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

In this last issue of Abstract Digest for this year, we present to you a collection of articles on various outcomes, determinants and interventions related to maternal and child nutrition, from around the world and India, in particular. Quite a few India-focused studies included in this issue have a common data source – the fourth round of National Family Health Survey, conducted during 2015-16. Here are some of the highlights:

- Reporting from the WHO–UNICEF Technical Expert Advisory Group on Nutrition Monitoring, de Onis and colleagues (2019) re-examined the classification of the prevalence thresholds for stunting, wasting and overweight, and recommended to replace those in current use with the revised prevalence thresholds, as presented in this paper.
- Using data collected in five survey waves between the ages of 1 to 15 years for children in Ethiopia, India, Peru, and Vietnam, Gausman and colleagues (2019) compared the stunting trajectories and found that children become newly stunted, recover, and falter throughout childhood and into early adolescence.
- Using data from the fourth round of India's National Family Health Survey (NFHS-4, 2015-16):
    - Liou and colleagues (2019) assessed the substantial burden of child malnutrition across all districts in India by examining geospatial variation in the overall prevalence in conjunction with wealth disparity.
    - In a cross-sectional study, Karlsson and colleagues (2019) explored the independent association of each item used to construct the Demographic and Health Surveys' wealth index with diverse child health outcomes.
    - Rodgers and colleagues (2019) explored the within and between- population variations in child undernutrition, as measured by anthropometric status and hemoglobin level across all states and union territories and presented three salient findings from this comprehensive assessment.
- Using data from the fourth round of District Level Household and Facility Survey (DLHS-4, 2012-13), Mishra and colleagues (2019) studied the extent to which context at difference population levels may influence chronic disease symptoms and outcomes across the general population of adults in India.
- In a cohort study, Prost and colleagues (2019) found that in rural Jharkhand and Odisha in eastern India, the incidence of acute malnutrition among children aged 6–18 months was high, but case fatality following severe acute malnutrition (SAM) was 1.2 percent, much lower than the 10–20 percent estimated by WHO.
- Lee and colleagues (2019) explored how three indicators of social capital (i.e., group membership, social support and cognitive social capital and specific types within each type) are associated with infant birth weight across three low-income and middle-income countries (LMICs): India, Peru and Vietnam.
- Wang and colleagues (2019) applied the Alternate Healthy Eating Index (AHEI) to a global dietary database to assess dietary quality among adults in 190 countries/territories, and concluded that global dietary quality is slowly improving, but remains far from optimal and varies across countries; improvements in dietary quality from the current global diet to the reference healthy diet have the potential to reduce mortality rates substantially.

- Luo and colleague (2019) developed a new statistical method which uses single-day dietary data and an external within-person to between-person variance ratio to estimate population distributions of usual intake of nearly daily consumed foods and nutrients.
- Through an analysis of the Indian Demographic and Health Survey (DHS) 2015–2016 data, Onyeneho and colleagues (2019) revealed that nutritional intake, maternal health and educational statuses as well as household wealth are the major determinants of childhood anemia in India.
- A study by Young and colleagues (2019) provided insights into the multiple factors that influence EIBF, prelacteal feeding, and EBF in Uttar Pradesh, India, and re-emphasised that supporting breastfeeding truly takes a village.
- In a randomised controlled, superiority trial, undertaken in Haryana, India, Mazumder and colleagues (2019) assessed the effect of community-initiated kangaroo mother care provided to babies weighing 1500–2250 g on neonatal and infant survival.
- Gram and colleagues (2019) conducted a mixed- methods systematic review of mechanisms, enablers and barriers to health promotion through community mobilisation, and uncovered a large number of possible mechanisms, enablers and barriers, ranging from group participation to institutional linkage, from community power relations to staff and resource management.
- Hazraa and colleagues (2019) conducted a quasi-experimental study of a large-scale SHG programme in Uttar Pradesh, India, and concluded that disparities in maternal and newborn health behaviours declined with the efforts by SHGs through behaviour change communication intervention.
- R.S. and colleagues (2019) have presented the scenario or context prior to layering of women's nutrition interventions on National Rural Livelihoods Mission (NRLM) platforms by project Swabhimaan in three eastern Indian states — Bihar, Chhattisgarh and Odisha – and shared findings on women's empowerment, nutrition status, household food security and use of maternal health services from baseline survey of project Swabhimaan, as the initiative tests the effectiveness of its service delivery model in improving these variables.
- Carmichael and colleagues (2019) evaluated the impact of a mHealth intervention, which included a mobile-based tool for frontline workers (FLWs) of the health and the Integrated Child Development Services and found that the intervention increased coordination among the workers, increased FLW home visits, increased skin-to-skin care, early initiation of breastfeeding, and age appropriate complementary feeding.
- Looking forward to the Sustainable Development Goal (SDG)-era, the Indian Council of Medical Research and The INCLEN Trust International conducted a national research priority setting exercise for maternal, child, newborn health, and maternal and child nutrition, using the Child Health and Nutrition Research Initiative (CHNRI) method. Wazny and colleagues (2019) have reported the results for child health research in India for 2016-2025.
- Scott and colleagues (2019) have presented findings from cognitive testing of a respectful maternity care (RMC) measurement tool for use in rural northern India and reflected on the difficulties associated with using quantitative surveys in populations unaccustomed to this type of interaction and on measuring internationally determined domains of RMC among diverse populations.

This comes with season's greetings and good wishes for 2020 - enjoy reading!

