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

Issue 46 of the POSHAN Abstract Digest brings to you yet another collection of articles on various maternal and child nutrition topics. This issue features studies on the prevalence and impact of anaemia in adolescents, an ecological analysis of child undernutrition and overweight, micronutrient supplementation and linear growth, diets, diet quality, and dietary diversity. growth. This issue also include two studies- one on cost-consequence analyses and another on the process evaluation-based on nutrition-sensitive agriculture interventions implemented in Odisha to improve maternal and child health nutrition. Other interesting studies included in this issue are on birthweight data quality, decentralization in the Integrated Child Development Services, use of digital technology to improve service delivery, and changes to service delivery in multiple states across India during COVID-19.

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Enjoy reading!

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PEER-REVIEWED

Data Quality of Birthweight Reporting in India: Evidence from Cross-Sectional Surveys and Service Statistics

Unisa, S., Dhillon, P., Anand, E., Sahoo, H., Agarwal, P.K., and R. Johnston. 2022. "Data Quality of Birthweight Reporting in India: Evidence from Cross-Sectional Surveys and Service Statistics." *SSM–Population Health*. doi: https://doi.org/10.1016/j.ssmph.2022.101220

The study aims to assess the quality of birthweight data collected in two surveys, including the National Family Health Survey (NFHS) and the Comprehensive National Nutrition Survey (CNNS), and as reported in the statistics from the Health Management Information System (HMIS). The study also aims to assess the implications of the data on the estimates of low birthweight (LBW). The percentage of newborns whose birthweight is missing continues to be high in the recent surveys (NFHS-4: 22%, CNNS: 30%) despite an improvement from 66% in NFHS-3. The under-coverage of birthweight data in HMIS is around 40%. In the surveys, the percentage of missing data on birthweight is higher among newborns belonging to poor households, Scheduled Tribes, and Scheduled Castes. Irrespective of whether birthweights are reported from the health cards or from mother's recall, there's a high reporting at multiples of 500g and heaping at 2,500g. The prevalence of missing data on birthweight and of heaping is higher among children born at home in comparison to facility-based births. Birthweight data of dead children who were more likely to have had a lower birthweight is highly underreported. The paper demonstrates state-level variations in birthweight reporting and inconsistencies across surveys and HMIS. In 2015–16, the prevalence of LBW as per HMIS data was 12.5%, whereas during the same period, NFHS-4 and CNNS reported a prevalence of 18%. The findings suggest that LBW is likely to be underestimated when missing data as well as heaping at 2,500g are highly prevalent. To generate robust LBW estimates in India, there is an urgent need to devise methods to ensure coverage of all live births (including early neo-natal deaths) as well as the stillbirths, irrespective of the facility where the deliveries take place.

Age Heterogeneities in Child Growth and Its Associated Socio-Demographic Factors: A Cross-Sectional Study in India

Yadav, S., Bhandari, P. 2022. "Age Heterogeneities in Child Growth and Its Associated Socio-Demographic Factors: A Cross-Sectional Study in India." *BMC Pediatrics* 22, 384. Doi: https://doi.org/10.1186/s12887-022-03415-x

Background: The impacts of socio-demographic and environmental risk factors on child growth have been widely documented. However, it remains unclear whether the impacts of such risk factors on child growth have remained static or changed with child's age. The present study aims to assess the underlying age heterogeneities in child growth and its potential determinants over age in under-five children. **Methods:** Cross-sectional data on child height (measured as height-for-age z-score, i.e., HAZ) and weight (measured as weight-for-age z-score, i.e., WAZ) and potential confounding factors from India's 2015–16 National Family Health Survey (NFHS) were used to construct anthropometric age-profiles by a number of bio-demographic and socioeconomic characteristics. Further, age-interacted multilevel regression analyses were performed to examine differential effects of such/those risk factors on child height and weight by age. **Results:** Faltered height and weight growth during first two years of life was noticed in children of all socioeconomic groups studied, albeit with varying magnitude. In case of child's height, factors such as short birth interval, higher birth order, maternal education, household wealth, district level mortality rate have shown strong interaction with child's age during the first 23 months, signifying their age-varying role in different developmental stages of child growth. These factors explain the observed upward and downward shifts in height curve during first two years. Some of these variables (e.g., household wealth) have

shown even stronger age interactions after the second birthday of children. For child's weight, interactive effects of most socio-demographic risk factors attenuated parabolically with child's age. **Conclusions:** The impacts of several risk factors, measured at the child, mother, community, and district levels, on child growth indicators varied significantly with the child's age. Nutritional interventions aimed at preventing poor linear growth in children in India should consider these underlying age heterogeneities for growth determinants into account.

