [Stanton and colleagues \(2018\)](#) have highlighted that many countries will need to double, or more than double, their current annual rate of reduction of maternal mortality to ensure sufficient progress toward national targets and the global Sustainable Development Goals.
- A study by [Kim and colleagues \(2018\)](#) estimated the extent to which basic socioeconomic factors contribute to variation in body-mass index (BMI) across populations in 58 low-income and middle-income countries (LMICs), using data from the cross-sectional Demographic and Health Surveys (2005–16) for 15–49 year old women with complete data for anthropometric measures.
- [Caleyachetty and colleagues \(2018\)](#) quantified the magnitude of the double burden of malnutrition among adolescents in low- and middle-income countries (LMICs) and the associated macrolevel contextual factors and called for context-sensitive implementation and scale-up of interventions and policies to address the double burden of malnutrition.
- [Mozaffarian and colleagues \(2018\)](#) reviewed the strategies that governments can use to improve nutrition and health, taking a closer look at the barriers and opportunities for healthier eating.
- On the basis of Cochrane and non-Cochrane systematic reviews aiming to contextualize the evidence on anaemia, and a trend analysis of existing data from the national surveys, [Sinha and colleagues \(2018\)](#) have presented research priorities in the field of anaemia in India.

Enjoy reading!

PEER-REVIEWED

Maternal depressive symptoms are negatively associated with child growth and development: Evidence from rural India

Nguyen, P.H., J. Friedman, M. Kak, P. Menon, and H. Alderman. 2018. *Maternal & Child Nutrition*. doi: <https://onlinelibrary.wiley.com/doi/full/10.1111/mcn.12621>.

Maternal depression has been suggested as a risk factor for both poor child growth and development in many low- and middle-income countries, but the validity of many studies is hindered by small sample sizes, varying cut-offs used in depression diagnostics, and incomplete control of confounding factors. This study examines the association between maternal depressive symptoms (MDSs) and child physical growth and cognitive development in Madhya Pradesh, India, where poverty, malnutrition, and poor mental health coexist. Data were from a baseline household survey (n = 2,934) of a randomized controlled trial assessing an early childhood development programme. Multivariate linear and logistic regression analyses were conducted, adjusting for socio-economic factors to avoid confounding the association of mental health and child outcomes. MDS (measured using the Center for Epidemiologic Studies Short Depression Scale) was categorized as low, medium, and high in 47%, 42%, and 10% of mothers, respectively. The prevalence of child developmental delay ranged from 16% to 27% for various development domains. Compared with children of mothers with low MDS, those of high MDS mothers had lower height-for-age, weight-for-age, and weight-for-height z-scores (0.22, 0.21, and 0.15, respectively), a higher rate of stunting and underweight (~1.5 times), and higher rate of developmental delay (partial adjusted odds ratio ranged from 1.3–1.8 for different development domains and fully adjusted odds ratio = 1.4 for fine motor). Our results—that MDS is significantly associated with both child undernutrition and development delay—add to the call for practical interventions to address maternal depression to simultaneously address multiple outcomes for both women and children.

Key messages

- Maternal depressive symptoms are significantly associated with child undernutrition in India, with possible mechanisms operating through poorer home environment, less engagement with children, lower use of health services, and suboptimal complementary feeding practices.
- Depressive symptoms also are associated with development delay among children <4 years, although the strength of the association depends on the domain of development considered.
- As poverty, poor mental health, and undernutrition coexist in India, it is crucial to consider maternal depression in endeavours to simultaneously address multiple outcomes for both women and children.

Small for gestational age babies and depressive symptoms of mothers during pregnancy: Results from a birth cohort in India

Babu, G.R., G.V.S. Murthy, Y. Reddy, R. Deepa, A. Yamuna, S. Prafulla, M. Rathnaiah, and S. Kinra. 2018. *Wellcome Open Research* 3(76). doi: <https://wellcomeopenresearch.org/articles/3-76>.

Background: More than one million babies are born with Low birthweight (LBW) in India every year, often afflicting disadvantaged families. Earlier studies on LBW in India have mostly focused on addressing poverty, nutritional status, and obstetric factors for LBW babies, comprising of preterm babies (<37 weeks) or small for gestational age (SGA) or both. We aim to find the association

between antepartum depression and SGA in a public hospital. **Methods:** Pregnant women with gestational age between 14 to 32 weeks were recruited. The Edinburgh Postnatal Depression Scale (EPDS) was administered to assess depression. Newborn anthropometry was performed soon after delivery. Birth weight less than 10 percentile were classified as SGA, between 10 to 90th percentile was appropriate for gestational age (AGA), and greater than 90th percentile was large for gestational age (LGA). **Results:** We found that 16.51% (108) of the antenatal mothers had depressive symptoms (EPDS score >11). The women with depressive symptoms delivered a greater proportion of SGA babies (21.3 v/s 15.8) and LGA (9.3 v/s 3.3) compared to women with no symptoms. The odds of women giving birth to a child with SGA were twice as high for women with EPDS scores >11 (adjusted OR = 2.18; 95% CI = 1.23 – 3.87) compared to the women with EPDS scores of ≤11. In terms of Area under curve (AUC), EPDS 11 cut off (AUC: 0.533) narrowly outperformed EPDS 12 cut-off (AUC: 0.4738), which in turn was better than EPDS 13 cut off (AUC: 0.4687) for screening depression in mothers. **Conclusions:** We have demonstrated the usefulness of the 10-item EPDS screening tool in screening for symptoms of antenatal depression. There is a need to explore implementation of screening, diagnostic services and evidence-based antenatal mental health services by modifying the provisions of ongoing national programs.

Factors associated with wasting among children under five years old in South Asia: Implications for action

Harding, K.L., V.M. Aguayo, and P. Webb. 2018. *PLoS One* 13(7):e0198749. doi:

10.1371/journal.pone.0198749.

