POSHAN
Partnerships and Opportunities to Strengthen and Harmonize Actions for Nutrition in India
Led by IFPRI
Abstract Digest
ISSUE 34 | JUNE 2020

EDITOR'S NOTE

This issue of Abstract Digest comes to you at a time when the global nutrition research community is actively looking for ways to address malnutrition in the changing context of the COVID-19 pandemic. The articles in this issue include a modelling study by Roberton and colleagues on early estimates of the indirect effects of COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries, and comments on it.

In addition, from the Global Burden of Disease Study 2000–17, India State-Level Disease Burden Initiative CGF Collaborators and India State-Level Disease Burden Initiative Child Mortality Collaborators have presented subnational analysis of child undernutrition and mortality trends in India. The other India-specific studies examine the patterns of wasting and stunting by month of measurement, and the evidence on the use of India's Integrated Child Development Services program among beneficiaries.

Given below is the list of articles included in this issue. Please click on the title if you wish to go straight to the article or scroll down to explore the abstract in the pages that follow. Stay safe and enjoy reading!

List of articles in this issue

India State-Level Disease Burden Initiative Child Mortality Collaborators. 2020. *The Lancet* 395(10237): 1640-1658.

The impact of nutrition on COVID-19 susceptibility and long-term consequences
Butler and Barriento. 2020. *Brain, Behavior, and Immunity*.

Associations of maternal resources with care behaviours differ by resource and behaviour
Basnet et al. 2020. *Maternal & Child Nutrition*.

Association between milk consumption and child growth for children aged 6–59 months
Herber et al. 2020. *Scientific Reports* 10: 6730.

Factors Associated With Child Stunting, Wasting, and Underweight in 35 Low- and Middle-Income Countries
Li et al. 2020. *JAMA Network Open* 3(4): e203386.

India's food system in the time of COVID-19
Bhamoriya et al. 2020. *Economic and Political Weekly* 55(15): 12-14.

Association of Poor Sanitation With Growth Measurements Among Children in India
Chakrabarti et al. 2020. *JAMA Network Open* 3(4): e202791.

Strategies to address anaemia among pregnant and lactating women in India: a formative research study
Williams et al. 2020. *Public Health Nutrition* 23(5): 795-805.

Utilization of Integrated Child Development Services in India: Programmatic Insights from National Family Health Survey, 2016
Rajpal et al. 2020. *International Journal of Environmental Research and Public Health* 17(9): 10.3390/ijerph17093197.

Lasting Impact of Early Life Interventions: Evidence from India's Integrated Child Development Services
Dhamija and Sen. 2020. *The Journal of Development Studies.*

Child Undernutrition and Convergence of Multisectoral Interventions in India: An Econometric Analysis of National Family Health Survey 2015–16
Rajpal et al. 2020. *Frontiers in Public Health* 8.

Measuring coverage of infant and young child feeding counselling interventions: A framework and empirical considerations for survey question design
Choufani et al. 2020. *Maternal & Child Nutrition*.

Effects of an mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: protocol for a quasi-experimental mixed-methods evaluation
Nimmagadda et al. 2020. *BMJ Open* 9(3).

PEER-REVIEWED

Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study

Roberton, T., E.D. Carter, V.B. Chou, A.R. Stegmuller, B.D. Jackson, Y. Tam, T. Sawadogo-Lewis, and N. Walker. 2020. "Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study". *The Lancet Global Health*. Doi: https://doi.org/10.1016/S2214-109X(20)30229-1