The Relationship Between Ferritin and Body Mass Index is Mediated by Inflammation Among Women in Higher-Income Countries, But Not in Most Lower-Income Countries Nor Among Young Children: A Multi-Country Analysis

Davis, J., Williams, A., Arnold, C.D., Rohner, F., Wirth, J.P., Addo, Y., Flores-Ayala, R.C., Oaks, B.M., Young, M.F., Suchdev, P.S., and R. Engle-Stone. 2022. "The Relationship Between Ferritin and Body Mass Index is Mediated by Inflammation Among Women in Higher-Income Countries, But Not in Most Lower-Income Countries Nor Among Young Children: A Multi-Country Analysis." *Current Developments in Nutrition* nzac139. doi: https://doi.org/10.1093/cdn/nzac139

Background: In the presence of inflammation, serum or plasma ferritin concentration ('ferritin') transiently increases, confounding its interpretation as an iron status marker. The extent to which adiposity-related inflammation may influence ferritin interpretation is uncertain. **Objective:** To describe relationships between weight status, inflammation, and ferritin among non-pregnant women of reproductive age (15-49 years, WRA) and preschool-age children (6-59 months, PSC) with normal weight to overweight or obesity (OWOB) in differing geographic settings. **Methods:** Cross-sectional data were separately analyzed from n = 18 surveys (WRA) and n = 25 surveys (PSC) from the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) project, excluding observations with underweight, wasting, pregnancy, or malaria. Relationships were assessed between BMI (WRA) or BMI-for-age z-score (BAZ, PSC), inflammatory biomarkers C-reactive protein (CRP) and/or α-1-acid glycoprotein (AGP), and ferritin by linear regression, and potential mediation by CRP and/or AGP in relationships between BMI or BAZ and ferritin with structural equation modeling. Regression and mediation models accounted for complex survey designs. Results were grouped by World Bank income classifications. Included Kenya trial data registered at http://clinicaltrials.gov, identifier NCT01088958. **Results:** In 5 of 6 surveys among WRA from upper-middle and high-income countries, ferritin was significantly positively associated with BMI, and this relationship was partially (or fully in the United States) mediated by CRP and/or AGP. Mediation was present in 4 of 12 surveys for WRA in low- and lower-middle income countries. Among PSC, ferritin was positively associated with CRP and/or AGP in all surveys, but there were no significant CRP- or AGP-mediated relationships between ferritin and BAZ, except a negative relationship in the Philippines. **Conclusions:** Where OWOB are common among WRA, measurement of inflammatory biomarkers and their use in interpreting ferritin may improve iron status assessment. While these relationships were inconsistent among PSC, inflammation was common and should be measured to interpret iron status.

Anaemia in Indians Aged 10–19 Years: Prevalence, Burden and Associated Factors at National and Regional Levels

Scott, S., Lahiri, A., Sethi, V., de Wagt, A., Menon, P., Yadav, K., Varghese, M., Joe, W., Vir, S.C., and P.H. Nguyen. 2022. "Anaemia in Indians Aged 10–19 Years: Prevalence, Burden and Associated Factors at National and Regional Levels." *Maternal Child Nutrition* 20: e13391. doi: https://doi.org/10.1111/mcn.13391

Anaemia control programmes in India are hampered by a lack of representative evidence on anaemia prevalence, burden and associated factors for adolescents. The aim of this study was to: (1) describe the national and subnational prevalence, severity and burden of anaemia among Indian adolescents; (2) examine factors associated with anaemia at national and regional levels. Data (n = 14,673 individuals aged 10-19 years) were from India's Comprehensive National Nutrition Survey (CNNS, 2016-2018). CNNS used a multistage, stratified, probability proportion to size cluster sampling design. Prevalence was estimated using globally comparable age- and sex-specific cutoffs, using survey weights for biomarker sample collection. Burden analysis used prevalence estimates and projected population from 2011 Census data. Multivariable logistic regression models were used to analyse factors (diet, micronutrient deficiencies, haemoglobinopathies, sociodemographic factors, environment) associated with anaemia. Anaemia was present in 40% of girls and 18% of boys, equivalent to 72 million adolescents in 2018, and varied by region (girls 29%-46%; boys 11%-28%) and state (girls 7%-62%; boys 4%-32%). Iron deficiency (ferritin < 15 µg/L) was the strongest predictor of anaemia (odds ratio [OR]: 4.68, 95% confidence interval [CI]: [3.21,6.83]), followed by haemoglobinopathies (HbA2 > 3.5% or any HbS) (OR: 2.81, 95% CI: [1.66,4.74]), vitamin A deficiency (serum retinol <20 ng/ml) (OR: 1.86, 95% CI: [1.23,2.80]) and zinc deficiency (serum zinc < 70 µg/L) (OR: 1.32, 95% CI: [1.02,1.72]). Regional models show heterogeneity in the strength of association between factors and anaemia by region. Adolescent anaemia control programmes in India should continue to address iron deficiency, strengthen strategies to identify haemoglobinopathies and other micronutrient deficiencies, and further explore geographic variation in associated factors.