<https://www.ncbi.nlm.nih.gov/pubmed/29969457>

South Asia continues to carry the greatest share and number of wasted children worldwide. Understanding the determinants of wasting is important as policymakers renew efforts to tackle this persistent public health and development problem. Using data from national surveys in Bangladesh, India, the Maldives, Nepal, Pakistan and Afghanistan, this analysis explores factors associated with wasting among children aged 0 to 59 months (n = 252,797). We conducted multivariate mixed logistic regression and backwards stepwise methods to identify parsimonious models for each country separately (all p values <0.05). Younger children (0 to 5 months), and those whose mothers had a low body mass index (<18.5 kg/m²) had greater odds of being wasted in all countries. Later birth order, being male, maternal illiteracy, short maternal stature, lack of improved water source, and household poverty were also associated with wasting in various countries, but not systematically in all. Seasonality was also not consistently associated with wasting in the final models. These findings suggest that pre-conception (adolescence), pregnancy and early postpartum, represent windows of opportunity for tackling child wasting, not only stunting. Our analysis suggests that the underlying determinants of wasting and stunting in South Asia are similar, but not universal across geographies. Cost-effective interventions to prevent both stunting and wasting, and to treat severe wasting, need to be scaled up urgently. Separating these two manifestations of child undernutrition in conceptual and programmatic terms may unnecessarily impair progress to reach the Sustainable Development Goals targets aimed at addressing both child stunting and wasting.

Associations between birth registration and early child growth and development: evidence from 31 low- and middle-income countries

Jeong, J., A. Bhatia, and G. Fink. 2018. *BMC Public Health* 18(673).

<https://doi.org/10.1186/s12889-018-5598-z>

Background: Lack of legal identification documents can impose major challenges for children in low- and middle-income countries (LMICs). The aim of this study was to investigate the association between not having a birth certificate and young children's physical growth and developmental outcomes in LMICs. **Methods:** We combined nationally representative data from the Multiple Indicator Cluster Surveys in 31 LMICs. For our measure of birth registration, primary caregivers reported on whether the child had a birth certificate. Early child outcome measures focused on height-for-age z-scores (HAZ), weight-for-age z-scores (WAZ), weight-for-height z-scores (WHZ), and standardized scores of the Early Childhood Development Index (ECDI) for a subsample of children aged 36–59 months. We used linear regression models with country fixed effects to estimate the relationship between birth registration and child outcomes. In fully adjusted models, we controlled for a variety of child, caregiver, household, and access to child services covariates, including cluster-level fixed effects. **Results:** In the total sample, 34.7% of children aged 0–59 months did not possess a birth certificate. After controlling for covariates, not owning a birth certificate was associated with lower HAZ ($\beta = -0.18$; 95% CI: -0.23, -0.14), WAZ ($\beta = -0.10$, 95% CI: -0.13, -0.07), and ECDI z-scores ($\beta = -0.10$; 95% CI: -0.13, -0.07) among children aged 36–59 months. **Conclusion:** Our findings document links between birth registration and children's early growth and development outcomes. Efforts to increase birth registration may be promising for promoting early childhood development in LMICs.

Morbidity, mortality, and long-term consequences associated with diarrhoea from Cryptosporidium infection in children younger than 5 years: a meta-analysis study

Khalil, I.A., C. Troeger, P.C. Rao, B.F. Blacker, A. Brown, T.G. Brewer, D.V. Colombara, E.L. De Hostos, C. Engmann, R.L. Guerrant, R. Haque, E.R. Houpt, G. Kang, P.S. Korpe, K.L. Kotloff, A.A.M. Lima, W.A. Petri Jr, J.A. Platts-Mills, D.A. Shultz, M.H. Forouzanfar, S.I. Hay, R.C. Reiner Jr, and A.H. Mokdad. 2018. *Lancet Global Health* 6(7): e758–68.

[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30283-3/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30283-3/fulltext)

Background: The protozoan *Cryptosporidium* is a leading cause of diarrhoea morbidity and mortality in children younger than 5 years. However, the true global burden of *Cryptosporidium* infection in children younger than 5 years might have been underestimated in previous quantifications because it only took account of the acute effects of diarrhoea. We aimed to demonstrate whether there is a causal relation between *Cryptosporidium* and childhood growth and, if so, to quantify the associated additional burden. **Methods:** The Global Burden of Diseases, Injuries, and Risk Factors study (GBD) 2016 was a systematic and scientific effort to quantify the morbidity and mortality associated with more than 300 causes of death and disability, including diarrhoea caused by *Cryptosporidium* infection. We supplemented estimates on the burden of *Cryptosporidium* in GBD 2016 with findings from a systematic review of published and unpublished cohort studies and a meta-analysis of the effect of childhood diarrhoea caused by *Cryptosporidium* infection on physical growth. **Findings:** In 2016, *Cryptosporidium* infection was the fifth leading diarrhoeal aetiology in children younger than 5 years, and acute infection caused more than 48000 deaths (95% uncertainty interval [UI] 24600–81900) and more than 4.2 million disability-adjusted life-years lost (95% UI 2.2 million–7.2 million). We identified seven data sources from the scientific literature and six individual-level data sources describing the relation between *Cryptosporidium* and childhood growth. Each episode of diarrhoea caused by *Cryptosporidium* infection was associated with a decrease in height-for-age Z score (0.049, 95% CI 0.014–0.080), weight-for-age Z score (0.095, 0.055–0.134), and weight-for-height Z score (0.126, 0.057–0.194). We estimated that diarrhoea from *Cryptosporidium* infection caused an

additional 7.85 million disability-adjusted life-years (95% UI 5.42 million–10.11 million) after we accounted for its effect on growth faltering—153% more than that estimated from acute effects alone. **Interpretation:** Our findings show that the substantial short-term burden of diarrhoea from *Cryptosporidium* infection on childhood growth and wellbeing is an underestimate of the true burden. Interventions designed to prevent and effectively treat infection in children younger than 5 years will have enormous public health and social development impacts.