PEER-REVIEWED

Prevalence thresholds for wasting, overweight and stunting in children under 5 years

de Onis, M., E. Borghi, M. Arimond, P. Webb, T. Croft, K. Saha, L.M. De-Regil, F. Thuita, R. Heidkamp, J. Krasevec, C. Hayashi, and R. Flores-Ayala. 2019. "Prevalence thresholds for wasting, overweight and stunting in children under 5 years". *Public Health Nutrition* 22(1), 175–179. https://doi.org/10.1017/S1368980018002434

Objective: Prevalence ranges to classify levels of wasting and stunting have been used since the 1990s for global monitoring of malnutrition. Recent developments prompted a re-examination of existing ranges and development of new ones for childhood overweight. The present paper reports from the WHO–UNICEF Technical Expert Advisory Group on Nutrition Monitoring. **Design**: Thresholds were developed in relation to SD of the normative WHO Child Growth Standards. The international definition of 'normal' (2 SD below/above the WHO standards median) defines the first threshold, which includes 2·3% of the area under the normalized distribution. Multipliers of this 'very low' level (rounded to 2·5%) set the basis to establish subsequent thresholds. Country groupings using the thresholds were produced using the most recent set of national surveys. **Setting**: One hundred and thirty-four countries. **Subjects**: Children under 5 years. Results: For wasting and overweight, thresholds are: 'very low' (<2·5%),'low' (≈1–2 times 2·5%), 'medium' (≈2–4 times 2·5%), 'high' (≈4–6 times 2·5%) and 'very high' (>≈6 times 2·5%). For stunting, thresholds are: 'very low' (<2·5%), 'low' (≈1–4 times 2·5%), 'medium' (≈4–8 times 2·5%), 'high' (≈8–12 times 2·5%) and 'very high' (>≈12 times 2·5%). **Conclusions**: The proposed thresholds minimize changes and keep coherence across anthropometric indicators. They can be used for descriptive purposes to map countries according to severity levels; by donors and global actors to identify priority countries for action; and by governments to trigger action and target programmes aimed at achieving 'low' or 'very low' levels. Harmonized terminology will help avoid confusion and promote appropriate interventions.

Stunting trajectories from post-infancy to adolescence in Ethiopia, India, Peru, and Vietnam

Gausman, J., R. Kim, and S.V. Subramanian. 2019. "Stunting trajectories from post-infancy to adolescence in Ethiopia, India, Peru and Vietnam". *Maternal & Child Nutrition* 15: e12835. https://doi.org/10.1111/mcn.12835

Many interventions focus on preventing stunting in the first 1,000 days of life. We take a broader perspective on childhood growth to assess the proportions of children who suffer persistent stunting, recover, and falter and become newly stunted between birth and adolescence. We use longitudinal data collected on 7,128 children in Ethiopia, India, Peru, and Vietnam. Data were collected in five survey waves between the ages of 1 to 15 years. We use descriptive and graphical approaches to compare the trajectories of children first stunted by age 1, first stunted by age 5, and those remained not stunted until age 5. On average, 29.6% of children were first stunted by age 1, 12.9% of children were first stunted by the age 5, and 68.7% of children were not stunted at either age 1 or age 5. A larger percentage of children stunted by age 1 remained stunted at age 15 (40.7%) compared with those who were first stunted by age 5 (32.3%); 33.7% of children first stunted by age 1 and 31.1% of children first stunted by age 5 go on to recover, but then falter during later childhood. 13.1% of children who were not stunted at age 1 or age 5 become newly stunted between the ages of 8 and 15. Our results show that children both become stunted and recover from stunting into adolescence. More attention should be paid to interventions to support healthy growth throughout childhood.

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

Liou, L., R. Kim, and S.V. Subramanian. 2019. "Identifying geospatial patterns in wealth disparity in child malnutrition across 640 districts in India". *SSM - Population Health*.
https://doi.org/10.1016/j.ssmph.2019.100524

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

The relationship of household assets and amenities with child health outcomes: An exploratory cross-sectional study in India 2015–2016

Karlsson, O., R. Kim, W. Joe, and S.V. Subramanian. 2020. "The relationship of household assets and amenities with child health outcomes: An exploratory cross-sectional study in India 2015-2016". *SSM – Population Health* 10: 100513.
https://doi.org/10.1016/j.ssmph.2019.100513

Healthy development of children in India is far from ensured. Proximate determinants of poor child health outcomes are infectious diseases and undernutrition, which are linked to socioeconomic status. In low- and middle-income countries, researchers rely on wealth indices, constructed from information on households' asset ownership and amenities, to study socioeconomic disparities in child health. Some of these wealth index items can, however, directly affect the proximate determinants of child health. This paper explores the independent association of each item used to construct the Demographic and Health Surveys' wealth index with diverse child health outcomes. This cross-sectional study used nationally representative sample of 245,866 children, age 0–59 months, from the Indian National Family Health Surveys conducted in 2015–16. The study used conditional Poisson regression models as well as a range of sensitivity specifications. After controlling for socioeconomic status, health care use, maternal factors, community-level factors, and all wealth index items, the following wealth index items were the most consistently associated with child health; type of toilet facilities, water source, refrigerator, pressure cooker, type of cooking fuel, land usable for agriculture, household building material, mobile phone, and motorcycle/scooter. The association with type of toilet facilities and water source was particularly strong for mortality, showing a 16–35% and 14–28% lower mortality, respectively. Most items used to construct the Demographic and Health Surveys' wealth index only indicate household socioeconomic status, while a few items may affect child health directly, and can be useful targets for policy intervention.