Changes in Anemia and Anthropometry During Adolescence Predict Learning Outcomes: Findings From a 3-Year Longitudinal Study in India

Nguyen, P.H., Walia, M., Pant, A., Menon, P., and S. Scott. 2022. "Changes in Anemia and Anthropometry During Adolescence Predict Learning Outcomes: Findings From a 3-Year Longitudinal Study in India." *American Journal of Clinical Nutrition* 115(6): 1549–1558. doi: https://doi.org/10.1093/ajcn/nqac028

Background: Anemia and poor physical growth during adolescence have far-ranging consequences, but limited longitudinal evidence exists on how changes in these factors relate to changes in learning skills as adolescents mature. **Objectives:** We examined the association between changes in anemia and physical growth during adolescence and learning outcomes. **Methods:** We used longitudinal data from the Understanding the Lives of Adolescents and Young Adults (UDAYA) project, which surveyed adolescents aged 10–19 y in northern India in 2015–2016 and 2018–2019 (n = 5963). We used multilevel mixed-effects logistic regression models to examine associations between changes in anemia/thinness/stunting status (4 groups: never, improved, new, and persistent) and reading (ability to read a story) and math proficiency (ability to solve division problems) at follow-up. **Results:** Persistent anemia and stunting were higher among girls than among boys (46% compared with 8% and 37% compared with 14%, respectively), but persistent thinness was lower (7% compared with 16%). Improvement in anemia, thinness, and stunting was 1.4–1.7 times higher among boys than among girls. Boys who were anemic in both waves were 74% [adjusted odds ratio (AOR): 0.26; 95% CI: 0.12, 0.59] and 65% (AOR: 0.35; 95% CI: 0.16, 0.76) less likely to be able to read a story and solve division problems, respectively, than boys who were nonanemic in both waves. Persistent thinness in boys was negatively associated with both reading (AOR: 0.37; 95% CI: 0.21, 0.66) and math proficiency (AOR: 0.27; 95% CI: 0.16, 0.46). Persistent stunting contributed to lower reading and math proficiency in boys and girls (AORs: 0.29–0.46). Boys whose anemia or thinness status improved and girls whose stunting status improved had similar learning skills at follow-up as those who were never anemic/thin/stunted. **Conclusions:** Persistent anemia, thinness, and short stature during adolescence were associated with poor learning. Programs targeted at adolescents should contribute to nurturing environments that foster healthy growth and learning.

Changes in Child Undernutrition and Overweight in India From 2006 to 2021: An Ecological Analysis of 36 States

Varghese, J.S., Gupta, A., Mehta, R., Stein, A.D., and S.A. Patel. 2022. "Changes in Child Undernutrition and Overweight in India From 2006 to 2021: An Ecological Analysis of 36 States." *Global Health: Science and Practice*. doi: https://doi.org/10.9745/GHSP-D-21-00569

Objectives: We evaluated changes in priority indicators of child growth from 2006 to 2021 and examined the role of human development measures in these changes. **Methods:** We estimated cumulative and annualized changes in state- and district-level child growth indicators using 3 rounds of National Family Health Surveys (2005–2006, 2015–2016, 2019–2021) in 36 states. Outcomes included stunting, underweight, wasting, and overweight. Human development was measured using a principal components analysis of 9 ecological indicators. We contrasted expected versus observed changes in district-level growth outcomes between 2016 and 2021 based on changes in development indicators using 2-way Blinder Oaxaca decomposition. **Results:** From 2006 to 2021, the prevalence of stunting, underweight, and wasting decreased by 12.3, 10.3, and 0.7 percentage points, respectively, while the prevalence of overweight increased by 1.9 percentage points. The annualized rate of within-state change for stunting was lower from 2016 to 2021 compared with the 2006 to 2016 period, while the rate of change in overweight was higher. Simultaneously, all 9 human development indicators improved between 2006 and 2021. A unit increase between 2016 and 2021 in the human development score predicted a −5.1 percentage point (95% confidence interval=−5.8, −4.4) change in stunting, yet observed stunting declined by just -2.5 percentage points. **Conclusions:** From 2016 to 2021, population-level reduction in child stunting has slowed and the rise in child overweight has accelerated, relative to the 10 years preceding this period.

Vitamin B12 and/or Folic Acid Supplementation on Linear Growth: A 6-Year Follow-Up Study of a Randomised Controlled Trial in Early Childhood in North India

Taneja, S., Chowdhury, R., Kvestad, I., Bhandari, N., and Strand, T. 2022. "Vitamin B12 and/or Folic Acid Supplementation on Linear Growth: A 6-Year Follow-Up Study of a Randomised Controlled Trial in Early Childhood in North India." *British Journal of Nutrition*, 1–8. doi: https://doi.org/10.1017/S0007114522002343