Comparative Models of Biological and Social Pathways to Predict Child Growth through Age 2 Years from Birth Cohorts in Brazil, India, the Philippines, and South Africa

Richter, L.M., F.M. Orkin, G.D. Roman, D.L. Dahly, B.L. Horta, S.K. Bhargava, S.A. Norris, A.D. Stein, and COHORTS investigators. 2018. *The Journal of Nutrition* 148(8): 1364–1371.

<https://doi.org/10.1093/jn/nxy101>

Background: Early growth faltering accounts for one-third of child deaths, and adversely impacts the health and human capital of surviving children. Social as well as biological factors contribute to growth faltering, but their relative strength and interrelations in different contexts have not been fully described. **Objective:** The aim of this study was to use structural equation modelling to explore social and biological multidetermination of child height at age 2 y in longitudinal data from 4 birth cohort studies in low- and middle-income countries. **Methods:** We analyzed data from 13,824 participants in birth cohort studies in Brazil, India, the Philippines, and South Africa. We used exploratory structural equation models, with height-for-age at 24 mo as the outcome to derive factors, and path analysis to estimate relations among a wide set of social and biological variables common to the 4 sites. **Results:** The prevalence of stunting at 24 mo ranged from 14.0% in Brazil to 67.7% in the Philippines. Maternal height and birthweight were strongly predictive of height-for-age at 24 mo in all 4 sites (all P values <0.001). Three social-environmental factors, which we characterized as “child circumstances,” “family socioeconomic status,” and “community facilities,” were identified in all sites. Each social-environmental factor was also strongly predictive of height-for-age at 24 mo (all P values <0.001), with some relations partly mediated through birthweight. The biological pathways accounted for 59% of the total explained variance and the social-environmental pathways accounted for 41%. The resulting path coefficients were broadly similar across the 4 sites. **Conclusions:** Early child growth faltering is determined by both biological and social factors. Maternal height, itself a marker of intergenerational deprivation, strongly influences child height at 2 y, including indirect effects through birthweight and social factors. However, concurrent social factors, many of which are modifiable, directly and indirectly contribute to child growth. This study highlights opportunities for interventions that address both biological and social determinants over the long and short term.

Education and micronutrient deficiencies: an ecological study exploring interactions between women’s schooling and children’s micronutrient status

Harding, K.L., V.M. Aguayo, W.A. Masters, and P. Webb. 2018. *BMC Public Health* 18: 470.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5894221/>

Background: Formal education can be a nutrition-sensitive intervention that supports the scale-up and impact of nutrition-specific actions. Maternal education has long been linked to child survival, growth, and development while adult earnings and nutrition are tied to years in school as a child. However, less is known about the relationship between maternal education and the micronutrient

status of children, women and the general population. **Methods:** Using country-level data and an ecological study design, we explored the global associations between women's educational attainment and: a) anemia and vitamin A deficiency (VAD) in children aged 6–59 months; b) anemia in non-pregnant women; and c) zinc deficiency, urinary iodine excretion (UIE), and the proportion of infants protected against iodine deficiency in the general population. Cross-sectional relationships (2005–2013) were assessed using linear regression models. **Results:** Percentage of women without schooling was negatively associated with all outcomes. Number of years of schooling among women was positively associated with all outcomes except for UIE and the proportion of infants protected against iodine deficiency. Income level was a significant effect modifier of the effect of years of women's schooling on child anemia as well as of the proportion of women without formal education on zinc deficiency in the population. The relationship was strongest in low-income countries for child anemia, and was not significant in upper middle-income countries. For zinc deficiency, the relationship was not significant in low or lower middle income countries, which may suggest that a minimum threshold of resources needs to be reached before education can influence zinc status. **Conclusions:** While relationships between maternal schooling and micronutrient outcomes vary around the globe, more schooling is generally linked to lower rates of deficiency. These findings draw policy-relevant connections between formal education and anemia and micronutrient status globally. It is necessary to examine the mechanisms through which this relationship may be working at both household and country level.

Regression Analysis to Identify Factors Associated with Household Salt Iodine Content at the Sub-National Level in Bangladesh, India, Ghana and Senegal

Knowles, J., R. Kupka, S. Dumble, G.S. Garrett, C.S. Pandav, K. Yadav, B. Nahar, N.K. Touré, E.F. Amoahful, and J. Gorstein. 2018. *Nutrients* 10(4): E508. doi: 10.3390/nu10040508.
<https://www.ncbi.nlm.nih.gov/pubmed/29671774>

Regression analyses of data from stratified, cluster sample, household iodine surveys in Bangladesh, India, Ghana and Senegal were conducted to identify factors associated with household access to adequately iodised salt. For all countries, in single variable analyses, household salt iodine was significantly different ($p < 0.05$) between strata (geographic areas with representative data, defined by survey design), and significantly higher ($p < 0.05$) among households: with better living standard scores, where the respondent knew about iodised salt and/or looked for iodised salt at purchase, using salt bought in a sealed package, or using refined grain salt. Other country-level associations were also found. Multiple variable analyses showed a significant association between salt iodine and strata ($p < 0.001$) in India, Ghana and Senegal and that salt grain type was significantly associated with estimated iodine content in all countries ($p < 0.001$). Salt iodine relative to the reference (coarse salt) ranged from 1.3 (95% CI 1.2, 1.5) times higher for fine salt in Senegal to 3.6 (95% CI 2.6, 4.9) times higher for washed and 6.5 (95% CI 4.9, 8.8) times higher for refined salt in India. Sub-national data are required to monitor equity of access to adequately iodised salt. Improving household access to refined iodised salt in sealed packaging, would improve iodine intake from household salt in all four countries in this analysis, particularly in areas where there is significant small-scale salt production.

