POSHAN
Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India
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EDITOR'S NOTE

In this issue of Abstract Digest, we bring to you articles that examine the spatial heterogeneity and correlates of child malnutrition in districts of India, contributing factors for undernutrition in Indian children, national level programs that address the issue of malnutrition, and many other informative articles. Here are some of the highlights:

- Bora and Saikia (2018) analysed India's population-based cross-sectional data from the National Family Health Survey (NFHS) conducted in 2015–2016, and provided an update on district-level disparities in the neonatal mortality rate (NMR) and the U5MR with special reference to Sustainable Development Goal 3 (SDG3) on preventable deaths among new-borns and children under five.
- Through a systematic review and meta-analysis of observational studies, Hume-Nixon and Kuper (2018) evaluated the association between childhood disability and malnutrition in low- and middle- income countries (LMICs) and concluded that children with disabilities are a vulnerable group for undernutrition in LMICs.
- A review article by Sesikeran and colleagues (2018) on child malnutrition in low- and middle-income countries, with special focus on India, highlighted the importance of promoting exclusive breastfeeding and appropriate complementary feeding practices, training the health service providers on counselling mothers and caregivers on breastfeeding and complementary feeding, and actions from multiple sectors and at multiple levels for the implementation of effective nutritional intervention programs.
- Using data from the recent round of National Family Health Survey (NFHS 2015–16), Khan and Mohanty (2018) examined the spatial heterogeneity and meso-scale correlates of child malnutrition across 640 districts of India and concluded that reduction of poverty, improving women's education and health, sanitation and child feeding knowledge is crucial to reduce the prevalence of malnutrition across India.
- In the Handbook of Famine, Starvation, and Nutrient Deprivation:
    - Masoud and colleagues (2018) examined various contributing factors for undernutrition in Indian children and emphasized on addressing the biological and social risk factors responsible for poor nutrition in children under age five.
    - Soni and colleagues (2018) reviewed existing national level programs that address child nutrition, detailed their performance, and recommended changes that can enhance their impact on child nutrition.
- The MAL-ED Network Investigators re-analysed stool specimens from the multisite MAL-ED cohort study (2018) of children aged 0–2 years. The quantitative molecular diagnostics improved estimates of pathogen-specific burdens of childhood diarrhoea in the community setting. These data could improve the management of diarrhoea in low-resource settings.
- Spears (2018) quantitatively investigated the hypothesis that differences in sanitation, especially in the population density of open defecation, can statistically account for the differences in average child height across developing countries and explain India's gap relative to sub-Saharan Africa.
- Madan and colleagues (2018) conducted a comprehensive review of the influence of seasonal variation on undernutrition during the first 1000 days of life in rural South Asia reporting on six proximal determinants of undernutrition. They reported a compelling

finding of significant seasonal variation for at least one determinant of undernutrition in all the available studies.

- Bliss and colleagues (2018) conducted a systemic review and found evidence that caregivers are able to use mid-upper arm circumference (MUAC) to detect severe acute malnutrition (SAM) in their children with minimal risk and many potential benefits to early case detection and coverage.
- Grellety and Golden (2018) showed that children with a low weight-for-height Z-score (WHZ) have at least as high a mortality risk as those with a low MUAC. The relative number of cases of SAM by MUAC alone, WHZ alone and those with both criteria have a dominant effect on the proportion of all SAM-related deaths that would occur in children excluded from treatment by a MUAC-only program.
- Mejia and colleagues (2018) assessed country cases for regulatory framework of public health interventions to provide vitamins and minerals and determined qualitatively whether there were provisions in the regulations that called for coordination among programs to ensure their innocuousness.
- DeFries and colleagues (2018) calculated intake of iron and other micronutrients from 84 food items from 1983 to 2011 and concluded that loss of coarse cereals in the Indian diet has substantially reduced iron intake without compensation from other food groups, particularly in states where rice rather than wheat replaced coarse cereals.
- Mukhopadhyay and colleagues (2018) assessed the role of fetal sex in modifying the effect of maternal macronutrient intake on the risk of small-for-gestational age (SGA) birth through a prospective, observational cohort study and concluded that higher carbohydrate and lower fat intakes early in pregnancy were associated with increased risk of male SGA births.
- Kulkarni's research study highlighted that suboptimal lean body mass seems to be the link between the two forms of malnutrition, and these two problems need to be considered as dual manifestations of a common problem of the low-quality diets lacking important food groups such as dairy and other animal source foods.
- India State-Level Disease Burden Initiative CVD Collaborators (2018) analysed the prevalence and disability-adjusted life-years (DALYs) due to cardiovascular diseases and the major component causes in the states of India from 1990 to 2016 and presented the changing patterns of cardiovascular diseases and their risk factors.
- McAlpine and colleagues (2018) described the design, development, and evaluation of the Maternal Outcomes and Nutrition Tool (MONT), a novel cross-cultural digital dietary data collection tool.
- Using the fourth round of district level household survey (DLHS-4), Rahman and Pallikadavath (2018) analysed the effects of Janani Suraksha Yojana (safe motherhood scheme, or JSY) on the utilization of several maternal and child health care (MCHC services under the continuum of care.
- Gupta and colleagues (2018) conducted a qualitative research to elicit various stakeholders' (government and policy-related stakeholders, industry, civil Society, consumers) perspectives on a salt reduction strategy for India and found that most of the stakeholders were in alignment with the need for a salt reduction programme in India to prevent and control hypertension and related cardiovascular disease (CVD).
- Ved and colleagues (2018) analysed some of the key strategies for improving India's Village Health Sanitation and Nutrition Committees (VHSNCs) functioning and concluded that while revised guidelines and training and support for facilitation are crucial in strengthening VHSNCs, deeper social reforms, health systems change and decentralisation are also needed to sustain VHSNCs as key mechanisms for community health governance.
- To address the paucity of case studies examining the experience of boundary-spanning actors (BSAs) in the context of low- and middle-income countries, Pelletier and colleagues (2018) examined their experiences with multisectoral nutrition (MSN) in four Sub-Saharan

African countries and concluded that under the right conditions, intentional boundary spanning can be a feasible and acceptable practice within a multisectoral, complex adaptive system in low- and middle-income countries.

- Gillespie and colleagues (2018) presented evidence from the Transform Nutrition research consortium (2012-2017), to inform and inspire action to address undernutrition in four high-burden countries (India, Bangladesh, Kenya, and Ethiopia) and globally.
- von Grebmer and colleagues (2018) presented the 2018 Global Hunger Index (GHI) report that focuses on hunger and the rising levels of forced migration—two interlinked challenges that require long-term action and political solutions.
- Building on the recently published Health Policy and Systems Research (HPSR) Reader on Human Resources for Health (HRH), George and colleagues (2018) have reflected on the added value of HPSR underpinning HRH.
- Ruducha and colleagues (2018) expanded the understanding of village dynamics in India and how first degree social and advice networks and cognitive perceptions of recently delivered women (RDW) in areas with and without women's Self-Help Groups (SHGs) affect immediate breastfeeding.
- George and colleagues (2018) examined the equity effects of community action for maternal health led by Non-Government Organizations (NGOs) on facility deliveries and then examined the underlying implementation processes with implications for strengthening accountability of maternity care across three districts in Gujarat, India.

Enjoy reading!