Background: While the COVID-19 pandemic will increase mortality due to the virus, it is also likely to increase mortality indirectly. In this study, we estimate the additional maternal and under-5 child deaths resulting from the potential disruption of health systems and decreased access to food. **Methods**: We modelled three scenarios in which the coverage of essential maternal and child health interventions is reduced by 9·8–51·9% and the prevalence of wasting is increased by 10–50%. Although our scenarios are hypothetical, we sought to reflect real-world possibilities, given emerging reports of the supply-side and demand-side effects of the pandemic. We used the Lives Saved Tool to estimate the additional maternal and under-5 child deaths under each scenario, in 118 low-income and middle-income countries. We estimated additional deaths for a single month and extrapolated for 3 months, 6 months, and 12 months. **Findings**: Our least severe scenario (coverage reductions of 9·8–18·5% and wasting increase of 10%) over 6 months would result in 253 500 additional child deaths and 12 200 additional maternal deaths. Our most severe scenario (coverage reductions of 39·3–51·9% and wasting increase of 50%) over 6 months would result in 1 157 000 additional child deaths and 56 700 additional maternal deaths. These additional deaths would represent an increase of 9·8–44·7% in under-5 child deaths per month, and an 8·3–38·6% increase in maternal deaths per month, across the 118 countries. Across our three scenarios, the reduced coverage of four childbirth interventions (parenteral administration of uterotonics, antibiotics, and anticonvulsants, and clean birth environments) would account for approximately 60% of additional maternal deaths. The increase in wasting prevalence would account for 18–23% of additional child deaths and reduced coverage of antibiotics for pneumonia and neonatal sepsis and of oral rehydration solution for diarrhoea would together account for around 41% of additional child deaths. **Interpretation**: Our estimates are based on tentative assumptions and represent a wide range of outcomes. Nonetheless, they show that, if routine health care is disrupted and access to food is decreased (as a result of unavoidable shocks, health system collapse, or intentional choices made in responding to the pandemic), the increase in child and maternal deaths will be devastating. We hope these numbers add context as policy makers establish guidelines and allocate resources in the days and months to come.

Comment

Avoiding indirect effects of COVID-19 on maternal and child health

Menendez, C., R. Gonzalez, F. Donnay, and R.G.F. Leke. 2020. "Avoiding indirect effects of COVID-19 on maternal and child health". *The Lancet Global Health*. Doi: https://doi.org/10.1016/S2214-109X(20)30239-4.

The coronavirus 2019 (COVID-19) pandemic is challenging the resilience of the most solid health systems in the world. In many low-income and middle-income countries (LMICs), the disease is rapidly spreading amid numerous endemic health problems such as HIV, tuberculosis, malaria, malnutrition, and frequent outbreaks of viral infections with high associated mortality. All this occurs in a context of weak health infrastructures that can barely cope with the aforementioned existing health challenges. In this article authors comment on the modelling study by Roberton and colleagues to estimate the indirect effects of the coronavirus pandemic on maternal and child mortality in LMICs.

Comment

A wake-up call: COVID-19 and its impact on children's health and wellbeing

Fore, H. H. 2020. "A wake-up call: COVID-19 and its impact on children's health and wellbeing". *The Lancet Global Health*. Doi: https://doi.org/10.1016/S2214-109X(20)30238-2

In The Lancet Global Health, Roberton and colleagues present startling new evidence on the potential rise in maternal and child mortality in low-income and middle-income countries if essential health services are disrupted as a result of COVID-19. Building on lessons learned from previous outbreaks of Ebola virus disease and severe acute respiratory syndrome (SARS), the authors estimate a devastating increase in the numbers of maternal and child deaths resulting from reductions in routine health service coverage.

COVID-19: The Inflammation Link and the Role of Nutrition in Potential Mitigation

Zabetakis, I., R. Lordan, C. Norton, and A. Tsoupras. 2020. "COVID-19: The Inflammation Link and the Role of Nutrition in Potential Mitigation". *Nutrients* 12(5): 1466. https://doi.org/10.3390/nu12051466