Overview of Nutrients in Human Milk

Dror, D.K., and L.H. Allen. 2018. *Advances in Nutrition* 9(suppl_1): 278S–294S.
<https://doi.org/10.1093/advances/nmy022>

The WHO recommends exclusive breastfeeding for the first 6 mo of life to promote optimal infant health and development. Understanding the micro- and macronutrient concentrations of human milk and how each nutrient fluctuates with lactational stage, maternal factors, and supplementation is imperative for supporting good breastfeeding practices. Where maternal undernutrition compromises human milk quality, a thorough awareness of the effectiveness of interventions can direct efforts to achieve both maternal and infant nutrient sufficiency. This review of current knowledge covers trends in nutrient concentrations over the course of lactation and describes the influence of maternal intake, status, supplementation, and other factors on human milk concentrations of each nutrient.

Micronutrients in Human Milk: Analytical Methods

Hampel, D., D.K. Dror, and L.H. Allen. 2018. *Advances in Nutrition* 9(suppl_1): 313S–331S.
<https://doi-org.ifpri.idm.oclc.org/10.1093/advances/nmy017>

Exclusive breastfeeding is recommended by the WHO for the first 6 mo of life because human milk protects against gastrointestinal infections and supplies balanced and adequate nutrient contents to the infant. However, reliable data on micronutrient concentrations in human milk are sparse, especially because some micronutrients are affected by maternal diet. Microbiological and competitive protein-binding assays, nuclear magnetic resonance or inductively coupled plasma spectroscopy, and chromatographic analyses are among the methods that have been applied to human-milk micronutrient analysis. However, the validation or evaluation of analytical methods in terms of their suitability for the complex human-milk matrix has been commonly ignored in reports, even though the human-milk matrix differs vastly from blood, plasma, or urine matrixes. Thus, information on the validity, accuracy, and sensitivity of the methods is essential for the estimation of infant and maternal intake requirements to support and maintain adequate milk micronutrient concentrations for healthy infant growth and development. In this review, we summarize current knowledge on methods used for analyzing water- and fat-soluble vitamins as well as iron, copper, zinc, iodine, and selenium in human milk and their different forms in milk; the tools available for quality control and assurance; and guidance for preanalytical considerations. Finally, we recommend preferred methodologic approaches for analysis of specific milk micronutrients.

Change in quality of malnutrition surveys between 1986 and 2015

Grellety, E., and M.H. Golden. 2018. *Emerging Themes in Epidemiology* 15(8).
<https://doi.org/10.1186/s12982-018-0075-9>

Background: Representative surveys collecting weight, height and MUAC are used to estimate the prevalence of acute malnutrition. The results are then used to assess the scale of malnutrition in a population and type of nutritional intervention required. There have been changes in methodology over recent decades; the objective of this study was to determine if these have resulted in higher quality surveys. **Methods:** In order to examine the change in reliability of such surveys we have analysed the statistical distributions of the derived anthropometric parameters from 1843 surveys conducted by 19 agencies between 1986 and 2015. **Results:** With the introduction of standardised guidelines and software by 2003 and their more general application from 2007 the mean standard deviation, kurtosis and skewness of the parameters used to assess nutritional status have each moved to now approximate the distribution of the WHO standards when the exclusion of outliers

from analysis is based upon SMART flagging procedure. Where WHO flags, that only exclude data incompatible with life, are used the quality of anthropometric surveys has improved and the results now approach those seen with SMART flags and the WHO standards distribution. Agencies vary in their uptake and adherence to standard guidelines. Those agencies that fully implement the guidelines achieve the most consistently reliable results. **Conclusions:** Standard methods should be universally used to produce reliable data and tests of data quality and SMART type flagging procedures should be applied and reported to ensure that the data are credible and therefore inform appropriate intervention. Use of SMART guidelines has coincided with reliable anthropometric data since 2007.

The validity of mid-upper arm circumference as an indicator of low BMI in population screening for undernutrition: a study among adult slum dwellers in eastern India

Das, P., A. Khatun, K. Bose, and R. Chakraborty. 2018. *Public Health Nutrition*. doi: <https://doi.org/10.1017/S1368980018001301>

Objective: To explore the possibility for a statistically appropriate value of mid-upper arm circumference (MUAC) to identify the state of severe undernutrition, based on very low BMI, among adult Indian slum dwellers. **Design:** Cross-sectional study on adults. Height and MUAC were recorded and BMI was computed. Chronic energy deficiency (CED) was determined using the WHO international guidelines as BMI < 18.5 kg/m² and normal as BMI ≥ 18.5 kg/m². Besides calculating mean, sd and 25th, 50th and 75th percentile values, multiple linear regression analysis was undertaken to assess the associations between age, MUAC and BMI. Receiver-operating characteristic curve analysis was performed to determine the best MUAC cut-off to identify CED status. The χ^2 test was used to assess significance of the difference in CED prevalence across MUAC categories. **Setting:** An urban slum in Midnapore town, West Bengal State, India. **Subjects:** Male (n 467) and female (n 488) Indian slum dwellers. **Results:** MUAC of 22.7 and 21.9 cm, respectively, in males and females were the best cut-off points to differentiate CED from non-CED. **Conclusions:** Results supported the validity of the WHO-recommended MUAC cut-offs for adults. There is still a need to establish statistically appropriate MUAC cut-offs to predict undernutrition and morbidity.