PEER-REVIEWED

Neonatal and under-five mortality rate in Indian districts with reference to Sustainable Development Goal 3: An analysis of the National Family Health Survey of India (NFHS), 2015–2016

Bora, J.K., and N. Saikia. 2018. *PLoS ONE* 13(7): e0201125.
https://doi.org/10.1371/journal.pone.0201125

Background and objective: India contributes the highest global share of deaths among the under-fives. Continuous monitoring of the reduction in the under-five mortality rate (U5MR) at local level is thus essential to set priorities for policy-makers and health professionals. In this study, we aimed to provide an update on district-level disparities in the neonatal mortality rate (NMR) and the U5MR with special reference to Sustainable Development Goal 3 (SDG3) on preventable deaths among new-borns and children under five. **Data and methods:** We used recently released population-based cross-sectional data from the National Family Health Survey (NFHS) conducted in 2015–2016. We used the synthetic cohort probability approach to analyze the full birth history information of women aged 15–49 to estimate the NMR and U5MR for the ten years preceding the survey. **Results:** Both the NMR and U5MR vary enormously across Indian districts. With respect to the SDG3 target for 2030 for the NMR and the U5MR, the estimated NMR for India for the period studied is about 2.4 times higher, while the estimated U5MR is about double. At district level, while 9% of the districts have already reached the NMR targeted in SDG3, nearly half (315 districts) are not likely to achieve the 2030 target even if they realize the NMR reductions achieved by their own states between the last two rounds of National Family Health Survey of India. Similarly, less than one-third of the districts (177) of India are unlikely to achieve the SDG3 target on the U5MR by 2030. While the majority of high-risk districts for the NMR and U5MR are located in the poorer states of north-central and eastern India, a few high-risk districts for NMR also fall in the rich and advanced states. About 97% of districts from Chhattisgarh and Uttar Pradesh, for example, are unlikely to meet the SDG3 target for preventable deaths among new-borns and children under age five, irrespective of gender. **Conclusions:** To achieve the SDG3 target on preventable deaths by 2030, the majority of Indian districts clearly need to make a giant leap to reduce their NMR and U5MR.

The association between malnutrition and childhood disability in low- and middle- income countries: systematic review and meta-analysis of observational studies

Hume-Nixon, M., and H. Kuper. 2018. *Tropical Medicine and International Health*. doi:
https://doi.org/10.1111/tmi.13139

Objective: The aim of this study was to evaluate the association between childhood disability and malnutrition in low- and middle- income countries (LMICs). **Methods:** Articles were identified from 1990 to August 2017 by searching nine electronic databases. Epidemiological studies, undertaken in LMICs that compared the prevalence of malnutrition in children with disabilities to children without disabilities were eligible for inclusion. Titles, abstracts, and full texts were screened by two reviewers, and data were extracted using a structured table for eligible papers. Meta-analyses for the association between childhood disability and undernutrition were performed. **Results:** The search generated 4678 results, from which 17 articles were eligible. Fifty-three per cent of these studies showed a positive association between childhood disability and undernutrition. Results varied when disaggregated by type of disability, with positive associations identified for 44% of studies focussed on neurodevelopmental disability, 60% of general disability studies and 67% of studies on hearing impairment. Only four studies were identified that considered overnutrition outcomes, and these showed variable results. Eighteen per cent of eligible studies were considered at low risk of bias, 53% had a medium risk, and 29% had a high risk of bias. Pooled ORs showed that children with disabilities were almost three times more likely to be underweight (OR 2.97, 95% CI

2.33, 3.79), and nearly twice as likely to experience stunting and wasting (Stunting: 1.82, 1.40, 2.36; Wasting: 1.90, 1.32–2.75), compared to controls. **Conclusions:** Children with disabilities may be a vulnerable group for undernutrition in LMICs, which should be reflected in disability and nutritional programming and policy-making.

Child Malnutrition in Low-Income and Middle-Income Countries: Insights from India

Sesikeran, B., U. Vaidya, and N. Mohan. 2018. *EC Paediatrics* 7(4): 255-272.
https://pdfs.semanticscholar.org/a761/3516ba4ff6f1c1c651e72e12c720c478a560.pdf

Nutritional influences during early life can have a lasting impact on the growth, health and cognitive and social development of an individual. Undernutrition during this phase can lead to increased susceptibility to infectious diseases, decreased learning capacity, and increased risk of non-communicable diseases in children. Stunting is one of the core indicators of childhood undernutrition and is associated with high morbidity and mortality especially from respiratory tract infections, diarrheal diseases, malaria and measles. Stunting can also affect cognitive development and school performance during childhood and decreased productivity and lower earnings in adulthood. In India, about 38% of the children under five years of age are stunted according to the recent National Family Health Survey (NFHS)-4. To add to the burden, about 21% and 36% of the children under 5 are wasted and underweight respectively. Suboptimal feeding practices are one of the main reasons for the increasing burden of undernutrition in India. Only 55% of the children under the age of 6 months are exclusively breastfed and timely introduction of complementary feeding in infants is very poor. Furthermore, most infants do not receive minimum dietary diversity, minimum meal frequency and minimum acceptable diet. Thus, there is a dire need to encourage and educate mothers about appropriate infant and young child feeding practices. Food fortification and supplementation programs have been found to be effective in tackling micronutrient deficiencies in children and the Government should take necessary actions to make sure that these programs reach every undernourished child within the country.

Spatial heterogeneity and correlates of child malnutrition in districts of India

Khan, J., and S.K. Mohanty. 2018. *BMC Public Health* 18:1027.
https://doi.org/10.1186/s12889-018-5873-z

Background: Despite sustained economic growth and reduction in money metric poverty in last two decades, prevalence of malnutrition remained high in India. During 1992–2016, the prevalence of underweight among children had declined from 53% to 36%, stunting had declined from 52% to 38% while that of wasting had increased from 17% to 21% in India. The national average in the level of malnutrition conceals large variation across districts of India. Using data from the recent round of National Family Health Survey (NFHS), 2015–16 this paper examined the spatial heterogeneity and meso-scale correlates of child malnutrition across 640 districts of India. **Methods**: Moran's I statistics and bivariate LISA maps were used to understand spatial dependence and clustering of child malnutrition. Multiple regression, spatial lag and error models were used to examine the correlates of malnutrition. Poverty, body mass index (BMI) of mother, breastfeeding practices, full immunization, institutional births, improved sanitation and electrification in the household were used as meso scale correlates of malnutrition. **Results**: The univariate Moran's I statistics was 0.65, 0.51 and 0.74 for stunting, wasting and underweight respectively suggesting spatial heterogeneity of malnutrition in India. Bivariate Moran's I statistics of stunting with BMI of mother was 0.52, 0.46 with poverty and − 0.52 with sanitation. The pattern was similar with respect to wasting and underweight suggesting spatial clustering of malnutrition against the meso scale correlates in the geographical hotspots of India. Results of spatial error model suggested that the coefficient of BMI

of mother and poverty of household were strong and significant predictors of stunting, wasting and underweight. The coefficient of BMI in spatial error model was largest found for underweight (β = 0.38, 95% CI: 0.29–0.48) followed by stunting (β = 0.23, 95% CI: 0.14–0.33) and wasting (β = 0.11, 95% CI: 0.01–0.22). Women's educational attainment and breastfeeding practices were also found significant for stunting and underweight. **Conclusion**: Malnutrition across the districts of India is spatially clustered. Reduction of poverty, improving women's education and health, sanitation and child feeding knowledge can reduce the prevalence of malnutrition across India. Multisectoral and targeted intervention in the geographical hotspots of malnutrition can reduce malnutrition in India.