The novel coronavirus disease (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has engulfed the world, affecting more than 180 countries. As a result, there has been considerable economic distress globally and a significant loss of life. Sadly, the vulnerable and immunocompromised in our societies seem to be more susceptible to severe COVID-19 complications. Global public health bodies and governments have ignited strategies and issued advisories on various handwashing and hygiene guidelines, social distancing strategies, and, in the most extreme cases, some countries have adopted "stay in place" or lockdown protocols to prevent COVID-19 spread. Notably, there are several significant risk factors for severe COVID-19 infection. These include the presence of poor nutritional status and pre-existing noncommunicable diseases (NCDs) such as diabetes mellitus, chronic lung diseases, cardiovascular diseases (CVD), obesity, and various other diseases that render the patient immunocompromised. These diseases are characterized by systemic inflammation, which may be a common feature of these NCDs, affecting patient outcomes against COVID-19. In this review, we discuss some of the anti-inflammatory therapies that are currently under investigation intended to dampen the cytokine storm of severe COVID-19 infections. Furthermore, nutritional status and the role of diet and lifestyle is considered, as it is known to affect patient outcomes in other severe infections and may play a role in COVID-19 infection. This review speculates the importance of nutrition as a mitigation strategy to support immune function amid the COVID-19 pandemic, identifying food groups and key nutrients of importance that may affect the outcomes of respiratory infections.

Editorial

Nutrition support in the time of SARS-CoV-2 (COVID-19)

Laviano, A., A. Koverech, and M. Zanetti. 2020. "Nutrition support in the time of SARS-CoV-2 (COVID-19)". *Nutrition* 74: 110834. Doi: 10.1016/j.nut.2020.110834. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7132492/

Nutrition is a key determinant of health. More importantly, nutrition is part of the treatment regimen for acute and chronic diseases and applies particularly to ailments for which an etiologic treatment has not yet been discovered and validated. The 2014–2016 Ebola virus outbreak in Western Africa demonstrated that immediate supportive care significantly reduces case fatality rates. This may apply as well to the current SARS-CoV-2 (or COVID-19) pandemic that is ravaging the world.

Effect of Differences in Month and Location of Measurement in Estimating Prevalence and Trend of Wasting and Stunting in India in 2005–2006 and 2015-2016

Madan, E.M., E.A. Frongillo, S. Unisa, L. Dwivedi, R. Johnston, A. Daniel, P.K. Agrawal, S. Deb, A. Khera, P. Menon, P.H. Nguyen. 2020. "Effect of Differences in Month and Location of Measurement in Estimating Prevalence and Trend of Wasting and Stunting in India in 2005–2006 and 2015-2016". *Current Developments in Nutrition.* Doi: nzaa092. https://doi.org/10.1093/cdn/nzaa092

Background: Child undernutrition in India remains widespread. Data from the National Family Health Survey (NFHS-3 and NFHS-4) suggest that wasting prevalence has increased while stunting prevalence has declined. **Objective**: The objectives of this study were to 1) describe wasting and stunting by month of measurement in India in children < 5 years of age in NFHS-3 and NFHS-4 surveys, and 2) test whether differences in the timing of anthropometric data collection and in states between survey years introduced bias in the comparison of estimates of wasting and stunting between NFHS-3 and NFHS-4. **Method**: Data on wasting and stunting for 42,608 and 232,744 children under five years in the NFHS-3 and NFHS-4 survey rounds were analysed. Differences in the prevalence of wasting and stunting by month of year and by state were examined descriptively. Regression analyses were conducted to test the sensitivity of the estimate of differences in wasting and stunting prevalence across survey years to both state differences and seasonality. **Results**: Examination of the patterns of wasting and stunting by month of measurement and by state across survey years reveal marked variability. When both state and month were adjusted, regardless of the method used to account for sample size, there was a small negative difference from 2005–06 to 2015–16 in the prevalence of wasting (-0.8 ± 0.6 percentage points; $p = 0.2$) and a negative difference in stunting prevalence (-8.3 ± 0.7 percentage points; $p < 0.001$), indicating a small bias for wasting but not for stunting in unadjusted analyses. **Conclusions**: State and seasonal differences may have introduced bias to the estimated difference in prevalence of wasting between the survey years but did not do so for stunting. Future data collection should be designed to maximize consistency in coverage of both time and place.