Explaining within- vs. between-population variation in child anthropometry and hemoglobin measures in India: A multilevel analysis of the National Family Health Survey 2015-2016

Rodgers, J., R. Kim, and S.V. Subramanian. 2019. "Explaining within- vs. between-population variation in child anthropometry and hemoglobin measures in India: A multilevel analysis of the National Family Health Survey 2015-2016". *Journal of Epidemiology*: JE20190064.
https://doi.org/10.2188/jea.JE20190064

Background: The complex etiology of child growth failure and anemia – commonly used indicators of child undernutrition – involving proximate and distal risk factors at multiple levels is generally recognized. However, their independent and joint effects are often assessed with no clear conceptualization of inferential targets. **Methods:** We utilized hierarchical linear modeling and a nationally representative sample of 139,116 children aged 6-59 months from India (2015-2016) to estimate the extent to which a comprehensive set of 27 covariates explained the within- and between-population variation in height-for-age, weight-for-age, weight-for-height, and hemoglobin level. **Results:** Most of the variation in child anthropometry and hemoglobin measures was attributable to within-population differences (80-85%), whereas between-population differences (including communities, districts, and states) accounted for only 15-20%. The proximate and distal covariates explained 0.2%-7.5% of within-population variation and 2.1%-34.0% of between-population variation depending on the indicator of interest. Substantial heterogeneity was observed in the magnitude of within-population variation, and the fraction explained, in child anthropometry and hemoglobin measures across the 36 states/union territories of India. **Conclusions:** Policies and interventions aimed at reducing between-population inequalities in child undernutrition may require a different set of components than those concerned with within-population inequalities. Both are needed to promote the health of the general population as well as high-risk children.

Variation in Chronic Diseases Across Households, Communities, Districts, and States in India

Mishra, S., J.M. Perkins, P.K. Kahn, R. Kim, S.K. Mohanty, and S.V. Subramanian. 2019. "Variation in chronic diseases across households, communities, districts, and states in India". *American Journal of Preventative Medicine* 57(5): 721-731.
https://doi.org/10.1016/j.amepre.2019.06.014

Introduction: Globally, chronic noncommunicable diseases are the leading cause of death and accounted for 6 million deaths in India in 2016. However, the extent to which variation in chronic disease can be attributed to different population levels in India is unknown, as is whether variation in individual-level factors explains outcome variation at different population levels. **Methods:** Cross-sectional data from the District Level Household and Facility Survey 2012–2013 conducted across 21 states, 275 districts, 14,235 villages, 378,487 households, and 1,098,940 individuals aged ≥18 years in India were analyzed in 2018–2019. Multilevel logistic models were used to partition variation in outcomes and attribute it to individual, household, village, district and state population levels. Outcomes included experiencing respiratory, cardiovascular, musculoskeletal, or eye symptoms; reporting a positive diagnosis by a doctor for chronic heart disease, hypertension, diabetes, or vision problems; and objectively assessed real-time measures of hypertension and diabetes. **Results**: For reported diagnosis of hypertension or diabetes, a much larger percentage of variation in these outcomes was attributed to differences among households as compared to differences among units within other population levels. However, for objectively measured hypertension and diabetes, variation in these outcomes was important at the village level, followed by variation at the household level. Wealth status was positively associated with respiratory and cardiovascular symptoms, as well as all reported diagnoses and real-time measurements except for vision problems. Inclusion of individual-level sociodemographic variables explained 0%–30% of variation attributed to the household level for most chronic disease symptoms and diagnoses, but almost none at the higher levels. **Conclusions:** These findings imply that household- and village-level factors explain substantial variation in the prevalence of chronic disease symptoms and reported diagnoses in India.

Mortality and recovery following moderate and severe acute malnutrition in children aged 6–18 months in rural Jharkhand and Odisha, eastern India: A cohort study

Prost, A., N. Nair, A. Copas, H. Pradhan, N. Saville, P. Tripathy, R. Gope, S. Rath, S. Rath, J. Skordis, S. Bhattacharyya, A. Costello, and H.S. Sachdev. 2019. "Mortality and recovery following moderate and severe acute malnutrition in children aged 6–18 months in rural Jharkhand and Odisha, eastern India: A cohort study". *PLOS Medicine* 16(10): e1002934.
https://doi.org/10.1371/journal.pmed.1002934

Background: Recent data suggest that case fatality from severe acute malnutrition (SAM) in India may be lower than the 10%–20% estimated by the World Health Organization (WHO). A contemporary quantification of mortality and recovery from acute malnutrition in Indian community settings is essential to inform policy regarding the benefits of scaling up prevention and treatment programmes. **Methods and findings**: We conducted a cohort study using data collected during a recently completed cluster-randomised controlled trial in 120 geographical clusters with a total population of 121,531 in rural Jharkhand and Odisha, eastern India. Children born between October 1, 2013, and February 10, 2015, and alive at 6 months of age were followed up at 9, 12, and 18 months. We measured the children's anthropometry and asked caregivers whether children had been referred to services for malnutrition in the past 3 months. We determined the incidence and prevalence of moderate acute malnutrition (MAM) and SAM, as well as mortality and recovery at each follow-up. We then used Cox-proportional models to estimate mortality hazard ratios (HRs) for MAM and SAM. In total, 2,869 children were eligible for follow-up at 6 months of age. We knew the vital status of 93% of children (2,669/2,869) at 18 months. There were 2,704 children-years of follow-up time. The incidence of MAM by weight-for-length z score (WLZ) and/or mid-upper arm circumference (MUAC) was 406 (1,098/2,704) per 1,000 children-years. The incidence of SAM by WLZ, MUAC, or oedema was 190 (513/2,704) per 1,000 children-years. There were 36 deaths: 12 among children with MAM and six among children with SAM. Case fatality rates were 1.1% (12/1,098) for MAM and 1.2% (6/513) for SAM. In total, 99% of all children with SAM at 6 months of age (227/230) were alive 3 months later, 40% (92/230) were still SAM, and 18% (41/230) had recovered (WLZ ≥ −2 standard deviation [SD]; MUAC ≥ 12.5; no oedema). The adjusted HRs using all anthropometric indicators were 1.43 (95% CI 0.53–3.87, p = 0.480) for MAM and 2.56 (95% CI 0.99–6.70, p = 0.052) for SAM. Both WLZ < −3 and MUAC ≥ 11.5 and < 12.5 were associated with increased mortality risk (HR: 3.33, 95% CI 1.23–8.99, p = 0.018 and HR: 3.87, 95% CI 1.63–9.18, p = 0.002, respectively). A key limitation of our analysis was missing WLZ or MUAC data at all time points for 2.5% of children, including for two of the 36 children who died. **Conclusions**: In rural eastern India, the incidence of acute malnutrition among children older than 6 months was high, but case fatality following SAM was 1.2%, much lower than the 10%–20% estimated by WHO. Case fatality rates below 6% have now been recorded in three other Indian studies. Community treatment using ready-to-use therapeutic food may not avert a substantial number of SAM-related deaths in children aged over 6 months, as mortality in this group is lower than expected. Our findings strengthen the case for prioritising prevention through known health, nutrition, and multisectoral interventions in the first 1,000 days of life, while ensuring access to treatment when prevention fails.