Addressing Child Malnutrition in India

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

National Programs and Policies to Address Child Malnutrition in India: Challenges and Opportunities

Soni, A., S. Masoud, and Z. Bhutta. 2018. *National Programs and Policies to Address Child Malnutrition in India: Challenges and Opportunities*. In: Preedy V., Patel V. (eds) Handbook of Famine, Starvation, and Nutrient Deprivation. Springer, Cham.
https://link.springer.com/referenceworkentry/10.1007%2F978-3-319-40007-5_101-1

Despite India's progress in launching and scaling up programs aimed at achieving optimal child nutrition over the last decade, India fell short of the 2015 Millennium Development Goals. This chapter reviews existing national level programs that address child nutrition, details their performance, and recommends changes that can enhance their impact on child nutrition. Specifically, we identify challenges and opportunities in the implementation and operation of national level programs, which currently function in silos and lack a cohesive coordinating strategy. This chapter also documents the palpable interest in advancing maternal and child health through national policy, advocacy, and social engagement that pervades India.

Use of quantitative molecular diagnostic methods to assess the aetiology, burden, and clinical characteristics of diarrhoea in children in low-resource settings: a reanalysis of the MAL-ED cohort study

Platts-Mills, J.A., J. Liu, E.T. Rogawski, F. Kabir, P. Lertsethtakarn, M. Siguas, S.S. Khan, I. Praharaj, A. Murei, R. Nshama, B. Mujaga, A. Havt, I.A. Maciel, T.L. McMurry, D.J. Operario, M. Taniuchi, J. Gratz,

S.E. Stroup, J.H. Roberts, A. Kalam, F. Aziz, S. Qureshi, M.O. Islam, P. Sakpaisal, S. Silapong, P.P. Yori, R. Rajendiran, B. Benny, M. McGrath, B.J.J. McCormick, J.C. Seidman, D. Lang, M. Gottlieb, R.L. Guerrant, A.A.M. Lima, J.P. Leite, A. Samie, P.O. Bessong, N. Page, L. Bodhidatta, C. Mason, S. Shrestha, I. Kiwelu, E.R. Mduma, N.T. Iqbal, Z.A. Bhutta, T. Ahmed, R. Haque, G. Kang, M.N. Kosek, E.R. Houpt, and The MAL-ED Network Investigators. 2018. *The Lancet Global Health*. doi: https://doi.org/10.1016/S2214-109X(18)30349-8

Background: Optimum management of childhood diarrhoea in low-resource settings has been hampered by insufficient data on aetiology, burden, and associated clinical characteristics. We used quantitative diagnostic methods to reassess and refine estimates of diarrhoea aetiology from the Etiology, Risk Factors, and Interactions of Enteric Infections and Malnutrition and the Consequences for Child Health and Development (MAL-ED) cohort study. **Methods**: We re-analysed stool specimens from the multisite MAL-ED cohort study of children aged 0–2 years done at eight locations (Dhaka, Bangladesh; Vellore, India; Bhaktapur, Nepal; Naushero Feroze, Pakistan; Venda, South Africa; Haydom, Tanzania; Fortaleza, Brazil; and Loreto, Peru), which included active surveillance for diarrhoea and routine non-diarrhoeal stool collection. We used quantitative PCR to test for 29 enteropathogens, calculated population-level pathogen-specific attributable burdens, derived stringent quantitative cutoffs to identify aetiology for individual episodes, and created aetiology prediction scores using clinical characteristics. **Findings**: We analysed 6625 diarrhoeal and 30 968 non-diarrhoeal surveillance stools from 1715 children. Overall, 64·9% of diarrhoea episodes (95% CI 62·6–71·2) could be attributed to an aetiology by quantitative PCR compared with 32·8% (30·8–38·7) using the original study microbiology. Viral diarrhoea (36·4% of overall incidence, 95% CI 33·6–39·5) was more common than bacterial (25·0%, 23·4–28·4) and parasitic diarrhoea (3·5%, 3·0–5·2). Ten pathogens accounted for 95·7% of attributable diarrhoea: *Shigella* (26·1 attributable episodes per 100 child-years, 95% CI 23·8–29·9), sapovirus (22·8, 18·9–27·5), rotavirus (20·7, 18·8–23·0), adenovirus 40/41 (19·0, 16·8–23·0), enterotoxigenic *Escherichia coli* (18·8, 16·5–23·8), norovirus (15·4, 13·5–20·1), astrovirus (15·0, 12·0–19·5), *Campylobacter jejuni or C coli* (12·1, 8·5–17·2), *Cryptosporidium* (5·8, 4·3–8·3), and typical enteropathogenic *E coli* (5·4, 2·8–9·3). 86·2% of the attributable incidence for *Shigella* was non-dysenteric. A prediction score for shigellosis was more accurate (sensitivity 50·4% [95% CI 46·7–54·1], specificity 84·0% [83·0–84·9]) than current guidelines, which recommend treatment only of bloody diarrhoea to cover *Shigella* (sensitivity 14·5% [95% CI 12·1–17·3], specificity 96·5% [96·0–97·0]). **Interpretation**: Quantitative molecular diagnostics improved estimates of pathogen-specific burdens of childhood diarrhoea in the community setting. Viral causes predominated, including a substantial burden of sapovirus; however, *Shigella* had the highest overall burden with a high incidence in the second year of life. These data could improve the management of diarrhoea in these low-resource settings.

Exposure to open defecation can account for the Indian enigma of child height

Spears, D. 2018. *Journal of Development Economics.* doi: 10.1016/j.jdeveco.2018.08.003. https://doi.org/10.1016/j.jdeveco.2018.08.003

Physical height is an important measure of human capital. However, differences in average height across developing countries are poorly explained by economic differences. Children in India are shorter than poorer children in Africa, a widely studied puzzle called “the Asian enigma.” This paper proposes and quantitatively investigates the hypothesis that differences in sanitation — and especially in the population density of open defecation — can statistically account for an important component of the Asian enigma, India's gap relative to sub-Saharan Africa. The paper's main result computes a demographic projection of the increase in the average height of Indian children, if they were counterfactually exposed to sub-Saharan African sanitation, using a non-parametric reweighting method. India's projected increase in mean height is at least as large as the gap. The

analysis also critically reviews evidence from recent estimates in the literature. Two possible mechanisms are effects on children and on their mothers.

Seasonal variation in the proximal determinants of undernutrition during the first 1000 days of life in rural South Asia: A comprehensive review

Madan, E.M., J.D. Haas, P. Menon, and S. Gillespie. 2018. *Global Food Security* 19:11-23. https://doi.org/10.1016/j.gfs.2018.08.008

In this review, the influence of seasonal variation on undernutrition during the first 1000 days of life of life in rural South Asia is conceptualized using a modified framework developed under the "Tackling the Agriculture and Nutrition Disconnect in India" project. Evidence for the existence and extent of seasonality is summarized from 14 studies reporting on six proximal determinants of undernutrition. A limited number of studies examine seasonal variation in risk factors for this age group. All available studies, however, report a compelling finding of significant seasonal variation for at least one determinant of undernutrition. Research to clarify mechanisms for potentially adverse effects of seasonal variation on health and nutritional status during the first 1000 days of life is needed.