Folate and vitamin B12 are essential for growth. Our objective was to estimate their long-term effects on linear growth in North Indian children. This is a follow-up study of a factorial designed, double-blind, randomised, placebo-controlled trial in 1000 young children. Starting at 6–30 months of age, we gave folic acid (approximately 2 RDA), vitamin B12 (approximately 2 RDA), both vitamins or a placebo daily for 6 months. Six years after the end of supplementation, we measured height in 791 children. We used the plasma concentrations of cobalamin, folate and total homocysteine to estimate vitamin status. The effect of the interventions, the association between height-for-age z-scores (HAZ) and baseline vitamin status, and the interactions between supplementation and baseline status were estimated in multiple regression models. Mean (SD) age at follow-up was 7·4 (0·7) years (range 6 to 9 years). There was a small, non-significant effect of vitamin B12 on linear growth and no effect of folic acid. We observed a subgroup effect of vitamin B12 supplementation in those with plasma cobalamin concentration < 200 pmol/l (Pfor interaction = 0·01). The effect of vitamin B12 supplementation in this group was 0·34 HAZ (95 % CI 0·11, 0·58). We found an association between cobalamin status and HAZ in children not given vitamin B12 (Pfor interaction = 0·001). In this group, each doubling of the cobalamin concentration was associated with 0·26 (95 % CI 0·15, 0·38) higher HAZ. Suboptimal vitamin B12 status in early childhood seemingly limits linear growth in North Indian children.

Quintuply-Fortified Salt for the Improvement of Micronutrient Status Among Women of Reproductive Age and Preschool-Aged Children in Punjab, India: Protocol for a Randomized, Controlled, Community-Based Trial

McDonald, C.M., Brown, K.H., Goh, Y.E. Manger, M.S., Arnold, C.D., Krebs, N.F., Westcott, J., Long, J.M., Gibson, R.S., Jamwal, M., Singh, B.L., Dahiya, N., Budhija, D., Das, R., and M. Duggal. 2022. "Quintuply-Fortified Salt for the Improvement of Micronutrient Status Among Women of Reproductive Age and Preschool-Aged Children in Punjab, India: Protocol for a Randomized, Controlled, Community-Based Trial." *BMC Nutrition* 8(98). doi: https://doi.org/10.1186/s40795-022-00583-y

Background: Multiple micronutrient (MN) deficiencies remain highly prevalent among women of reproductive age (WRA) and preschool-aged children (PSC) in many areas within India. Salt is an attractive vehicle for MN fortification in this context, as it is universally consumed in fairly consistent amounts and coverage of iodized salt (IS) is 94%. The overall objective of this trial is to evaluate the nutritional impact of quintuply-fortified salt with iron in the form of encapsulated ferrous fumarate, zinc, vitamin B12, folic acid, and iodine (eFF-Q5S) vs. quintuply-fortified salt with iron in the form of ferric pyrophosphate plus EDTA, zinc, vitamin B12, folic acid, and iodine (FePP-Q5S) vs. IS for the improvement of MN status among non-pregnant WRA and PSC. **Methods:** The study is a community-based, randomized, controlled trial that will be conducted in Punjab, India. 780 non-pregnant WRA 18–49 years old and 468 PSC 12–59 months old will be enrolled and assigned to one of three intervention groups. Salt will be provided to participants monthly for 12 months. Primary outcomes include changes in mean concentration of biomarkers of iron, zinc, vitamin B12, folate and iodine. Secondary outcomes include changes in the composition of the gut microbiome, and discretionary salt intake of PSC. **Discussion:** If proven efficacious, multiply-fortified salt (MFS) has the potential to drastically reduce the burden of MN deficiencies in India, and around the world. Although effectiveness research will be needed to examine the impact of MFS under programmatic conditions, salt fortification will piggy-back on existing platforms to produce IS and doubly-fortified salt (DFS), making it possible to scale-up the intervention quickly.

Minimum Dietary Diversity and Associated Factors Among Lactating Mothers in Haryana, India: A Community Based Cross-Sectional Study

Shumayla, S., Irfan, E.M., Kathuria, N., Rathi, S.K., Srivastava, S., and S. Mehra. 2022. "Minimum Dietary Diversity and Associated Factors Among Lactating Mothers in Haryana, India: A Community Based Cross-Sectional Study." *BMC Pediatrics* 22(525). doi: https://doi.org/10.1186/s12887-022-03588-5

Introduction: Food adequacy and dietary quality in the lactation period are fundamental for maternal and child health. Lactating mothers are vulnerable to malnutrition because of increased physiological demand, monotonous diet, lactogenesis process, and increased nutrient requirements. The micronutrient adequacy especially among women is not ensured in Indian diet. The dual course of gender bias and poverty, along with lack of knowledge about diet quality are significant impediments in maintaining minimum dietary diversity among Indian women. The study aimed to assess the prevalence of minimum dietary diversity and associated factors among lactating women. **Methodology:** A community-based cross-sectional study was conducted among 1236 lactating women through a multistage sampling procedure in Haryana state, India. Data were collected in Computer-assisted personal interviewing (CAPI) using a pretested structured interview schedule. Minimum Dietary Diversity for Women by Food and Agriculture Organization (FAO) was used to calculate the minimum dietary diversity. **Results:** The mean dietary diversity score among lactating

women from the ten food groups was 6.35 ± 2.57 and the prevalence of minimum dietary diversity was 77.1%. The complete model revealed that both individual and household factors can explain the variation in dietary diversity intake. Furthermore, the result of model 2 explained that women aged 31 to 35 years (AOR 5.92,95% (1.87–18.77), graduation and above qualified women (AOR 1.98, 95% (0.96–4.09) and lactating women with high knowledge on nutrition (AOR 2.00, 95% (1.34–4.57) were the significant factors promoting minimum dietary diversity. **Conclusion:** Three-fourths of the lactating women reached adequate minimum dietary diversity. Younger age, low educational level, and poor nutritional knowledge were significant constraints to achieving minimum dietary diversity. Further improvement in the minimum dietary diversity among lactating women is very much required. It is also advised that exiting platforms dispersing awareness on nutrition should be supported and strengthened.