Mid upper arm circumference as a predictor of risk of mortality in children in a low resource setting in India

Taneja, S., T. Rongsen-Chandola, S.B. Mohan, S. Mazumder, N. Bhandari, J. Kaur, N. Arya, R. Chowdhury, J.C. Martines, R. Bahl, and M.K. Bhan. 2018. *PLoS One*. doi: <https://doi.org/10.1371/journal.pone.0197832>

Objective: In this secondary analysis of data from an intervention trial, we assessed the performance of Mid Upper Arm Circumference (MUAC) as a predictor of mortality in children aged 6–59 months from Delhi, India, one year after their initial MUAC measurements were taken. Additionally, we assessed MUAC as an absolute value and MUAC z-scores as predictors of risk of mortality. **Methods:** In the trial, children were screened using MUAC prior to referral to the study clinic. These children were revisited a year later to ascertain their vital status. Baseline MUAC and MUAC z-scores were used to categorize children as severely (MUAC < 115 mm, MUAC z-score < -3SD) or moderately (MUAC 115 to < 125 mm, MUAC z-score < -2SD) malnourished. The proportion of malnutrition, risk of mortality, relative risk estimates, positive predictive value and area under the curve (AUC) by MUAC and MUAC z-scores were calculated. **Results:** In the resurvey, the first 36159 children of the 48635 in

the initial survey were contacted. Of these, vital status of 34060 (94.2%) was available. The proportion of severe malnutrition by MUAC (<115 mm) was 0.5% with an associated mortality of 4.7% over a one year period and an attributable mortality of 13% while the proportion of the severe malnutrition by MUAC z-score (<-3SD) was 0.9% with an associated mortality of 2.2%. **Conclusions:** MUAC is a significant predictor of subsequent mortality in under-five children. In settings where height measurement is not feasible, MUAC can be used as a screening tool for identifying severely malnourished children for management.

Strategies for optimizing maternal nutrition to promote infant development

Hambidge, K.M., and N.F. Krebs. 2018. *Reproductive Health* 15(Suppl 1): 87.

<https://doi.org/10.1186/s12978-018-0534-3>

Background: The growing appreciation of the multi-faceted importance of optimal maternal nutrition to the health and development of the infant and young child is tempered by incompletely resolved strategies for combatting challenges. **Objective:** To review the importance of maternal nutrition and strategies being employed to optimize outcomes. **Methods:** Selected data from recent literature with special focus on rationale for and currently published results of maternal nutrition supplements, including lipid based nutrition supplements. **Results:** 1) An impelling rationale for improving the maternal and in utero environment of low resource populations has emerged to achieve improved fetal and post-natal growth and development. 2) Based partly on population increases in adult height over one-two generations, much can be achieved by reducing poverty. 3) Maternal, newborn and infant characteristics associated with low resource environments include evidence of undernutrition, manifested by underweight and impaired linear growth. 4) Apart from broad public health and educational initiatives, to date, most specific efforts to improve fetal growth and development have included maternal nutrition interventions during gestation. 5) The relatively limited but real benefits of both iron/folic acid (IFA) and multiple micronutrient (MMN) maternal supplements during gestation have now been reasonably defined. 6) Recent investigations of a maternal lipid-based primarily micronutrient supplement (LNS) have not demonstrated a consistent benefit beyond MMN alone. 7) However, effects of both MMN and LNS appear to be enhanced by commencing early in gestation. **Conclusions:** Poor maternal nutritional status is one of a very few specific factors in the human that not only contributes to impaired fetal and early post-natal growth but for which maternal interventions have demonstrated improved in utero development, documented primarily by both improvements in low birth weights and by partial corrections of impaired birth length. A clearer definition of the benefits achievable by interventions specifically focused on correcting maternal nutrition deficits should not be limited to improvements in the quality of maternal nutrition supplements, but on the cumulative quantity and timing of interventions (also recognizing the heterogeneity between populations). Finally, in an ideal world these steps are only a prelude to improvements in the total environment in which optimal nutrition and other health determinants can be achieved.

Effectiveness of Community Intervention Program to Improve Maternal Healthcare Services Uptake among Young Married Women in Rural India

Sharma, P., R. Patel, J. Behera, S.D. Samanta, and S. Mehra. 2018. *Journal of Women's Health Care* 7(3). doi: 10.4172/2167-0420.1000432.

<https://www.omicsonline.org/open-access/effectiveness-of-community-intervention-program-to-improve-maternal-healthcare-services-uptake-among-young-married-women-in-rural-2167-0420-1000432-101653.html>

Background: The uptake of maternal healthcare services by young women in rural India is limited. This study aims to assess the effectiveness of community intervention model to improve the maternal healthcare service uptake of young married couples (15-24 years) in rural India. A three year project was carried out to reach young married women through a multi-pronged community intervention involving sensitizing family members, community mobilization, and capacity building of frontline health functionaries. **Methods:** The study was conducted among the young married couples aged 15-25 years in states of Uttar Pradesh and Rajasthan of India. A quasi-experimental evaluation design was adopted for this study. Two rounds of cross-sectional surveys at baseline and end line were carried out at both intervention and control sites. Net impact of intervention (Difference-in-Difference and multivariate regression) on key outcomes was assessed adjusting for control variables. Composite maternal healthcare uptake score significantly increased in intervention area compared to control area. **Results:** Women who were able to discuss about delivery care with family, were five times more likely to go for institutional delivery, also the utilization of maternal health care services was higher among these women ($\beta=1.58$). Likelihood of uptake for more than three visits for antenatal care (3+ANC) service indicated three times ($OR=3.14$, $p<0.001$) increase in intervention area than those in control area. Regression result on composite maternal health care uptake score significantly increased by 2.5 ($\beta=2.23$, $p<0.001$) in intervention area compared to control area. **Conclusion:** This study demonstrated that the community intervention to foster enabling environment was effective in improving the awareness and uptake of maternal healthcare services.