Use of Mid-Upper Arm Circumference by Novel Community Platforms to Detect, Diagnose, and Treat Severe Acute Malnutrition in Children: A Systematic Review

Bliss, J., N. Lelijveld, A. Briend, M. Kerac, M. Manary, M. McGrath, Z.W. Prinzo, S. Shepherd, N.M. Zagre, S. Woodhead, S. Guerrero, and A. Mayberry. 2018. *Global Health Science and Practice*. http://www.ghspjournal.org/content/ghsp/early/2018/09/05/GHSP-D-18-00105.full.pdf

Background: A stubborn persistence of child severe acute malnutrition (SAM) and continued gaps in program coverage have made identifying methods for expanding detection, diagnosis, and treatment of SAM an urgent public health need. There is growing consensus that making mid-upper arm circumference (MUAC) use more widely accessible among caregivers and community health workers (CHWs) is an important next step in further decentralizing SAM care and increasing program coverage, including the ability of CHWs to treat uncomplicated SAM in community settings. **Methods**: We conducted a systematic review to summarize published and operational evidence published since 2000 describing the use of MUAC for detection and diagnosis of SAM in children aged 6–59 months by caregivers and CHWs, and of management of uncomplicated SAM by CHWs, all outside of formal health care settings. We screened 1,072 records, selected 43 records for full-text screening, and identified 22 studies that met our eligibility criteria. We extracted data on a number of items, including study design, strengths, and weaknesses; intervention and control; and key findings and operational lessons. We then synthesized the qualitative findings to inform our conclusions. The issue of treating children classified as SAM based on low weight-for-height, rather than MUAC, at household level, is not addressed in this review. **Findings:** We found evidence that caregivers are able to use MUAC to detect SAM in their children with minimal risk and many potential benefits to early case detection and coverage. We also found evidence that CHWs are able to correctly use MUAC for SAM detection and diagnosis and to provide a high quality of care in the treatment of uncomplicated SAM when training, supervision, and motivation are adequate. However, the number of published research studies was small, their geographic scope was narrow, and most described intensive, small-scale interventions; thus, findings are not currently generalizable to public-sector health care systems. **Conclusions**: Scaling up the use of MUAC by caregivers and CHWs to detect SAM in household and community settings is a promising step toward improving the coverage of SAM detection, diagnosis, and treatment. Further research on

scalability, applicability across a wider range of contexts, coverage impact, and cost is needed. The primary use of MUAC for SAM detection should also be explored where appropriate.

Severely malnourished children with a low weight-for-height have a higher mortality than those with a low mid-upper-arm-circumference: III. Effect of case-load on malnutrition related mortality– policy implications

Grellety, E., and M.H. Golden. 2018. *Nutrition Journal* 17:81.
https://doi.org/10.1186/s12937-018-0382-6

Background: Severe acute malnutrition (SAM) is diagnosed when the weight-for-height Z-score (WHZ) is < 115 mm or there is nutritional oedema. Although there has been a move to eliminate WHZ as a diagnostic criterion we have shown that children with a low WHZ have at least as high a mortality risk as those with a low MUAC. Here we take the estimated case fatality rates and published case-loads to estimate the proportion of total SAM related deaths occurring in children that would be excluded from treatment with a MUAC-only policy. **Methods**: The effect of varying case-load and mortality rates on the proportion of all deaths that would occur in admitted children was examined. We used the same calculations to estimate the proportion of all SAM-related deaths that would be excluded with a MUAC-only policy in 48 countries with very different relative case loads for SAM by only MUAC, only WHZ and children with both deficits. The case fatality rates (CFR) are taken from simulations, empirical data and the literature. **Results**: The relative number of cases of SAM by MUAC alone, WHZ alone and those with both criteria have a dominant effect on the proportion of all SAM-related deaths that would occur in children excluded from treatment by a MUAC-only program. Many countries, particularly in the Sahel, West Africa and South East Asia would fail to identify the majority of SAM-related deaths if a MUAC only program were to be implemented. Globally, the estimated minimum number of deaths that would occur among children excluded from treatment in our analyses is 300,000 annually. **Conclusions**: The number, proportion or attributable fraction of children excluded from treatment with any change of current policy are the correct indicators to guide policy change. CRFs alone should not be used to guide policy in choosing whether or not to drop WHZ as a diagnostic for SAM. All the criteria for diagnosis of malnutrition need to be retained. It is critical that methods are found to identify those children with a low WHZ, but not a low MUAC, in the community so that they will not remain undetected.

Provision of micronutrients in coexisting public health programs and risk of excessive intake: regulatory considerations

Mejia, L. A., W. Kuo, and F. Beltran-Velazquez. 2018. *Annals of the New York Academy of Sciences*.
doi:10.1111/nyas.13972
https://doi.org/10.1111/nyas.13972

Countries around the world have been implementing public health interventions to provide vitamins and minerals. There is a concern that the cumulative micronutrient contribution of coexisting programs, when targeting the same population, may exceed their safe levels of intake, thus potentially challenging the *primum non nocere* principle. We assessed the regulatory framework of such interventions and determined qualitatively whether there were provisions in the regulations that called for coordination among programs to ensure their innocuousness. Country cases from various WHO regions were selected for the study: (1) the Americas: Chile, Costa Rica, and Guatemala; (2) Africa: Malawi, Uganda, and Zambia; (3) South Asia: Bangladesh; and (4) the Western Pacific Region: China and the Philippines. We did not identify any provisions in the existing regulations requiring coordination mechanisms among interventions. However, in some countries, governments have established national micronutrient fortification commissions or alliances aimed to

foster interprogram coordination. Their focus, however, has been mostly on the efficacy of the programs and less on their safety. A regulatory framework for coexisting micronutrient interventions should be comprehensive, accounting for all micronutrient sources and including regulatory provisions for coordination among programs.

Impact of Historical Changes in Coarse Cereals Consumption in India on Micronutrient Intake and Anemia Prevalence

DeFries, R., A. Chhatre, K.F. Davis, A. Dutta, J. Fanzo, S. Ghosh-Jerath, S. Myers, N.D. Rao, and M.R. Smith. 2018. *Food and Nutrition Bulletin* 39(3): 377-392.
https://doi.org/10.1177/0379572118783492

Background: Production of rice and wheat increased dramatically in India over the past decades, with reduced proportion of coarse cereals in the food supply. **Objective**: We assess impacts of changes in cereal consumption in India on intake of iron and other micronutrients and whether increased consumption of coarse cereals could help alleviate anemia prevalence. **Methods**: With consumption data from over 800 000 households, we calculate intake of iron and other micronutrients from 84 food items from 1983 to 2011. We use mixed-effect models to relate state-level anemia prevalence in women and children to micronutrient consumption and household characteristics. **Results**: Coarse cereals reduced from 23% to 6% of calories from cereals in rural households (10% to 3% in urban households) between 1983 and 2011, with wide variations across states. Loss of iron from coarse cereals was only partially compensated by increased iron from other cereals and food groups, with a 21% (rural) and 11% (urban) net loss of total iron intake. Models indicate negative association between iron from cereals and anemia prevalence in women. The benefit from increased iron from coarse cereals is partially offset by the adverse effects from antinutrients. For children, anemia was negatively associated with heme–iron consumption but not with iron from cereals. **Conclusions**: Loss of coarse cereals in the Indian diet has substantially reduced iron intake without compensation from other food groups, particularly in states where rice rather than wheat replaced coarse cereals. Increased consumption of coarse cereals could reduce anemia prevalence in Indian women along with other interventions.