Transition in Dietary Quality: Evidence from India

Paul, S., and S. Paul. 2022. "Transition in Dietary Quality: Evidence from India." *British Journal of Nutrition* 1–35. doi: https://doi.org/10.1017/S0007114522002847

Despite significant economic growth over the past decades, poor nutritional status in India is a serious concern. The social transformation led by growth in income influences both the composition of food and the quality of diet consumed. Against this backdrop of changing lifestyles and the rise in obesity and Non-Communicable Diseases, in this study, we examined changes in diet quality and the critical socio-economic correlates of this quality from 1983 to 2012 using three rounds of nationally representative surveys providing information on food consumption for more than 100,000 households in each round. We constructed diet quality indices at the household level using deficient and excess intake of macro and micronutrients compared to the recommended daily allowances for different age-sex groups of the Indian population. We found that in relation to the Recommended Daily Allowance, fat consumption increased over time while protein and energy consumption decreased. The average diet quality index improved in the rural sector while it deteriorated in the urban sector. Caste and religion are significant correlates of the diet quality index. The deficiency index of nutrients decreased for poor households as they get richer, however, it increased with affluence level for the non-poor. It is suggested that the Indian Government may play a more proactive role in implementing coherent national policies in trade, food, and agriculture to protect public health by promoting the demand for a healthy diet.

Indigenous Foods to Address Malnutrition: An Inquiry into the Diets and Nutritional Status of Women in the Indigenous Community of Munda Tribes of Jharkhand, India

Ghosh-Jerath, S., Kapoor, R., Bandhu, A., Singh, A., Downs, S., and J. Fanzo. 2022. "Indigenous Foods to Address Malnutrition: An Inquiry into the Diets and Nutritional Status of Women in the Indigenous Community of Munda Tribes of Jharkhand, India." *Current Developments in Nutrition* 6(9): nzac102. doi: https://doi.org/10.1093/cdn/nzac102

Background: Indigenous people globally experience poor nutrition outcomes, with women facing the greater burden. Munda, a predominant tribe in Jharkhand, India, live in a biodiverse food environment but yet have high levels of malnutrition. **Objectives:** To assess diets and the nutritional status of Munda tribal women and explore associations with their Indigenous food consumption, dietary diversity, and socioeconomic and demographic profiles. **Methods:** A cross-sectional study with a longitudinal component to capture seasonal dietary intake was conducted in 11 villages of the Khunti district, Jharkhand. Household surveys and FFQs, supplemented with 2-d 24-h dietary recall and anthropometric assessments on 1 randomly selected woman per household were conducted.

Results: Limited access to diverse foods from a natural food environment (Food Accessed Diversity Index score of 0.3 ± 0.3) was observed. More than 90% women in both seasons had usual nutrient intakes below the estimated average requirements for all nutrients except protein and vitamin C; 35.5% of women were underweight. The mean Minimum Dietary Diversity Score among women (MDDS) was low [2.6 ± 0.6 in wet monsoon; 3 ± 0.7 in winters (acceptable ≥5)]. Higher MDDS contributed to higher usual nutrient intakes (P <0.001). Indigenous food intakes in both seasons (wet monsoon and winter) were low, e.g. Indigenous green leafy vegetables [10.5 and 27.8% of the recommended dietary intake (RDI), respectively], other vegetables (5.2% and 7.8% of RDI, respectively), and fruits (5.8 and 22.8% of RDI, respectively). Despite low intakes, the Indigenous food consumption score was positively associated with usual intake of vitamin A, riboflavin, vitamin C, pyridoxine, and calcium (P < 0.05) in the wet monsoon and thiamine, riboflavin, and zinc (P < 0.001) in winters. After adjusting for covariates, Indigenous food consumption was associated with a higher usual intake of vitamin A (P < 0.001) in the wet monsoon season. **Conclusion:** Contextual food-based interventions promoting Indigenous foods and increasing dietary diversity have the potential to address malnutrition in Munda women.