Beyond the Safe Motherhood Initiative: Accelerated Action Urgently Needed to End Preventable Maternal Mortality

Stanton, M.E., B.E. Kwast, T. Shaver, B. McCallon, and M. Koblinsky. 2018. *Global Health: Science and Practice*. doi: <https://doi.org/10.9745/GHSP-D-18-00100>.

Many countries will need to double, or more than double, their current annual rate of reduction of maternal mortality to ensure sufficient progress toward national targets and the global Sustainable Development Goals. Dedication to the principles and actions of quality, equity, dignity, social justice, and human rights are key.

Contribution of socioeconomic factors to the variation in body-mass index in 58 low-income and middle-income countries: an econometric analysis of multilevel data

Kim, R., I. Kawachi, B.A. Coull, and S. V. Subramanian. 2018. *Lancet Global Health* 6(7): E777-E786. [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(18\)30232-8/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30232-8/fulltext)

Background: Most epidemiological studies have not simultaneously quantified variance in health within and between populations. We aimed to estimate the extent to which basic socioeconomic factors contribute to variation in body-mass index (BMI) across different populations. **Methods:** We pooled data from the cross-sectional Demographic and Health Surveys (2005–16) for 15–49 year old women with complete data for anthropometric measures in 58 low-income and middle-income countries (LMICs). We compared estimates from multilevel variance component models for BMI

before and after adjusting for age and socioeconomic factors (place of residence, education, household wealth, and marital status). The hierarchical structure of the sample included three levels with women at level 1, communities at level 2, and countries at level 3. The primary outcome was BMI. We did a sensitivity analysis using the 2002–03 World Health Surveys. **Findings:** Of 1212 758 women nested within 64764 communities and 58 countries, we found that most unexplained variation for BMI was attributed to between-individual differences (80%) and the remaining was between-population differences (14% for countries and 6% for communities). Socioeconomic factors explained a large proportion of between-population variance in BMI (14.8% for countries and 47.1% for communities), but only about 2% of interindividual variance. In country-specific models, we found substantial variation in the magnitude of between individual differences (variance estimates ranging from 7.6 to 31.4, or 86.0–98.6% of the total variation) and the proportion explained by socioeconomic factors (0.1–6.4%). The disproportionately large unexplained between individual variance in BMI was consistently found in additional analyses including more comprehensive set of predictor variables, both men and women, and populations from low-income and high-income countries. **Interpretation:** Our findings on variance decomposition in BMI and explanation by socioeconomic factors at population and individual levels indicate that inferential questions that target within and between populations are importantly inter-related and should be considered simultaneously.

The double burden of malnutrition among adolescents: analysis of data from the Global School-Based Student Health and Health Behavior in School-Aged Children surveys in 57 low- and middle-income countries

Caleyachetty, R., G.N. Thomas, A.P. Kengne, J.B. Echouffo-Tcheugui, S. Schilsky, J. Khodabocus, and R. Uauy. 2018. *The American Journal of Clinical Nutrition* 108(2): 414-424.

<https://doi.org/10.1093/ajcn/nqy105>

Background: Adults and young children in countries experiencing the nutrition transition are known to be affected simultaneously by undernutrition and overnutrition. Adolescence is a critical period for growth and development. Yet, it is unknown to what extent this double burden of malnutrition affects adolescents in low- and middle-income countries (LMICs) and the macrolevel contextual factors associated with the double burden of malnutrition. **Objective:** The aim was to quantify the magnitude of the double burden of malnutrition among adolescents and to examine the potential sources of heterogeneity in prevalence estimates across LMICs. **Design:** We used individual-participant data from the Global School-Based Student Health and Health Behavior in School-Aged Children surveys conducted in 57 LMICs between 2003 and 2013, comprising 129,276 adolescents aged 12–15 y. Pooled estimates of stunting, thinness, or both; overweight or obesity; and concurrent stunting and overweight or obesity were calculated overall, by regions, and stratified by sex, with random-effects meta-analysis. Guided by UNICEF's conceptual framework for child malnutrition, we used ecological linear regression models to examine the association between macrolevel contextual factors (internal conflict, lack of democracy, gross domestic product, food insecurity, urbanization, and survey year) and stunting, thinness, and overweight and obesity prevalence, respectively. **Results:** The prevalence of stunting was 10.2% (95% CI: 8.3%, 12.2%) and of thinness was 5.5% (95% CI: 4.3%, 6.9%). The prevalence of overweight or obesity was 21.4% (95% CI: 18.6%, 24.2%). Between 38.4% and 58.7% of the variance in adolescent malnutrition was explained by macrolevel contextual factors. The prevalence of concurrent stunting and overweight or obesity was 2.0% (95% CI: 1.7%, 2.5%). **Conclusions:** The double burden of malnutrition among adolescents in LMICs is common. Context-sensitive implementation and scale-up of interventions and policies for the double burden

of malnutrition are needed to achieve the Sustainable Development Goal to end malnutrition in all of its forms by 2030.

Role of government policy in nutrition—barriers to and opportunities for healthier eating

Mozaffarian, D., S.Y. Angell, T. Lang, and J.A. Rivera. 2018. *The British Medical Journal* 361. doi: <https://doi.org/10.1136/bmj.k2426>.

Key Messages

- Despite the rise in diet related chronic diseases and associated costs, government policies continue to have conventional perspectives on agricultural production, industry support, food security, economics, and trade
- New, evidence informed government nutrition policies are needed to reduce the risk of chronic diseases and reduce dietary and health inequities
- The complementary and synergistic nature of different policies supports the need for an integrated, multicomponent government strategy that uses and adapts existing structures and systems
- To translate evidence into action, governments must have the appropriate knowledge, capacity, and will to act and the governance and partnership to support action
- Specific actions by major stakeholders should promote, facilitate, and complement policy efforts
- Strong government policy is essential to help achieve a healthy, profitable, equitable and sustainable food system that benefits all.