Fetal sex modifies the effect of maternal macronutrient intake on the incidence of small-for-gestational-age births: a prospective observational cohort study

Mukhopadhyay, A., T. Thomas, R.J. Bosch, P. Dwarkanath, A. Thomas, C.P. Duggan, and A.V. Kurpad. 2018. *The American Journal of Clinical Nutrition*. doi: https://doi.org/10.1093/ajcn/nqy161

Background: Maternal macronutrient intake is likely to play a pivotal role in fetoplacental growth. Male fetuses grow faster and their growth is more responsive to maternal size. **Objective**: We assessed the role of fetal sex in modifying the effect of maternal macronutrient intake on the risk of small-for-gestational age (SGA) birth. **Design**: This was a prospective, observational cohort study of 2035 births from an urban South Asian Indian population. Maternal intakes of total energy and macronutrients were recorded by validated food-frequency questionnaires. The interaction of trimester 1 macronutrient intake with fetal sex was tested on the outcome of SGA births. **Results**: The prevalence of SGA was 28%. Trimester 1 macronutrient composition was high in carbohydrate and low in fat (means ± SDs—carbohydrate: 64.6% ± 5.1%; protein: 11.5% ± 1.1%; and fat: 23.9% ± 4.4% of energy). Higher carbohydrate and lower fat consumption were each associated with an increased risk of SGA [adjusted OR (AOR) per 5% of energy (95% CI): carbohydrate: 1.15 (1.01, 1.32); fat: 0.83 (0.71, 0.97)] specifically among male births (males: n = 1047; females: n = 988). Dietary intake of >70% of energy from carbohydrate was also associated with increased risk (AOR: 1.67; 95% CI: 1.00, 2.78), whereas >25% of energy from fat intake was associated with decreased risk (AOR:

0.61; 95% CI: 0.41, 0.90) of SGA in male births. **Conclusions**: Higher carbohydrate and lower fat intakes early in pregnancy were associated with increased risk of male SGA births. Therefore, we speculate that fetal sex acts as a modifier of the role of maternal periconceptional nutrition in optimal fetoplacental growth.

Addressing the Double Burden of Malnutrition in Developing Countries: Need for Strategies to Improve the Lean Body Mass

Kulkarni, B. 2018. *Food and Nutrition Bulletin* 39(2S): S69-S76.
https://doi.org/10.1177/0379572118768572

The double burden of childhood undernutrition and adult-onset adiposity-related chronic diseases is a key concern in many developing countries that are currently undergoing epidemiological and nutrition transition. Impaired linear growth with suboptimal lean body mass development seems to be the link between these 2 seemingly contrasting forms of malnutrition. Studies assessing the role of early nutrition in the later lean body mass development have shown consistent positive association. In addition, the nutrition during life course, especially the dietary intake of protein, zinc, calcium, and vitamin D status, impacts the lean body mass. Promoting increased intake of these important nutrients throughout life course would, therefore, be important for optimal development and maintenance of lean body mass. Diversified diets with increased consumption of nutrient-rich foods, especially milk and other animal source foods, are crucial for the development of optimal body composition and alleviation of the double burden of malnutrition.

The changing patterns of cardiovascular diseases and their risk factors in the states of India: the Global Burden of Disease Study 1990–2016

India State-Level Disease Burden Initiative CVD Collaborators. 2018. *The Lancet Global Health*. doi:
https://doi.org/10.1016/S2214-109X(18)30407-8

Background: The burden of cardiovascular diseases is increasing in India, but a systematic understanding of its distribution and time trends across all the states is not readily available. In this report, we present a detailed analysis of how the patterns of cardiovascular diseases and major risk factors have changed across the states of India between 1990 and 2016. **Methods:** We analysed the prevalence and disability-adjusted life-years (DALYs) due to cardiovascular diseases and the major component causes in the states of India from 1990 to 2016, using all accessible data sources as part of the Global Burden of Diseases, Injuries, and Risk Factors Study 2016. We placed states into four groups based on epidemiological transition level (ETL), defined using the ratio of DALYs from communicable diseases to those from non-communicable diseases and injuries combined, with a low ratio denoting high ETL and vice versa. We assessed heterogeneity in the burden of major cardiovascular diseases across the states of India, and the contribution of risk factors to cardiovascular diseases. We calculated 95% uncertainty intervals (UIs) for the point estimates. **Findings**: Overall, cardiovascular diseases contributed 28·1% (95% UI 26·5–29·1) of the total deaths and 14·1% (12·9–15·3) of the total DALYs in India in 2016, compared with 15·2% (13·7–16·2) and 6·9% (6·3–7·4), respectively, in 1990. In 2016, there was a nine times difference between states in the DALY rate for ischaemic heart disease, a six times difference for stroke, and a four times difference for rheumatic heart disease. 23·8 million (95% UI 22·6–25·0) prevalent cases of ischaemic heart disease were estimated in India in 2016, and 6·5 million (6·3–6·8) prevalent cases of stroke, a 2·3 times increase in both disorders from 1990. The age-standardised prevalence of both ischaemic heart disease and stroke increased in all ETL state groups between 1990 and 2016, whereas that of rheumatic heart disease decreased; the increase for ischaemic heart disease was highest in the low ETL state group. 53·4% (95% UI 52·6–54·6) of crude deaths due to cardiovascular diseases in India in

2016 were among people younger than 70 years, with a higher proportion in the low ETL state group. The leading overlapping risk factors for cardiovascular diseases in 2016 included dietary risks (56·4% [95% CI 48·5–63·9] of cardiovascular disease DALYs), high systolic blood pressure (54·6% [49·0–59·8]), air pollution (31·1% [29·0–33·4]), high total cholesterol (29·4% [24·3–34·8]), tobacco use (18·9% [16·6–21·3]), high fasting plasma glucose (16·7% [11·4–23·5]), and high body mass index (14·7% [8·3–22·0]). The prevalence of high systolic blood pressure, high total cholesterol, and high fasting plasma glucose increased generally across all ETL state groups from 1990 to 2016, but this increase was variable across the states; the prevalence of smoking decreased during this period in all ETL state groups. **Interpretation**: The burden from the leading cardiovascular diseases in India—ischaemic heart disease and stroke— varies widely between the states. Their increasing prevalence and that of several major risk factors in every part of India, especially the highest increase in the prevalence of ischaemic heart disease in the less developed low ETL states, indicates the need for urgent policy and health system response appropriate for the situation in each state.