Associations between maternal social capital and infant birth weight in three developing countries: a cross-sectional multilevel analysis of Young Lives data

Lee, H., J. Oh, J.M. Perkins, J. Heo, and S.V. Subramanian. 2019. "Associations between maternal social capital and infant birth weight in three developing countries: a cross-sectional multilevel analysis of Young Lives data". *BMJ Open* 9: e024769. doi: 10.1136/bmjopen-2018-024769
http://dx.doi.org/10.1136/bmjopen-2018-024769

Objective: To explore how three indicators of social capital (ie, group membership, social support and cognitive social capital and specific types within each type) are associated with infant birth weight. **Study design and settings**: Cross-sectional analyses of the first wave of Young Lives Survey

data collected in 2002 from India (Andhra Pradesh state), Peru and Vietnam. **Participants**: 807 mothers in India, 1528 mothers in Peru and 1706 mothers in Vietnam. **Outcomes measure**: Infant birth weight was measured in grams. Participation in specific groups, receipt of social support from specific groups or individuals and perceptions of their community were measured for social capital indicators. Two-level random intercept linear regression models were fit separately by country (first level: individual and second level: community). **Results**: Maternal group membership displayed a consistent positive association with infant birth weight across the three countries. There was no relationship with maternal cognitive social capital. Membership in a women's group was associated with infant birth weight consistently in all three countries (b=119.6, 95% CI 21.7 to 217.4 in India, b=133.4, 95% CI 40.9 to 225.9 in Peru, b=60.6, 95% CI 0.5 to 120.6 in Vietnam). However, membership in a political group in Peru was inversely associated with infant birth weight (b=−276.1, 95% CI −465.7 to −86.5). **Conclusion**: Although a higher level of social capital is associated with higher infant birth weight, specific types of social capital may have different associations with infant birth weight depending on the social, political or cultural specificity of the country. These results pave the way for additional research on the mechanisms through which social capital influences birth weight outcomes in each country.

Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death

Wang, D.D., Y. Li, A. Afshin, M. Springmann, D. Mozaffarian, M.J. Stampfer, F.B. Hu, C.J.L. Murray, and W.C. Willett. 2019. *Journal of Nutrition* 149(6): 1065–1074.
https://doi.org/10.1093/jn/nxz010

Background: The preventable premature mortality achievable by improvement in dietary quality at a global level is unclear. **Objective**: The aim of this study was to assess dietary quality globally, and to quantify the potential global impact of improving dietary quality on population health. **Methods**: We applied the Alternate Healthy Eating Index (AHEI, potential range 0-100) to a global dietary database to assess dietary quality among adults in 190 countries/territories. The relation of AHEI score to risks of major chronic disease was estimated from 2 large cohorts of men and women for whom many repeated dietary assessments during up to 30 years were available. We calculated the preventable premature deaths achievable by shifting from current national diets to a reference healthy diet. **Results**: The global mean AHEI score in 2017 was 49.5 for males and 50.5 for females. Large differences between current and target intakes existed for whole grains, sodium, long-chain n-3 polyunsaturated fats, polyunsaturated fats, and fruits. From 1990 to 2017, the global mean AHEI score increased modestly from 45.4 to 50.0. Diet quality varied substantially across the world. Coastal Mediterranean nations, the Caribbean region, and Eastern Asia (except China and Mongolia) had a higher AHEI score, whereas Central Asia, the South Pacific, and Eastern and Northern Europe had a lower score. An improvement in dietary quality from the current global diet to the reference healthy diet could prevent >11 million premature deaths, ∼24% of total deaths in 2017. These included 1.6 million cancer deaths, 3.9 million coronary artery disease deaths, 1.0 million stroke deaths, 1.7 million respiratory disease deaths, 0.4 million neurodegenerative disease deaths, 0.5 million kidney disease deaths, 0.6 million diabetes deaths, and 1.2 million digestive disease deaths. **Conclusions:** Global dietary quality is slowly improving, but remains far from optimal and varies across countries. Improvements in dietary quality have the potential to reduce mortality rates substantially.