Research Priorities in the field of Anaemia in India

Sinha, A., B. Kulkarni, P. Mithra, P. Mahajan, R. Upadhyay, S.K. Nair, and R.S. Sharma. 2018. *Indian Journal of Community Health* 30(Supp): 115-118.

http://scholar.google.co.in/scholar_url?url=http://iapsmupuk.org/journal/index.php/IJCH/article/download/824/824&hl=en&sa=X&scisig=AAGBfm1QVwSumT3pA2HDh8Dg4YRbYENkbg&nossl=1&oi=scholarIrt

It is clear that the current rate of decline in the prevalence of anaemia is insufficient to meet the Global Nutrition Target 2025 and the situation prompts us to re-examine the current approaches for control of nutritional anaemia in the country. Under this premise, the ICMR set up a task force on childhood and adolescent anaemia, to brainstorm, evaluate the evidence and prioritise research questions for immediate implementation, under the chairmanship of Prof. M.K. Bhan. The coordination unit, ICMR commissioned an overview of reviews based on Cochrane and nonCochrane systematic reviews, aiming to contextualize the evidence on Anaemia. Additionally, a trend analysis of existing data from the national surveys was conducted and a document based on recent conferences was prepared and shared with the task force committee. These efforts were geared towards out of the box thinking to result in most appropriate research questions, to be taken up in research mode immediately.

NON-PEER REVIEWED

The Aggregate Income Losses from Childhood Stunting and the Returns to a Nutrition Intervention Aimed at Reducing Stunting

Galasso, E., and A. Wagstaff. 2018. *Policy Research Working Paper 8536*. Development Research Group, Development Economics, World Bank.

<http://documents.worldbank.org/curated/en/528901533144584145/pdf/WPS8536.pdf>

This paper undertakes two calculations, one for all developing countries, the other for 34 developing countries that together account for 90 percent of the world's stunted children. The first calculation asks how much lower a country's per capita income is today as a result of some of its workers having been stunted in childhood. The analysis uses a development accounting framework, relying on micro-econometric estimates of the effects of childhood stunting on adult wages, through the effects on years of schooling, cognitive skills, and height, parsing out the relative contribution of each set of returns to avoid double counting. The estimates show that, on average, the per capita income penalty from stunting is around 7 percent. The second calculation estimates the economic value and the costs associated with scaling up a package of nutrition interventions using the same methodology and set of assumptions used in the first calculation. The analysis considers a package of 10 nutrition interventions for which data are available on the effects and costs. The estimated rate-of-return from gradually introducing this program over a period of 10 years in the 34 countries is 17 percent, and the corresponding benefit-cost ratio is 15:1.

Addressing Child Malnutrition in India

Masoud, S., P. Menon, and Z.A. Bhutta. 2018. *Addressing Child Malnutrition in India*. In: Preedy V., and V. Patel (eds) *Handbook of Famine, Starvation, and Nutrient Deprivation*. Springer, Cham.

https://doi.org/10.1007/978-3-319-40007-5_96-1

This chapter discusses the role of malnutrition in children under the age of 5 growing up in India. Malnutrition is an ongoing public health challenge in children around the world and specifically within this subcontinent. Malnutrition includes both undernutrition and obesity. Some common forms of undernutrition include stunting, wasting, and micronutrient deficiencies. In an effort to help address undernutrition, several studies have examined various contributing factors. Some of the challenges in addressing undernutrition have been: regional differences in the burden and determinants, rapid urbanization, and the social and economic status of families/individuals. In addition, the consequences of ongoing undernutrition in Indian children are severe. Some of the risks associated with undernutrition include: mortality, morbidity, impaired growth and development, and reduced economic productivity. Thus, addressing the biological and social risk factors contributing to poor nutrition in children under age 5 in India is a critical imperative for achieving optimal health and development of its growing population.

Supplementary Nutrition Programme under ICDS: Case Study of Telangana and Tamil Nadu

Parasar, R., and R.V. Bhavani. 2018. *LANSA Working Paper Series 30*.

https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/13874/LANSA_Working_paper_30_ICDS_Parasar_Bhavani_final.pdf?sequence=1

Government food distribution programmes have the potential to reduce malnutrition at scale. The Supplementary Nutrition Programme (SNP) under the Integrated Child Development Services (ICDS) in India presents a unique example of a state-led food distribution initiative to address malnutrition. Targeted at pregnant and lactating women, children (0-6 years) and adolescent girls, SNP uses an agri-food value chain-based approach to improve the nutrition status of these vulnerable groups. This paper examines the value chain of SNP under ICDS in operation in two states of India, Tamil Nadu and Telangana, with particular reference to reaching nutritious food to the vulnerable group of women and children. The salient features and the innovative aspects of the two value chains are highlighted and the effectiveness of delivery under each is examined.

Caste-Gender Intersectionalities and the Curious Case of Child Nutrition: A Methodological Exposition

Mukhopadhyay, S., and A. Chakraborty. 2018. *Working Papers id:12787*, eSocialSciences.
<https://ideas.repec.org/p/ess/wpaper/id12787.html>

A growing body of research has addressed the issue of intersectionality since the last three decades, mostly adopting qualitative methodologies. Quantitative attempts to capture intersectionality have been recent and few. We invoke the framework of intersectionality to shed light on the puzzle of an insignificant gender gap in child nutrition in India. Given the multifaceted intersections of caste and gender in shaping inequalities in other indicators such as childhood mortality, reported preference for sons and labour market outcomes, we examine the variations in nutritional status of children across the intersections of the two axes, sex and caste. This is a methodological paper, attempting to illustrate the various quantitative methods that have been used (with or without adhering to the term intersectionality or may be used to capture intersectional inequalities).