Design, development, and evaluation of the Maternal Outcomes and Nutrition Tool (MONT)
McAlpine, J.M., A.V. Perkins, and J.J. Vanderlelie. 2018. *Maternal and Child Nutrition*. doi: https://doi.org/10.1111/mcn.12634

Suboptimal nutrition has been largely associated with poorer perinatal outcomes. However, an inability to compare data between biologically and geographically diverse cohorts has complicated determination of the role of diet in such conditions. The aim of this paper is to describe the design, development, and evaluation of the Maternal Outcomes and Nutrition Tool (MONT), a novel cross-cultural digital dietary data collection tool. The tool was modelled on previously validated food frequency questionnaires and designed for exclusive administration in the digital environment, featuring minimal language and emphasis on images. Participants were recruited by both passive and active means. A total of 502 women were recruited; descriptive statistics were used to describe the cohort. Pregnant women constituted the majority of subjects recruited (n = 376, 74.9%), 63% of which were nulliparous. Women were recruited from 13 ethnicities and 20 countries of birth. Of the 341 women who commenced the surveys (68%), 114 submitted complete datasets (33.5%). Maintenance and recruitment costs equated to $5.64 per completion. Total processing and analysis time for the pilot dataset equated to 12 s per survey. The MONT was used successfully by women from a variety of continents and cultures and proved to be practical and economical in terms resource management.

How much do conditional cash transfers increase the utilization of maternal and child health care services? New evidence from Janani Suraksha Yojana in India
Rahman, M.M., and S. Pallikadavath. 2018. *Economics and Human Biology* 31: 164–183. https://doi.org/10.1016/j.ehb.2018.08.007

Janani Suraksha Yojana (safe motherhood scheme, or JSY) provides cash incentives to marginal pregnant women in India conditional on having mainly institutional delivery. Using the fourth round of district level household survey (DLHS-4), we have estimated its effects on both intended and unintended outcomes. Our estimates of average treatment effect on the treated (ATT) from propensity score matching are remarkably higher than those found in previous prominent studies using the second and third rounds of the survey (DLHS-2 and DLHS-3). When we apply fuzzy regression discontinuity design exploiting the second birth order, our estimates of local average treatment effect (LATE) are much higher than that of ATT. For example, due to JSY, institutional delivery increases by around 16 percentage points according to ATT estimate but about 23 percentage points according to LATE estimate.

Stakeholders' perceptions regarding a salt reduction strategy for India: Findings from qualitative research

Gupta, P., S. Mohan, C. Johnson, V. Garg, S.R. Thout, R. Shivashankar, A. Krishnan, B. Neal, and D. Prabhakaran. 2018. *PLoS ONE* 13(8): e0201707. https://doi.org/10.1371/journal.pone.0201707

Background: Scientific evidence indicates that high dietary salt intake has detrimental effects on blood pressure and associated cardiovascular disease (CVD). However, limited information is available on how to implement salt reduction in low and middle-income countries (LMICs) such as India, where the burden of hypertension and CVD is increasing rapidly. As part of a large study to create the evidence base required to develop a salt reduction strategy for India, we assessed the perspectives of various stakeholders regarding developing an India specific salt reduction strategy.
Methods: A qualitative research design was deployed to elicit various stakeholder's (government and policy-related stakeholders, industry, civil Society, consumers) perspectives on a salt reduction strategy for India, using in-depth interviews (IDIs) and focus group discussions (FGDs). We used an inductive approach for data analysis. Data were analyzed using thematic content analysis method.
Results: Forty-two IDIs and eight FGDs were conducted with various stakeholders of interest and relevance. Analysis indicated three major themes: 1. Barriers for salt reduction 2. Facilitators for salt reduction; 3. Strategies for salt reduction. Most of the stakeholders were in alignment with the need for a salt reduction programme in India to prevent and control hypertension and related CVD. Major barriers indicated by the stakeholders for salt reduction in India were social and cultural beliefs, a large unorganized food retail sector, and the lack of proper implementation of even existing food policies. Stakeholders from the food industry reported that there might be decreased sales due to salt reduction. Major facilitators included the fact that: salt reduction is currently a part of the National Multi-Sectoral Action Plan for the prevention and control of NCDs, salt reduction and salt iodine programme are compatible, and that few of the multinational food companies have already started working in the direction of initiating efforts for salt reduction. Based on the barriers and facilitators, few of the recommendations are to generate awareness among consumers, promote salt reduction by processed food industry, and implement consumer friendly food labelling.
Conclusions: In this study of multiple key influential stakeholders in India, most of the stakeholders were in alignment with the need for a salt reduction programme in India to prevent and control hypertension and related CVD. The development and adoption of the National Multi-sectoral Action Plan to reduce premature non-communicable diseases (NCDs) in India, provides a potential platform that can be leveraged to drive, implement and monitor salt reduction efforts.

Village Health Sanitation and Nutrition Committees: reflections on strengthening community health governance at scale in India

Ved, R., K. Sheikh, A.S. George, and V.R. Raman. 2018. *BMJ Global Health* 3:e000681. doi:10.1136/bmjgh-2017-000681.
http://dx.doi.org/10.1136/bmjgh-2017-000681

India's National Health Mission constituted Village Health Sanitation and Nutrition Committees (VHSNCs) as a key mechanism for community health governance. Health committees provide citizens with the opportunity to shape health systems and policies. Yet much remains to be learnt on how best to sustain health committees as vehicles for community health governance at scale. This paper reflects on the authors' experiences of introducing revised guidelines and an institutional support package for VHSNCs in two pilot settings in India and outlines lessons we learnt for sustaining community health governance at geographic scale. We describe the importance of ensuring norms for equitable participation, aligning committee rules with existing forms of decentralised

government and providing key supports in terms of engaging NGOs as key implementation facilitators. Integration with rigid and unresponsive government administrative structures however remains a persistent challenge for scaling up health committees. With sustained financial support and strategic deployment of key personnel, VHSNCs could pave the way for more equitable and effective community participation in health governance at scale.

Boundary-spanning actors in complex adaptive governance systems: The case of multisectoral nutrition

Pelletier, D., S. Gervais, H. Hafeez-ur-Rehman, D. Sanou, and J. Tumwine. 2018. *The International Journal of Health Planning and Management*. doi: https://doi-org.ifpri.idm.oclc.org/10.1002/hpm.2468

A growing literature highlights complexity of policy implementation and governance in global health and argues that the processes and outcomes of policies could be improved by explicitly taking this complexity into account. Yet there is a paucity of studies exploring how this can be achieved in everyday practice. This study documents the strategies, tactics, and challenges of boundary-spanning actors working in 4 Sub-Saharan Africa countries who supported the implementation of multisectoral nutrition as part of the African Nutrition Security Partnership in Burkina Faso, Mali, Ethiopia, and Uganda. Three action researchers were posted to these countries during the final 2 years of the project to help the government and its partners implement multisectoral nutrition and document the lessons. Prospective data were collected through participant observation, end-line semi-structured interviews, and document analysis. All 4 countries made significant progress despite a wide range of challenges at the individual, organizational, and system levels. The boundary-spanning actors and their collaborators deployed a wide range of strategies but faced significant challenges in playing these unconventional roles. The study concludes that, under the right conditions, intentional boundary spanning can be a feasible and acceptable practice within a multisectoral, complex adaptive system in low- and middle-income countries.