Understanding the Effects of Nutrition-Sensitive Agriculture Interventions with Participatory Videos and Women's Group Meetings on Maternal and Child Nutrition in Rural Odisha, India: A Mixed-Methods Process Evaluation

Prost, A., Harris-Fry, H., Mohanty, S., Parida, M., Krishnan, S., Fivian, E., Rath, S., Nair, N., Mishra, N.K., Padhan, S., Pradhan, R., Sahu, S., Skordis, J., Danton, H., Koniz-Booher, P., Beaumont, E., James, P., Allen, E., Elbourne, D., and S. Kadiyala. 2022. "Understanding the Effects of Nutrition-Sensitive Agriculture Interventions with Participatory Videos and Women's Group Meetings on Maternal and Child Nutrition in Rural Odisha, India: A Mixed-Methods Process Evaluation." *Maternal and Child Nutrition* 19: e13398. doi: https://doi.org/10.1111/mcn.13398

A trial of three nutrition-sensitive agriculture interventions with participatory videos and women's group meetings in rural Odisha, India, found improvements in maternal and child dietary diversity, limited effects on agricultural production, and no effects on women and children's nutritional status. Our process evaluation explored fidelity, reach, and mechanisms behind interventions' effects. We also examined how context affected implementation, mechanisms, and outcomes. We used data from intervention monitoring systems, review notes, trial surveys, 32 case studies with families (n = 91 family members), and 20 group discussions with women's group members and intervention workers (n = 181 and 32, respectively). We found that interventions were implemented with high fidelity. Groups reached around half of the mothers of children under 2 years. Videos and meetings increased women's knowledge, motivation and confidence to suggest or make changes to their diets and agricultural production. Families responded in diverse ways. Many adopted or improved rainfed homestead garden cultivation for consumption, which could explain gains in maternal and child dietary diversity seen in the impact evaluation. Cultivation for income was less common. This was often due to small landholdings, poor access to irrigation and decision-making dominated by men. Interventions helped change norms about heavy work during pregnancy, but young women with little family support still did considerable work. Women's ability to shape cultivation, income and workload decisions was strongly influenced by support from male relatives. Future nutrition-sensitive agriculture interventions could include additional flexibility to address families' land, water, labour and time constraints, as well as actively engage with spouses and in-laws.

Economic Evaluation of Nutrition-Sensitive Agricultural Interventions to Increase Maternal and Child Dietary Diversity and Nutritional Status in Rural Odisha, India

Haghparast-Bidgoli, H., Harris-Fry, H., Kumar, A., Pradhan, R., Mishra, N.K, Padhan, S., Ojha, A.K., Mishra, S.N., Fivian, E., James, P., Ferguson, S., Krishnan, S., O'Hearn, M., Palmer, T., Koniz-Booher, P., Danton, H., Minovi, S., Mohanty, S., Rath, S., Rath, S., Nair, N., Tripathy, P., Prost, A., Allen, E., Skordis, J., and S. Kadiyala, 2022. "Economic Evaluation of Nutrition-Sensitive Agricultural Interventions to Increase Maternal and Child Dietary Diversity and Nutritional Status in Rural Odisha, India" *The Journal of Nutrition* nxac132. doi: https://doi.org/10.1093/jn/nxac132

Background: Economic evaluations of nutrition-sensitive agriculture (NSA) interventions are scarce, limiting assessment of their potential affordability and scalability. **Objectives:** We conducted cost–consequence analyses of 3 participatory video-based interventions of fortnightly women's group meetings using the following platforms: 1) NSA videos; 2) NSA and nutrition-specific videos; or 3) NSA videos with a nutrition-specific participatory learning and action (PLA) cycle. **Methods:** Interventions were tested in a 32-mo, 4-arm cluster-randomized controlled trial, Upscaling Participatory Action and Videos for Agriculture and Nutrition (UPAVAN) in the Keonjhar district, Odisha, India. Impacts were evaluated in children aged 0–23 mo and their mothers. We estimated program costs using data collected prospectively from expenditure records of implementing and technical partners and societal costs using expenditure assessment data collected from households with a child aged 0–23 mo and key informant interviews. Costs were adjusted for inflation, discounted, and converted to 2019 US$. **Results:** Total program costs of each intervention ranged from US$272,121 to US$386,907. Program costs per pregnant woman or mother of a child aged 0–23 mo were US$62 for NSA videos, US$84 for NSA and nutrition-specific videos, and US$78 for NSA videos with PLA (societal costs: US$125, US$143, and US$122, respectively). Substantial shares of total costs were attributable to development and delivery of the videos and PLA (52–69%) and quality assurance (25–41%). Relative to control, minimum dietary diversity was higher in the children who underwent the interventions incorporating nutrition-specific videos and PLA (adjusted RRs: 1.19 and 1.27; 95% CIs: 1.03–1.37 and 1.11, 1.46, respectively). Relative to control, minimum dietary diversity in mothers was higher in those who underwent NSA video (1.21 [1.01, 1.45]) and NSA with PLA (1.30 [1.10, 1.53]) interventions. **Conclusion:** NSA videos with PLA can increase both maternal and child dietary diversity and have the lowest cost per unit increase in diet diversity. Building on investments made in developing UPAVAN, cost-efficiency at scale could be increased with less intensive monitoring, reduced startup costs, and integration within existing government programs.