A New statistical method for estimating usual intakes of nearly-daily consumed foods and nutrients through use of only one 24-hour dietary recall

Luo, H., K.W. Dodd, C.D. Arnold, and R. Engle-Stone. 2019. "A New statistical method for estimating usual intakes of nearly-daily consumed foods and nutrients through use of only one 24-hour dietary recall". *Journal of Nutrition* 149(9): 1667–1673.
https://doi.org/10.1093/jn/nxz070

Background: To estimate usual intake distributions of dietary components, collection of non-consecutive repeated 24-h dietary recalls is recommended, but resource limitations sometimes restrict data collection to single-day dietary data per person. **Objectives**: We developed a new statistical method, the NCI 1-d method, which uses single-day dietary data and an external within-person to between-person variance ratio to estimate population distributions of usual intake of nearly daily consumed foods and nutrients. **Methods**: We used NHANES 2011–2014 data for men (n = 4938 and n = 4293 for the first and second 24-h recalls) to compare nutrient intake distributions of vitamin A, magnesium, folate, and vitamin E generated by the 1-d method (with use of only the first recall per person) with those from the NCI amount-only method (with use of all days of dietary intake per person). The within-person to between-person variance ratio from the amount-only model was used as the unbiased "external" estimate for the 1-d method. We also examined the effect of mis-specification of variance ratios on usual intake distributions. **Results**: The amount-only and 1-d methods estimated statistically equivalent median (25p, 75p): 647 (459, 890) compared with 648 (461, 886) µg retinol activity equivalents/d, 338 (268, 420) compared with 334 (266, 417) mg magnesium/d,595(458,762) compared with 589 (456,758) µg dietary folate equivalents/d, and 9.7 (7.3,12.6) compared with 9.6 (7.3, 12.7) mg vitamin E/d. As the external variance ratios increased from 25% to 200% of the unbiased ratios, the prevalence of inadequate intake ranged from 53% to 43% for vitamin A, 57% to 55% for magnesium, 16% to 2% for folate, and 70% to 73% for vitamin E. **Conclusions**: The 1-d method is a viable statistical method for estimating usual intakes of nearly-daily consumed dietary components when the variance ratio is unbiased. Results are sensitive to variance ratio selection, so researchers should still collect replicate data where possible.

Determinants of Childhood Anemia in India

Onyeneho, N.G., B.C. Ozumba, and S.V. Subramanian. 2019. "Determinants of childhood anemia in India". *Scientific Reports* 9: 16540.
https://doi.org/10.1038/s41598-019-52793-3

We analyzed a sample of 112714 children from the 2015–2016 Indian National Fertility and Health Survey with available data on hemoglobin. Multinomial logistic regression models were used to establish associations between parent anemia, household characteristics and nutritional intake of children. Linear regression analysis was also conducted to see the link between the household characteristic and childhood nutritional intake on one hand and hemoglobin levels on the other hand. A number of socio-demographic factors, namely maternal age, type of residence and maternal education, as well as wealth index, among others correlate with incidence of childhood anemia. For instance, whereas 52.9% of children in the richest households were anemic, 63.2% of children in the poorest household were anemic ($p < 0.001$). Mean Vitamin A intake in the last six months was 0.63 (0.626–0.634) which was 0.18% of the recommended intake. Mean iron intake, from sources other than breast milk, in the last 24 hours was 0.29 (0.286–0.294) and 2.42% of the recommended daily intake. Fifty-nine percent (58.5%) of the children surveyed were anemic (Hb level: 9.75 g/dL [9.59–9.91]). Children with anemia were more prone to being iron deficient (odds ratio [OR]: 0.981 (0.961–1.001), Vitamin A deficient (OR: 0.813 (0.794–0.833)), and have lower maternal hemoglobin level (OR: 1.992 (1.957–2.027)). Combining nutritional supplementation and food-fortification programmes with reduction in maternal anemia and family poverty may yield optimal improvement of childhood anemia in India.

It takes a village: An empirical analysis of how husbands, mothers-in-law, health workers, and mothers influence breastfeeding practices in Uttar Pradesh, India

Young, M.F., P.H. Nguyen, S. Kachwaha, L.T. Mai, S. Ghosh, R. Agrawal, J. Escobar-Alegria, P. Menon, and R. Avula. 2019. "It takes a village: An empirical analysis of how husbands, mothers-in-law, health workers, and mothers influence breastfeeding practices in Uttar Pradesh, India". *Maternal and Child Nutrition*.
https://doi.org/10.1111/mcn.12892

Evidence on strategies to improve infant and young child feeding in India, a country that carries the world's largest burden of undernutrition, is limited. In the context of a programme evaluation in two districts in Uttar Pradesh, we sought to understand the multiple influences on breastfeeding practices and to model potential programme influence on improving breastfeeding. A cross-sectional survey was conducted among 1,838 recently delivered women, 1,194 husbands, and 1,353 mothers/mothers-in-law. We used bivariate and multivariable logistic regression models to examine the association between key determinants (maternal, household, community, and health services) and breastfeeding outcomes [early initiation of breastfeeding (EIBF)], prelacteal feed, and exclusive breastfeeding (EBF). We used population attributable risk analysis to estimate potential improvement in breastfeeding practices. Breastfeeding practices were suboptimal: EIBF (26.3%), EBF (54%), and prelacteal feeding (33%). EIBF was positively associated with maternal knowledge, counselling during pregnancy/delivery, and vaginal delivery at a health facility. Prelacteal feeds were less likely to be given when mothers had higher knowledge, beliefs and self-efficacy, delivered at health facility, and mothers/mothers-in-law had attended school. EBF was positively associated with maternal knowledge, beliefs and self-efficacy, parity, and socio-economic status. High maternal stress and domestic violence contributed to lower EBF. Under optimal programme implementation, we estimate EIBF can be improved by 25%, prelacteal feeding can be reduced by 25%, and EBF can be increased by 23%. A multifactorial approach, including maternal-, health service-, family-, and community-level interventions has the potential to lead to significant improvements in breastfeeding practices in Uttar Pradesh.