Evidence to Action: Highlights From Transform Nutrition Research (2012-2017)

Gillespie, S., J. Hoddinott, N. Nisbett, S. Arifeen, and M. van den Bold. 2018. *Food and Nutrition Bulletin* 39(3): 335-360. https://doi.org/10.1177/0379572118788155

Background: The Transform Nutrition (Transform) research consortium (2012-2017), led by the International Food Policy Research Institute, sought to generate evidence to inform and inspire action to address undernutrition in 4 high-burden countries (India, Bangladesh, Kenya, and Ethiopia) and globally. **Objective**: Within the context of the literature, this synthesis article brings together core findings of Transform, highlighting priorities for future research. **Methods**: This article uses a narrative approach to synthesize diverse study findings that collectively address Transform's three primary research questions: (1) How can nutrition-specific interventions be appropriately designed, implemented, scaled, and sustained in different settings?; (2) How can the nutritional impact of social protection and agriculture be improved?; and (3) How can enabling environments be promoted so as to use existing political and economic resources more effectively? **Results**: Highlights of Transform include (1) improved understanding of the relative effectiveness of different combinations of nutrition-specific interventions and the ways in which they can be scaled for maximal impact; (2) evidence that shows that social protection and agriculture need to be explicitly linked to nutrition in order to contribute to stunting reduction; (3) identification of key components of "enabling environments" for nutrition and how they can be cultivated/sustained; (4) research that examines ways in which leaders emerge and operate to change the political and policy landscape in

different settings; and (5) “stories of change” that provide in-depth contextual knowledge of how transformative change has been driven in countries that have made inroads in reducing malnutrition. The conclusion highlights the contributions of the consortium and provides recommendations for future research.

2018 Global Hunger Index: Forced Migration and Hunger

von Grebmer, K., J. Bernstein, L. Hammond, F. Patterson, A. Sonntag, L. Klaus, J. Fahlbusch, O. Towey, C. Foley, S. Gitter, K. Ekstrom, and H. Fritschel. 2018. *2018 Global Hunger Index: Forced Migration and Hunger*. Bonn and Dublin: Welthungerhilfe and Concern Worldwide.
https://www.welthungerhilfe.org/fileadmin/pictures/publications/en/studies_analysis/2018-global-hunger-index.pdf

The 2018 Global Hunger Index (GHI) report—the thirteenth in an annual series—presents a multidimensional measure of global, regional, and national hunger. The latest data available show that while the world has made progress in reducing hunger since 2000, we still have a long way to go. Levels of hunger are still serious or alarming in 51 countries and extremely alarming in one country. This year’s report focuses on hunger and the rising levels of forced migration—two interlinked challenges that require long-term action and political solutions.

Advancing the science behind human resources for health: highlights from the Health Policy and Systems Research Reader on Human Resources for Health

George, A.S., J. Campbell, A. Ghaffar, and HPSR HRH reader collaborators. 2018. *Health Research Policy and Systems* 16:80.
https://doi.org/10.1186/s12961-018-0346-5

Health workers are central to people-centred health systems, resilient economies and sustainable development. Given the rising importance of the health workforce, changing human resource for health (HRH) policy and practice and recent health policy and systems research (HPSR) advances, it is critical to reassess and reinvigorate the science behind HRH as part of health systems strengthening and social development more broadly. Building on the recently published Health Policy and Systems Research Reader on Human Resources for Health (the Reader), this commentary reflects on the added value of HPSR underpinning HRH. HPSR does so by strengthening the multi-disciplinary base and rigour of HRH research by (1) valuing diverse research inferences and (2) deepening research enquiry and quality. It also anchors the relevance of HRH research for HRH policy and practice by (3) broadening conceptual boundaries and (4) strengthening policy engagement. Most importantly, HPSR enables us to transform HRH from being faceless numbers or units of health producers to the heart and soul of health systems and vital change agents in our communities and societies. Health workers’ identities and motivation, daily routines and negotiations, and training and working environments are at the centre of successes and failures of health interventions, health system functioning and broader social development. Further, in an increasingly complex globalised economy, the expansion of the health sector as an arena for employment and the liberalisation of labour markets has contributed to the unprecedented movement of health workers, many or most of whom are women, not only between public and private health sectors, but also across borders. Yet, these political, human development and labour market realities are often set aside or elided altogether. Health workers’ lives and livelihoods, their contributions and commitments, and their individual and collective agency are ignored. The science of HRH, offering new discoveries and deeper understanding of how universal health coverage and the Sustainable Development Goals are dependent on millions of health workers globally, has the potential to overcome this outdated and ineffective orthodoxy.

Perceived Social Networks and Newborn Health: Evidence from Self-Help Group Communities in Northern India

Ruducha, J., X. Huang, J. Potter, D. Hariharan, D. Ahmad, S. Kumar, P.S. Mohanan, and A. Hazra. 2018. *Societies* 8(4), 92: https://doi.org/10.3390/soc8040092.
https://doi.org/10.3390/soc8040092

The limitations of individual level interventions in changing behaviors to improve global maternal, newborn and child health have generated more interest in the patterns of social influence and decision making embedded in families, friends and communities. The purpose of this study is to expand the understanding of village dynamics in India and how first degree social and advice networks and cognitive perceptions of 185 recently delivered women (RDW) in areas with and without women's Self-Help Groups (SHGs) affect immediate breastfeeding. Data was collected in 6 blocks and 36 villages in Uttar Pradesh, India. The expansion of RDW's social worlds and creation of social capital through the organization of Self-Help Groups in their villages allowed us to examine basic relationships and advice formation as well as perceptions of interconnectedness of known groups. RDW living in SHG villages and blocks had consistently higher numbers of relationship ties, health advice ties and higher density of health advice networks than RDW living in the non-SHG areas. RDW's perceived knowing ties were also significantly higher between family and health workers in the SHG areas with related higher immediate breastfeeding rates. These results suggest that SHGs can accelerate community social capital and promote more accountability in the health system to engage with families and support the change from traditional to more evidence-based health practices.

Can community action improve equity for maternal health and how does it do so? Research findings from Gujarat, India

George, A.S., D. Mohan, J. Gupta, A.E. LeFevre, S. Balakrishnan, R. Ved, and R. Khanna. 2018. *International Journal for Equity in Health* 17:125.
https://doi.org/10.1186/s12939-018-0838-5

Background: Efforts to work with civil society to strengthen community participation and action for health are particularly important in Gujarat, India, given that the state has resources and capacity, but faces challenges in ensuring that services reach those most in need. To contribute to the knowledge base on accountability and maternal health, this study examines the equity effects of community action for maternal health led by Non-Government Organizations (NGOs) on facility deliveries. It then examines the underlying implementation processes with implications for strengthening accountability of maternity care across three districts of Gujarat, India. Community action for maternal health entailed NGOs a) working with community collectives to raise awareness about maternal health entitlements, b) supporting community monitoring of outreach government services, and c) facilitating dialogue with government providers and authorities with report cards based on community monitoring of maternal health. **Methods**: The study combined qualitative data (project documents and 56 stakeholder interviews thematically analyzed) with quantitative data (2395 women's self-reported receipt of information on entitlements and use of services over 3 years of implementation monitored prospectively through household visits). Multivariable logistic regression examined delivery care seeking and equity. Results: In the marginalised districts, women reported substantial increases in receipt of information of entitlements and utilization of antenatal and delivery care. In the marginalized and wealthier districts, a switch from private facilities to public ones was observed for the most vulnerable. Supportive implementation factors included a) alignment among NGO organizational missions, b) participatory development of project tools, c)

repeated capacity building and d) government interest in improving utilization and recognition of NGO contributions. Initial challenges included a) confidence and turnover of volunteers, b) complexity of the monitoring tool and c) scepticism from both communities and providers. **Conclusion**: With capacity and trust building, NGOs supporting community based collectives to monitor health services and engage with health providers and local authorities, over time overcame implementation challenges to strengthen public sector services. These accountability efforts resulted in improvements in utilisation of public sector services and a shift away from private care seeking, particularly for the marginalised.