Can Digitally Enabling Community Health and Nutrition Workers Improve Services Delivery to Pregnant Women and Mothers of Infants? Quasi-Experimental Evidence from a National-Scale Nutrition Programme in India

Patil, S.R., Nimmagadda, S., Gopalakrishnan, L., Avula, R., Bajaj, S., Diamond-Smith, N., Paul, A., Fernald, L., Menon, P., and D. Walker. 2022. "Can Digitally Enabling Community Health and Nutrition Workers Improve Services Delivery to Pregnant Women and Mothers of Infants? Quasi-Experimental Evidence from a National-Scale Nutrition Programme in India." *BMJ Global Health* 6(5):e007298. doi: https://doi.org/10.1136/bmjgh-2021-007298

Background: India's 1.4 million community health and nutrition workers (CHNWs) serve 158 million beneficiaries under the Integrated Child Development Services (ICDS) programme. We assessed the impact of a data capture, decision support, and job-aid mobile app for the CHNWs on two primary outcomes-(1) timeliness of home visits and (2) appropriate counselling specific to the needs of pregnant women and mothers of children <12 months. **Methods:** We used a quasi-experimental pair-matched controlled trial using repeated cross-sectional surveys to evaluate the intervention in Bihar and Madhya Pradesh (MP) separately using an intention-to-treat analysis. The study was powered to detect difference of 5-9 percentage points (pp) with type I error of 0.05 and type II error of 0.20 with endline sample of 6635 mothers of children <12 months and 2398 pregnant women

from a panel of 841 villages. **Results:** Among pregnant women and mothers of children <12 months, recall of counselling specific to the trimester of pregnancy or age of the child as per ICDS guidelines was higher in both MP (11.5pp (95% CI 7.0pp to 16.0pp)) and Bihar (8.0pp (95% CI 5.3pp to 10.7pp)). Significant differences were observed in the proportion of mothers of children <12 months receiving adequate number of home visits as per ICDS guidelines (MP 8.3pp (95% CI 4.1pp to 12.5pp), Bihar: 7.9pp (95% CI 4.1pp to 11.6pp)). Coverage of children receiving growth monitoring increased in Bihar (22pp (95% CI 0.18 to 0.25)), but not in MP. No effects were observed on infant and young child feeding practices. **Conclusion:** The at-scale app integrated with ICDS improved provision of services under the purview of CHNWs but not those that depended on systemic factors, and was relatively more effective when baseline levels of services were low. Overall, digitally enabling CHNWs can complement but not substitute efforts for strengthening health systems and addressing structural barriers.

Two Cheers for Decentralisation: Unpacking Mechanisms, Politics and Accountability in the ICDS, Central India

Chanchani, D. 2022. "Two Cheers for Decentralisation: Unpacking Mechanisms, Politics and Accountability in the ICDS, Central India." *European Journal of Development Research*. doi: https://doi.org/10.1057/s41287-022-00545-x

From long-term qualitative research this paper argues that Chhattisgarh's decentralised mechanisms in implementation of the Integrated Child Development Services (ICDS) foster increased stake of local communities and local politics, and that these work to enhance accountability and programme quality. A larger number of actors with financial interests in the scheme at the level of the sub-block ICDS 'sector' and down to the village leads to wider distribution of financial gains from delivery of ICDS Services, thereby increasing local competition and political interest from lower tiers of governance. Decentralised mechanisms work to enhance checks and balances via formal and informal routes to governance and accountability. Chhattisgarh's ICDS represents a 'hybrid model' between the short and long routes to accountability. While competing interests from local politics and institutions of governance work to improve ICDS accountability, they also work to appropriate the programme for political gain, or unfairly target ICDS workers. The paper unpacks mechanisms by which local politics relate with decentralised prescriptions in ICDS implementation. It gives the decentralised mechanisms a qualified two cheers.

Disruptions, Restorations and Adaptations to Health and Nutrition Service Delivery in Multiple States Across India Over the Course of the COVID-19 Pandemic in 2020: An Observational Study

Avula R, Nguyen PH, Ashok S, Bajaj S, Kachwaha S, Pant A, Walia M, Singh A, Paul A, Singh A, Kulkarni B, Singhania D, Escobar-Alegria J, Augustine LF, Khanna M, Krishna M, Sundaravathanam N, Nayak PK, Sharma PK, Makkar P, Ghosh P, Subramaniam S, Mala S, Giri R, Jain S, Banjara SK, Nair S, Ghosh S, Das S, Patil S, Mahapatra T, Forissier T, Nanda P, Krishnan S, Menon P. 2022. "Disruptions, Restorations and Adaptations to Health and Nutrition Service Delivery in Multiple States Across India Over the Course of the COVID-19 Pandemic in 2020: An Observational Study," *PLoS One* 17(7):e0269674. doi: https://doi.org/10.1371/journal.pone.0269674

Background: Modeling studies estimated severe impacts of potential service delivery disruptions due to COVID-19 pandemic on maternal and child nutrition outcomes. Although anecdotal evidence exists on disruptions, little is known about the actual state of service delivery at scale. We studied disruptions and restorations, challenges and adaptations in health and nutrition service delivery by frontline workers (FLWs) in India during COVID-19 in 2020. **Methods:** We conducted phone surveys with 5500 FLWs (among them 3118 Anganwadi Workers) in seven states between August–October