Effect of community-initiated kangaroo mother care on survival of infants with low birthweight: a randomised controlled trial

Mazumder, S., S. Taneja, B. Dube, K. Bhatia, R. Ghosh, M. Shekhar, B. Sinha, R. Bahl, J. Martines, M.K. Bhan, H. Sommerfelt, and N. Bhandari. 2019. "Effect of community-initiated kangaroo mother care on survival of infants with low birthweight: a randomised controlled trial". *The Lancet* 394 (10210): 1724-1736.
https://doi.org/10.1016/S0140-6736(19)32223-8

Background: Coverage of kangaroo mother care remains very low despite WHO recommendations for its use for babies with low birthweight in health facilities for over a decade. Initiating kangaroo mother care at the community level is a promising strategy to increase coverage. However, knowledge of the efficacy of community-initiated kangaroo mother care is still lacking. We aimed to assess the effect of community-initiated kangaroo mother care provided to babies weighing 1500–2250 g on neonatal and infant survival. **Methods:** In this randomised controlled, superiority trial, undertaken in Haryana, India, we enrolled babies weighing 1500–2250 g at home within 72 h of birth, if not already initiated in kangaroo mother care, irrespective of place of birth (ie, home or health facility) and who were stable and feeding. The first eligible infants in households were randomly assigned (1:1) to the intervention (community-initiated kangaroo mother care) or control group by block randomisation using permuted blocks of variable size. Twins were allocated to the same group. For second eligible infants in the same household as an enrolled infant, if the first infant

was assigned to the intervention group the second infant was also assigned to this group, whereas if the first infant was assigned to the control group the second infant was randomly assigned (1:1) to the intervention or control group. Mothers and infants in the intervention group were visited at home (days 1–3, 5, 7, 10, 14, 21, and 28) to support kangaroo mother care (ie, skin-to-skin contact and exclusive breastfeeding). The control group received routine care. The two primary outcomes were mortality between enrolment and 28 days and between enrolment and 180 days. Analysis was by intention to treat and adjusted for clustering within households. The effect of the intervention on mortality was assessed with person-time in the denominator using Cox proportional hazards model. This study is registered with ClinicalTrials.gov, NCT02653534 and NCT02631343, and is now closed to new participants. **Findings:** Between July 30, 2015, and Oct 31, 2018, 8402 babies were enrolled, of whom 4480 were assigned to the intervention group and 3922 to the control group. Most births (6837 [81·4%]) occurred at a health facility, 36·2% (n=3045) had initiated breastfeeding within 1 h of birth, and infants were enrolled at an average of about 30 h (SD 17) of age. Vital status was known for 4470 infants in the intervention group and 3914 in the control group at age 28 days, and for 3653 in the intervention group and 3331 in the control group at age 180 days. Between enrolment and 28 days, 73 infants died in 4423 periods of 28 days in the intervention group and 90 deaths in 3859 periods of 28 days in the control group (hazard ratio [HR] 0·70, 95% CI 0·51–0·96; p=0·027). Between enrolment and 180 days, 158 infants died in 3965 periods of 180 days in the intervention group and 184 infants died in 3514 periods of 180 days in the control group (HR 0·75, 0·60–0·93; p=0·010). The risk ratios for death were almost the same as the HRs (28-day mortality 0·71, 95% CI 0·52– 0·97; p=0·032; 180-day mortality 0·76, 0·60–0·95; p=0·017). **Interpretation:** Community-initiated kangaroo mother care substantially improves newborn baby and infant survival. In low-income and middle-income countries, incorporation of kangaroo mother care for all infants with low birthweight, irrespective of place of birth, could substantially reduce neonatal and infant mortality.

Promoting women's and children's health through community groups in low-income and middle-income countries: a mixed-methods systematic review of mechanisms, enablers and barriers

Gram, L., A. Fitchett, A. Ashraf, N. Daruwalla, and D. Osrin. 2019. "Promoting women's and children's health through community groups in low-income and middle-income countries: a mixed-methods systematic review of mechanisms, enablers and barriers". *BMJ Global Health* 4(6): e001972. http://dx.doi.org/10.1136/bmjgh-2019-001972

Introduction: Community mobilisation through group activities has been used to improve women's and children's health in a range of low-income and middle-income contexts, but the mechanisms through which it works deserve greater consideration. We did a mixed-methods systematic review of mechanisms, enablers and barriers to the promotion of women's and children's health in community mobilisation interventions. **Methods**: We searched for theoretical and empirical peer-reviewed articles between January 2000 and November 2018. First, we extracted and collated proposed mechanisms, enablers and barriers into categories. Second, we extracted and synthesised evidence for them using narrative synthesis. We assessed risk of bias with adapted Downs and Black and Critical Appraisal Skills Programme checklists. We assigned confidence grades to each proposed mechanism, enabler and barrier. **Results**: 78 articles met the inclusion criteria, of which 39 described interventions based on a participatory group education model, 19 described community-led structural interventions to promote sexual health in marginalised populations and 20 concerned other types of intervention or multiple interventions at once. We did not have high confidence in any mechanism, enabler or barrier. Two out of 15 proposed mechanisms and 10 out of 12 proposed enablers and barriers reached medium confidence. A few studies provided direct evidence relating proposed mechanisms, enablers or barriers to health behaviours or health outcomes. Only two studies presented mediation or interaction analysis for a proposed mechanism, enabler or barrier.

Conclusion: We uncovered multiple proposed mechanisms, enablers and barriers to health promotion through community groups, but much work remains to provide a robust evidence base for proposed mechanisms, enablers and barriers.