NON-PEER REVIEWED

The state of food security and nutrition in the world 2018: Building climate resilience for food security and nutrition

FAO, IFAD, UNICEF, WFP and WHO. 2018. *The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition*. Rome, FAO.
http://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2018/en/

New evidence this year corroborates the rise in world hunger observed in this report last year, sending a warning that more action is needed if we aspire to end world hunger and malnutrition in all its forms by 2030. Updated estimates show the number of people who suffer from hunger has been growing over the past three years, returning to prevailing levels from almost a decade ago. Although progress continues to be made in reducing child stunting, over 22 percent of children under five years of age are still affected. Other forms of malnutrition are also growing: adult obesity continues to increase in countries irrespective of their income levels, and many countries are coping with multiple forms of malnutrition at the same time – overweight and obesity, as well as anaemia in women, and child stunting and wasting. Last year's report showed that the failure to reduce world hunger is closely associated with the increase in conflict and violence in several parts of the world. In some countries, initial evidence showed climate-related events were also undermining food security and nutrition. This year's report goes further to show that climate variability and extremes – even without conflict – are key drivers behind the recent rise in global hunger and one of the leading causes of severe food crises and their impact on people's nutrition and health. Climate variability and exposure to more complex, frequent and intense climate extremes are threatening to erode and reverse gains in ending hunger and malnutrition. Furthermore, hunger is significantly worse in countries where agriculture systems are highly sensitive to rainfall, temperature and severe drought, and where the livelihood of a high proportion of the population depends on agriculture. The findings of this report reveal new challenges to ending hunger, food insecurity and all forms of malnutrition. There is an urgent need to accelerate and scale up actions that strengthen resilience and adaptive capacity of people and their livelihoods to climate variability and extremes. These and other findings are detailed in the 2018 edition of The State of Food Security and Nutrition in the World.

India Field Report: Forging an Anemia-Free Future
The path to India's national anemia control programme

UNICEF. 2018. *Field reports: Lessons from improving nutrition at scale*. New York, UNICEF.
https://anemiamuktbharat.info/portal/wp-content/uploads/2018/09/Field_report_nutrition-web3.pdf

India has the largest universal adolescent anaemia control programme in the world, targeting 116 million adolescent girls and boys. The programme plays a pivotal role in protecting adolescents from the debilitating effects of anaemia, breaking the country's inter-generational cycle of malnutrition and safeguarding the health and potential of future generations. Good nutrition – including

sustaining adequate iron stores – puts all adolescents on the same starting line. India's 15-year journey towards nationwide expansion of its adolescent anaemia control programme offers vital lessons to other countries.

Statistical Analysis Using Data Mining: A District-Level Analysis of Malnutrition

Gupta, R., G. Raj, and T. Choudhury. 2018. *Statistical Analysis Using Data Mining: A District-Level Analysis of Malnutrition*. In: Bhateja V., Tavares J., Rani B., Prasad V., Raju K. (eds) Proceedings of the Second International Conference on Computational Intelligence and Informatics. Advances in Intelligent Systems and Computing, vol 712 (pp 707-721). Springer, Singapore. https://link.springer.com/chapter/10.1007/978-981-10-8228-3_65

Children in India suffer from the highest level of undernourishment in the world, having serious effects on health. Bihar, in turn, has the highest incidence in India. This study was taken up to ascertain the effect of clusterization on a large dataset with respect to analyzes of the association of multitude of variables with malnutrition indices. Raw data were obtained using secondary data sources, especially government reports pertaining to malnutrition indices, demographic, social, nutritional, economic and medical factors causing malnutrition. In stage one the variables from un-clustered data were correlated with malnutrition indices (Stunting, wasting and underweight). Subsequently, the data was split using RapidMiner Studio (version-7.2.003) into three clusters. This segregation was done by the software using k-means and hierarchical agglomerative clustering. In the second phase, each of these clusters was again analyzed using the software and the correlation results were compared. Significant variation was observed in most of the correlations in the clustered and un-clustered datasets. This indicates the importance of clusterization in reaching the truth when a statistical analysis is carried out, as clusterization excludes/segregates the outliers/extremes of values. This has significant implications in policy making for malnutrition control, through identifying the most relevant variables/factors responsible.

Maternal, Newborn and Child Health Programmes in India: A Programme Science Approach

Ramesh, B.M., S. S. Halli, K. Jayanna, and H.L. Mohan. 2018. *Maternal, Newborn and Child Health Programmes in India: A Programme Science Approach.* SAGE Publishing India, New Delhi. https://books.google.co.in/books?id=JwxjDwAAQBAJ&lr=&source=gbs_navlinks_s

Despite the existing plethora of knowledge and continuous efforts to identify synergies and integrate the interventions across the continuum of maternal, newborn and child health (MNCH), there is a lack of consensus on the best way forward to achieve the quickest reductions in maternal and child mortality rates in developing countries in a strategic and coordinated manner. This book fills the gap, and provides a strategic approach, process and tools for designing and implementing large-scale MNCH programmes that are covered by the health system. This strategic approach termed as 'programme science' embeds science into all phases of programme cycle to optimize results and resources in implementing large-scale MNCH programmes. The book argues, with examples from Karnataka and Uttar Pradesh, that programme science as an approach can significantly improve the MNCH services in developing countries.

Nonparametric tests for independence: a review and comparative simulation study with an application to malnutrition data in India

Herwartz, H., and S. Maxand. 2018. *Statistical Papers*. doi: https://doi.org/10.1007/s00362-018-1026-9

The detection of dependence structures within a set of random variables provides a valuable basis for a detailed subsequent investigation of their relationships. Nonparametric tests for independence require only basic assumptions on the marginal or joint distribution of the involved variables. In this paper, we review nonparametric tests of independence in bivariate as well as multivariate settings which are throughout ready-to-use, i.e., implemented in R packages. Highlighting their distinct empirical size and power properties in various small sample settings, our analysis supports an analyst in deciding for a most adequate test conditional on underlying distributional settings or data characteristics. Avoiding restrictive moment conditions, the copula based Cramér-von Mises distance of Genest and Rémillard (Test 13:335–370, 2004) is remarkably robust under the null hypothesis and powerful under diverse settings that are in line with the alternative hypothesis. Based on distinguished test outcomes in small samples, we detect nonlinear dependence structures between childhood malnutrition indices and possible determinants in an empirical application for India.

UPCOMING EVENTS

Accelerating the end of hunger and malnutrition

Description: The International Food Policy Research Institute (IFPRI) and the Food and Agriculture Organization of the United Nations (FAO) are organizing a global gathering to accelerate progress to end hunger and malnutrition. During the event, distinguished decision makers, practitioners, researchers, and other stakeholders will share evidence and lessons learned from around the world on how we can transform our agri-food systems to meet the needs of the hungry and malnourished. The event will contribute to cross-sectoral dialogue and information sharing and will advocate for accelerating progress at the global and country levels.
When: 28-30 November 2018
Where: Bangkok, Thailand
For more information: https://www.ifpri-faobangkokconference.org/

Call for Papers: 16th Midwest International Economic Development Conference (26-27 April 2019)

Deadline: 11 January 2019
Where: University of Wisconsin-Madison, USA
For more information: https://mwiedc.aae.wisc.edu/

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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