2020, asking about service delivery during April 2020 (T1) and in August-October (T2), and analyzed changes between T1 and T2. We also analyzed health systems administrative data from 704 districts on disruptions and restoration of services between pre-pandemic (December 2019, T0), T1 and T2. **Results:** In April 2020 (T1), village centers, fixed day events, child growth monitoring, and immunization were provided by <50% of FLWs in several states. Food supplementation was least disrupted. In T2, center-based services were restored by over a third in most states. Administrative data highlights geographic variability in both disruptions and restorations. Most districts had restored service delivery for pregnant women and children by T2 but had not yet reached T0 levels. Adaptations included home delivery (60 to 96%), coordinating with other FLWs (7 to 49%), and use of phones for counseling (~2 to 65%). Personal fears, long distances, limited personal protective equipment, and antagonistic behavior of beneficiaries were reported challenges. **Conclusions:** Services to mothers and children were disrupted during stringent lockdown but restored thereafter, albeit not to pre-pandemic levels. Rapid policy guidance and adaptations by FLWs enabled restoration but little remains known about uptake by client populations. As COVID-19 continues to surge in India, focused attention to ensuring essential services is critical to mitigate these major indirect impacts of the pandemic.

NON-PEER REVIEWED

Mid-Term Review of the Strategic Action Plan To Reduce the Double Burden of Malnutrition in the WHO South-East Asia Region 2016–2025

World Health Organization. 2022. *Mid-Term Review of the Strategic Action Plan To Reduce the Double Burden of Malnutrition in the WHO South-East Asia Region 2016–2025*. New Delhi: World Health Organization, Regional Office for South-East Asia.
https://www.who.int/publications/i/item/9789290209898

The WHO South-East Asia Region (SE Asia Region) is the most populous Region in the world with high levels of poverty, disease burden and malnutrition. The combination of rapid nutritional, epidemiological and demographical transition has impacted the nutrition profile across the Member States of the Region. While undernutrition rates, including micronutrient malnutrition, are declining slowly, a significant rise in overweight and obesity – the double burden – is seen across many age groups. There is also an associated rapid upsurge in noncommunicable diseases (NCDs).

The extent of the double burden varies across Member States necessitating urgent and sustained efforts to address, combat and overcome the issues of undernutrition, overweight and obesity and associated NCDs. The identification, promotion and implementation of double-duty actions that simultaneously and synergistically address undernutrition as well as overweight, obesity and diet-related NCDs across key policy action areas are envisaged as inevitably important opportunities and immediate priorities.

Using Flow Charts and Health Systems Strengthening to Improve Antenatal Nutrition Services in India

Sethi, V., Mishra, A., Singh, A.P., Pawar, S., Awasthy, P. and A. de Wagt. 2022. “Using Flow Charts and Health Systems Strengthening to Improve Antenatal Nutrition Services in India.” Field Exchange 68.
www.ennonline.net/fex/68/chartsystemsantenatalindia

Many Indian women enter pregnancy with poor nutrition – 19% of women of reproductive age are thin for their height (body mass index (BMI) less than 18.5 kg/m2), 24% are obese (BMI greater than 25 kg/m2) and 57% are anaemic (haemoglobin (Hb) levels < 12.0 g/dL). Additionally, 15% of

pregnant women are adolescent mothers (IIPS, 2021). An estimated 30 million pregnant women in India are eligible to receive antenatal nutrition services, delivered through two national centrally sponsored schemes – the Integrated Child Development Services (Ministry of Women and Child Development) and the National Health Mission (Ministry of Health and Family Welfare).

UPCOMING EVENTS & DEADLINES

Delivering for Nutrition (D4N) in South Asia: Implementation Research in the Context of COVID-19

Healthy diets are necessary for achieving optimal growth and development; however, many people do not have access to safe, affordable, healthy food, particularly in South Asia. To add, the COVID-19 pandemic exacerbated and exposed the existing gaps and inequities in food systems, health and nutrition services, and economies in the region. IFPRI's Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India (POSHAN), together with the One CGIAR South Asia regionally integrated initiative Transforming Agri-Food Systems in South Asia (TAFSSA) and a range of regional co-hosts, are pleased to announce the virtual conference, 'Delivering for Nutrition in South Asia: Transforming Diets,' scheduled for November 9–10, 2022. The purpose of this conference is to synthesize relevant evidence and stimulate dialogue to inform and guide policy and program initiatives in South Asia for improving equitable access to and consumption of healthy diets.

When: November 9–10, 2022
Where: Online
For more information: https://poshan.ifpri.info/delivering-for-nutrition-in-south-asia-transforming-diets/

22nd International Congress of Nutrition (ICN)

The 22nd International Congress of Nutrition (ICN) will be held in Tokyo, Japan, in December of 2022. ICN is a meeting of the International Union of Nutritional Sciences (IUNS) that takes place every four years, the tenth of which was successfully held in Kyoto in 1975.

When: December 6-11, 2022
Where: Tokyo, Japan
For more information: https://icn22.org/

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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