Effects of health behaviour change intervention through women's self-help groups on maternal and newborn health practices and related inequalities in rural india: A quasi-experimental study

Hazraa, A., Y. Atmavilas, K. Hay, N. Saggurti, R.K. Verma, J. Ahmad, S. Kumar, P.S. Mohanand, D. Mavalankar, and L. Irani. 2019. "Effects of health behaviour change intervention through women's self-help groups on maternal and newborn health practices and related inequalities in rural india: A quasi-experimental study". *EClinicalMedicine*.
https://doi.org/10.1016/j.eclinm.2019.10.011

Background: Despite the health system efforts, health disparities exist across sub-populations in India. We assessed the effects of health behaviour change interventions through women's self-help groups (SHGs) on maternal and newborn health (MNH) behaviours and socio-economic inequalities. **Methods**: We did a quasi-experimental study of a large-scale SHG program in Uttar Pradesh, India, where 120 geographic blocks received, and 83 blocks did not receive health intervention. Data comes from two cross-sectional surveys with 4,615 recently delivered women in 2015, and 4,250 women in 2017. The intervention included MNH discussions in SHG meetings and community outreach activities. The outcomes included antenatal, natal and postnatal care, contraceptive use, cord care, skin-to-skin care, and breastfeeding practices. Effects were assessed using multilevel mixed-effects regression adjusted difference in-differences (DID) analysis adjusting for geographic clustering and potential covariates, for all, most marginalised and least-marginalised women. Concentration indices examined the socio-economic inequality in health practices over time. **Findings**: The net improvements (5–11 percentage points [pp]) in correct MNH practices were significant in the intervention areas. The improvements over time were higher among the most-marginalised than least-marginalised for antenatal check-ups (DID: 20pp, p<0•001 versus DID: 6pp, p = 0•093), consumption of iron folic acid tablets for 100 days (DID: 7pp, p = 0•036 versus DID: -1pp, p = 0•671), current use of contraception (DID: 12pp, p = 0•046 versus DID: 10pp, p = 0•021), cord care (DID: 12pp, p = 0•051 versus DID: 7pp, p = 0•210), and timely initiation of breastfeeding (DID: 29pp, p = 0•001 versus DID: 1pp, p = 0•933). Lorenz curves and concentration indices indicated reduction in rich-poor gap in health practices over time in the intervention areas. **Interpretation:** Disparities in MNH behaviours declined with the efforts by SHGs through behaviour change communication intervention.

Context for layering women's nutrition interventions on a large scale poverty alleviation program: Evidence from three eastern Indian states

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Over 70 million women of reproductive age are undernourished in India. Most poverty alleviation programs have not been systematically evaluated to assess impact on women's empowerment and nutrition outcomes. National Rural Livelihoods Mission's poverty alleviation and livelihoods generation initiative is an opportune platform to layer women's nutrition interventions being tapped by project Swabhimaan in three eastern Indian states—Bihar, Chhattisgarh and Odisha. A cross-sectional baseline survey covering 8755 mothers of children under-two years of age, one of the three primary target groups of program are presented. Standardized questionnaire was

administered and anthropometric measurements were undertaken from October 2016 to January 2017. 21 indicators on women's empowerment, Body Mass Index and Mid-upper Arm Circumference for nutrition status, food insecurity indicators as per the Food Insecurity Experience Scale and selected indicators for assessing women's access to basic health services were included. National Rural Livelihoods Mission operates in contexts with stark social and gender inequalities. Self-help group members exhibited better control on financial resources and participation in community activities than non-members. Using Body Mass Index, at least 45% mothers were undernourished irrespective of their enrolment in self-help groups. Higher proportion of self-help group members (77%-87%) belonged to food insecure households than non-members (66%-83%). Proportion of mothers reporting receipt of various components of antenatal care service package varied from over 90% for tetanus toxoid vaccination to less than 10% for height measurement. Current use of family planning methods was excruciatingly low (8.2%-32.4%) in all states but positively skewed towards self-help group members. Participation in monthly fixed day health camps was a concern in Bihar. Layering women's nutrition interventions as stipulated under Swabhimaan may yield better results for women's empowerment and nutrition status under National Rural Livelihoods Mission. While this opportunity exists in all three states, Bihar with a higher proportion of matured self-help groups offers more readiness for Swabhimaan implementation.

Use of mobile technology by frontline health workers to promote reproductive, maternal, newborn and child health and nutrition: a cluster randomized controlled Trial in Bihar, India

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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6875677/

Background: mHealth technology holds promise for improving the effectiveness of frontline health workers (FLWs), who provide most health-related primary care services, especially reproductive, maternal, newborn, child health and nutrition services (RMNCHN), in low-resource – especially hard-to-reach – settings. Data are lacking, however, from rigorous evaluations of mHealth interventions on delivery of health services or on health-related behaviors and outcomes. **Methods:** The Information Communication Technology-Continuum of Care Service (ICT-CCS) tool was designed for use by community-based FLWs to increase the coverage, quality and coordination of services they provide in Bihar, India. It consisted of numerous mobile phone-based job aids aimed to improve key RMNCHN-related behaviors and outcomes. ICT-CCS was implemented in Saharsa district, with cluster randomization at the health sub-center level. In total, evaluation surveys were conducted with approximately 1100 FLWs and 3000 beneficiaries who had delivered an infant in the previous year in the catchment areas of intervention and control health sub-centers, about half before implementation (mid-2012) and half two years afterward (mid-2014). Analyses included bivariate and difference-in-difference analyses across study groups. **Results:** The ICT-CCS intervention was associated with more frequent coordination of AWWs with ASHAs on home visits and greater job confidence among ASHAs. The intervention resulted in an 11 percentage point increase in FLW antenatal home visits during the third trimester ($P = 0.04$). In the post-implementation period, postnatal home visits during the first week were increased in the intervention (72%) vs the control (60%) group ($P < 0.01$). The intervention also resulted in 13, 12, and 21 percentage point increases in skin-to-skin care ($P < 0.01$), breastfeeding immediately after delivery ($P < 0.01$), and age-appropriate complementary feeding ($P < 0.01$). FLW supervision and other RMNCHN behaviors were not significantly impacted. **Conclusions:** Important improvements in FLW home visits and RMNCHN

behaviors were achieved. The ICT-CCS tool shows promise for facilitating FLW effectiveness in improving RMNCHN behaviors.