Improving Children Health and Cognition: Evidence from School-Based Nutrition Intervention in India

Krämer, M., S. Kumar, and S. Vollmer. 2018. *Working Papers 1803*. Sam Houston State University, Department of Economics and International Business.
<https://ideas.repec.org/p/shs/wpaper/1803.html>

We present experimental evidence on the impact of delivering double-fortified salt (DFS), salt fortified with iron and iodine, through the Indian school-feeding program called “mid-day meal” on anemia, cognition, and math and reading outcomes of primary school children. We conducted a field experiment that randomly provided a one-year supply of DFS at a subsidized price to public primary schools in one of the poorest regions of India. The DFS treatment had significantly positive impacts on hemoglobin levels and reduced the prevalence of any form of anemia by 20 percent but these health gains did not translate into statistically significant impacts on cognition and test scores. While exploring the heterogeneity in effects, we find that treatment had statistically significant gains in anemia and test scores among children with higher treatment compliance. We further estimate that the intervention was very cost effective and can potentially be scaled up rather easily.

Using evidence to inform nutrition policies

World Health Organization. 2018.
http://www.who.int/nutrition/topics/elena_video/

<https://youtu.be/oTRrfabdk8>

To help reach and inform e-Library of Evidence for Nutrition Actions (eLENA) users, the WHO Department of Nutrition for Health and Development (NHD) has developed a short promotional video, titled Using evidence to inform nutrition policies. The video explains how eLENA can help countries to develop and refine evidence-informed nutrition policies and programmes that target their particular nutrition challenges, and in doing so, help to achieve global nutrition goals, targets and commitments.

Analysis of maternal and child health interventions in Rajasthan

Shariff, A., and A. Sharma. 2018. *Rajasthan Priorities*. Copenhagen Consensus Center.

https://www.copenhagenconsensus.com/sites/default/files/raj_mch_small.pdf

The objective of this paper is to address the issue of maternal and child health in India – specifically in Rajasthan. Despite a significant decrease in infant and maternal mortality rates in the country, India continues to demonstrate among the highest prevalence of neonatal mortality in the world, with about 0.75 million neonates dying every year. Rajasthan has improved significantly on its maternal and child survival indicators in the last 10 years. Between 2005-06 and 2015-16, Rajasthan's infant mortality fell from 65 to 41 deaths per 1000 live births (NFHS-3, NFHS-4). Maternal mortality rate fell from 318 per 100,000 live births in 2008, to 244 in 2013 (Ministry of Health and Family Welfare). Nevertheless, there is still room for improvement, particularly on several indicators related to access and use of child and maternal health services. In Rajasthan, 58 percent of women exclusively breastfeed, 39 percent of women had at least 4 antenatal care (ANC) visits during pregnancy, and only 55 percent of children are fully vaccinated (NFHS-4). A cost-benefit analysis of three policy interventions - breastfeeding promotion, promotion and incentivization of immunizations in lagging districts and conditional cash transfers for accessing ante natal services shows significantly positive benefit-cost ratios (BCRs). The paper argues that the most effective (highest benefits-to-costs) intervention to improve maternal and child health is immunization promotion, while promotion of exclusive breastfeeding to new mothers has the largest net benefits.

Effectiveness of nutrition interventions in low and middle income countries: an evidence summary

Menon, K., S. Puthussery, A. Ravalia, P. Panchal, R. Rana, S.K. Mistry, P.C. Tseng, J. Bhandol, and D. Mavalankar. 2018. Indian Institute of Public Health Gandhinagar, Public Health Foundation of India, University of Bedfordshire, and BRAC, Bangladesh.

<http://hdl.handle.net/10547/622729>

This is an independent report commissioned under the DFID Systematic Review Programme for South Asia. This material has been funded by South Asia Research Hub, Research and Evidence Division, Department for International Development, Government of UK.

Early life nutrition and future educational outcomes: Findings from ICDS

Laxminarayan, R., and A. Nandi. 2018. *Ideas for India*. International Growth Center.

<http://www.ideasforindia.in/about-us.html>

Integrated Child Development Services – India’s flagship child nutrition programme – has recently suffered a major cut in funding. This column shows that supplementary nutrition provided under the programme positively influences long-term educational outcomes of children. The findings suggest that funding for the programme should be fully restored and efforts should be made to address its systemic inefficiencies.

UPCOMING EVENTS

Grand Challenges India call on ki (knowledge integration) Data Challenge for Maternal and Child Health

Theme: This is a call for proposals directed at addressing challenges in improving health of mother and child

Closing date for applications: 17th August 2018

For more information: <http://www.birac.nic.in/grandchallengesindia/pages.php?pid=35>

Annual Conference on Women and Maternal Nutrition and Care

Theme: Nutritional aspects towards managing women’s health

When: Aug 31-Sept 01, 2018

Where: Toronto, Ontario, Canada

For more information: <https://womensnutrition.conferenceseries.com/>

IFPRI/POSHAN one-day event to share analyses on nutrition outcomes, determinants and reach of interventions based on NFHS data

Theme: Strengthening Actions for Nutrition in India: Insights from the National Family Health Survey

When: Sept 4, 2018

Where: New Delhi, India

For more information: <http://poshan.ifpri.info/upcoming-events-2/>

27th World Congress on Diet, Nutrition & Obesity

Theme: Research and Innovation in Nutrition, Food and Health

When: Sept 7-8, 2018

Where: Auckland, New Zealand

For more information: <https://dietcongress.nutritionalconference.com/conference-brochure.php>

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.

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