Setting priorities in child health research in India for 2016-2025: a CHNRI exercise undertaken by the Indian Council for Medical Research and INCLEN Trust

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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6818639/

Background: Millennium Development Goal 4 (MDGs) mobilised countries to reduce child mortality by two thirds the 1990 rate in 2015. While India did not reach MDG 4, it considerably reduced child mortality in the MDG-era. Efficient and targeted interventions and adequate monitoring are necessary to further progress in improvements to child health. Looking forward to the Sustainable Development Goal (SDG)-era, the Indian Council of Medical Research and The INCLEN Trust International conducted a national research priority setting exercise for maternal, child, newborn health, and maternal and child nutrition. Here, results are reported for child health. **Methods:** The Child Health and Nutrition Research Initiative (CHNRI) method for research priority setting was employed. Research ideas were crowd-sourced from a network of child health experts from across India; these were refined and consolidated into research options (ROs) which were scored against five weighted criteria to arrive weighted Research Priority Scores (wRPS). National and regional priority lists were prepared. **Results:** 90 experts contributed 596 ideas that were consolidated into 101 research options (ROs). These were scored by 233 experts nationwide. National wRPS for ROs ranged between 0.92 and 0.51. The majority of the top research priorities related to development of cost-effective interventions and their implementation, and impact evaluations, improving data quality; and monitoring of existing programs, or improving the management of morbidities. The research priorities varied between regions, the Economic Action Group and North-Eastern states prioritised questions relating to delivering interventions at community- or household-level, whereas the North-Eastern states and Union Territories prioritised research questions involving managing and measuring malaria, and the Southern and Western states prioritised research questions involving pharmacovigilance of vaccines, impact of newly introduced vaccines, and delivery of vaccines to hard-to-reach populations. **Conclusions:** Research priorities varied geographically, according the stage of development of the area and mostly pertained to implementation sciences, which was expected given diversity in epidemiological profiles. Priority setting should help guide investment decisions by national and international agencies, therefore encouraging researchers to focus on priority areas. The ICMR has launched a grants programme for implementation research on maternal and child health to pursue research priorities identified by this exercise.

Yes, no, maybe so: the importance of cognitive interviewing to enhance structured surveys on respectful maternity care in northern India

Scott, K., D. Gharai, M. Sharma, N. Choudhury, B. Mishra, S. Chamberlain, and A. LeFevre. 2019. "Yes, no, maybe so: the importance of cognitive interviewing to enhance structured surveys on respectful maternity care in northern India". *Health Policy and Planning*. czz141.
https://doi.org/10.1093/heapol/czz141.

Quantitative survey findings are important in measuring health-related phenomena, including on sensitive topics such as respectful maternity care (RMC). But how well do survey results truly

capture respondent experiences and opinions? Quantitative tool development and piloting often involve translating questions from other settings and assessing the mechanics of implementation, which fails to deeply explore how respondents understand survey questions and response options. To address this gap, we conducted cognitive interviews on survey questions (n = 88) adapted from validated RMC instruments used in Ethiopia, Kenya and elsewhere in India. Cognitive interviews with rural women (n = 21) in Madhya Pradesh, India involved asking the respondent the survey question, recording her response, then interviewing her about what the question and response options meant to her. We analysed the interviews to revise the tool and identify question failures, which we grouped into six areas: issues with sequencing, length and sensitivity; problematic response options; inappropriate vocabulary; temporal and spatial confusion; accessing different cognitive domains; and failure to resonate with the respondent's worldview and reality. Although women tended to provide initial answers to the survey questions, cognitive interviews revealed widespread mismatch between respondent interpretation and question intent. Likert scale response options were generally incomprehensible and questions involving hypothetical scenarios could be interpreted in unexpected ways. Many key terms and concepts from the international RMC literature did not translate well and showed low resonance with respondents, including consent and being involved in decisions about one's care. This study highlights the threat to data quality and the validity of findings when translating quantitative surveys between languages and cultures and showcases the value of cognitive interviews in identifying question failures. While survey tool revision can address many of these issues, further critical discussion is needed on the use of standardized questions to assess the same domains across contexts.

UPCOMING EVENTS & DEADLINES

World Public Health Nutrition Congress 2020

Theme: Knowledge, Policy, Action in the Decade of Nutrition 2016-2025: What is working or not? Where are the gaps? What needs more effort or change?
Description: Held every 4 years, the World Public Health Nutrition Congress was established by the World Public Health Nutrition Association (WPHNA) to bring together the international public health nutrition sector for an international congress free from funding from conflicted sources. The Congress acts as a pathway to strengthen the knowledge base, partnerships and commitment for effective action to improve nutrition related health, particularly among vulnerable populations in the world.
When: 31 March - 2 April 2020
Where: Brisbane, Queensland, Australia
For more information: https://www.wphncongress2020.com/

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

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

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