Mapping of variations in child stunting, wasting and underweight within the states of India: the Global Burden of Disease Study 2000–2017

India State-Level Disease Burden Initiative CGF Collaborators. 2020. "Mapping of variations in child stunting, wasting and underweight within the states of India: the Global Burden of Disease Study 2000–2017". *EClinicalMedicine* 22: 100317. https://doi.org/10.1016/j.eclinm.2020.100317

Background: To inform actions at the district level under the National Nutrition Mission (NNM), we assessed the prevalence trends of child growth failure (CGF) indicators for all districts in India and inequality between districts within the states. **Methods:** We assessed the trends of CGF indicators (stunting, wasting and underweight) from 2000 to 2017 across the districts of India, aggregated from 5 × 5 km grid estimates, using all accessible data from various surveys with subnational geographical information. The states were categorised into three groups using their Socio-demographic Index (SDI) levels calculated as part of the Global Burden of Disease Study based on per capita income, mean education and fertility rate in women younger than 25 years. Inequality between districts within the states was assessed using coefficient of variation (CV). We projected the prevalence of CGF indicators for the districts up to 2030 based on the trends from 2000 to 2017 to compare with the NNM 2022 targets for stunting and underweight, and the WHO/UNICEF 2030 targets for stunting and wasting. We assessed Pearson correlation coefficient between two major national surveys for district-level estimates of CGF indicators in the states. **Findings:** The prevalence of stunting ranged 3.8-fold from 16.4% (95% UI 15.2–17.8) to 62.8% (95% UI 61.5–64.0) among the 723 districts of India in 2017, wasting ranged 5.4-fold from 5.5% (95% UI 5.1–6.1) to 30.0% (95% UI 28.2–31.8), and underweight ranged 4.6-fold from 11.0% (95% UI 10.5–11.9) to 51.0% (95% UI 49.9–52.1). 36.1% of the districts in India had stunting prevalence 40% or more, with 67.0% districts in the low SDI states

group and only 1.1% districts in the high SDI states with this level of stunting. The prevalence of stunting declined significantly from 2010 to 2017 in 98.5% of the districts with a maximum decline of 41.2% (95% UI 40.3–42.5), wasting in 61.3% with a maximum decline of 44.0% (95% UI 42.3–46.7), and underweight in 95.0% with a maximum decline of 53.9% (95% UI 52.8–55.4). The CV varied 7.4-fold for stunting, 12.2-fold for wasting, and 8.6-fold for underweight between the states in 2017; the CV increased for stunting in 28 out of 31 states, for wasting in 16 states, and for underweight in 20 states from 2000 to 2017. In order to reach the NNM 2022 targets for stunting and underweight individually, 82.6% and 98.5% of the districts in India would need a rate of improvement higher than they had up to 2017, respectively. To achieve the WHO/UNICEF 2030 target for wasting, all districts in India would need a rate of improvement higher than they had up to 2017. The correlation between the two national surveys for district-level estimates was poor, with Pearson correlation coefficient of 0.7 only in Odisha and four small north-eastern states out of the 27 states covered by these surveys. **Interpretation**: CGF indicators have improved in India, but there are substantial variations between the districts in their magnitude and rate of decline, and the inequality between districts has increased in a large proportion of the states. The poor correlation between the national surveys for CGF estimates highlights the need to standardise collection of anthropometric data in India. The district-level trends in this report provide a useful reference for targeting the efforts under NNM to reduce CGF across India and meet the Indian and global targets.

Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–17

India State-Level Disease Burden Initiative Child Mortality Collaborators. 2020. "Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000–17". *The Lancet* 395(10237): 1640-1658. https://doi.org/10.1016/S0140-6736(20)30471-2

Background: India has made substantial progress in improving child survival over the past few decades, but a comprehensive understanding of child mortality trends at disaggregated geographical levels is not available. We present a detailed analysis of subnational trends of child mortality to inform efforts aimed at meeting the India National Health Policy (NHP) and Sustainable Development Goal (SDG) targets for child mortality. **Methods**: We assessed the under-5 mortality rate (U5MR) and neonatal mortality rate (NMR) from 2000 to 2017 in 5 × 5 km grids across India, and for the districts and states of India, using all accessible data from various sources including surveys with subnational geographical information. The 31 states and groups of union territories were categorised into three groups using their Socio-demographic Index (SDI) level, calculated as part of the Global Burden of Diseases, Injuries, and Risk Factors Study on the basis of per-capita income, mean education, and total fertility rate in women younger than 25 years. Inequality between districts within the states was assessed using the coefficient of variation. We projected U5MR and NMR for the states and districts up to 2025 and 2030 on the basis of the trends from 2000 to 2017 and compared these projections with the NHP 2025 and SDG 2030 targets for U5MR (23 deaths and 25 deaths per 1000 livebirths, respectively) and NMR (16 deaths and 12 deaths per 1000 livebirths, respectively). We assessed the causes of child death and the contribution of risk factors to child deaths at the state level. **Findings**: U5MR in India decreased from 83·1 (95% uncertainty interval [UI] 76·7–90·1) in 2000 to 42·4 (36·5–50·0) per 1000 livebirths in 2017, and NMR from 38·0 (34·2–41·6) to 23·5 (20·1–27·8) per 1000 livebirths. U5MR varied 5·7 times between the states of India and 10·5 times between the 723 districts of India in 2017, whereas NMR varied 4·5 times and 8·0 times, respectively. In the low SDI states, 275 (88%) districts had a U5MR of 40 or more per 1000 livebirths and 291 (93%) districts had an NMR of 20 or more per 1000 livebirths in 2017. The annual rate of change from 2010 to 2017 varied among the districts from a 9·02% (95% UI 6·30–11·63) reduction to no significant change for U5MR and from an 8·05% (95% UI 5·34–10·74) reduction to no significant change for NMR. Inequality between districts within the states increased from 2000 to 2017 in 23 of the 31 states for U5MR and in 24 states for NMR, with the largest increases in Odisha and Assam

among the low SDI states. If the trends observed up to 2017 were to continue, India would meet the SDG 2030 U5MR target but not the SDG 2030 NMR target or either of the NHP 2025 targets. To reach the SDG 2030 targets individually, 246 (34%) districts for U5MR and 430 (59%) districts for NMR would need a higher rate of improvement than they had up to 2017. For all major causes of under-5 death in India, the death rate decreased between 2000 and 2017, with the highest decline for infectious diseases, intermediate decline for neonatal disorders, and the smallest decline for congenital birth defects, although the magnitude of decline varied widely between the states. Child and maternal malnutrition was the predominant risk factor, to which 68·2% (65·8–70·7) of under-5 deaths and 83·0% (80·6–85·0) of neonatal deaths in India could be attributed in 2017; 10·8% (9·1–12·4) of under-5 deaths could be attributed to unsafe water and sanitation and 8·8% (7·0–10·3) to air pollution. **Interpretation**: India has made gains in child survival, but there are substantial variations between the states in the magnitude and rate of decline in mortality, and even higher variations between the districts of India. Inequality between districts within states has increased for the majority of the states. The district-level trends presented here can provide crucial guidance for targeted efforts needed in India to reduce child mortality to meet the Indian and global child survival targets. District-level mortality trends along with state-level trends in causes of under-5 and neonatal death and the risk factors in this Article provide a comprehensive reference for further planning of child mortality reduction in India.

The impact of nutrition on COVID-19 susceptibility and long-term consequences

Butler, M.J., and R.M. Barriento. 2020. "The impact of nutrition on COVID-19 susceptibility and long-term consequences". *Brain, Behavior, and Immunity*. Doi: https://doi.org/10.1016/j.bbi.2020.04.040.

While all groups are affected by the COVID-19 pandemic, the elderly, underrepresented minorities, and those with underlying medical conditions are at the greatest risk. The high rate of consumption of diets high in saturated fats, sugars, and refined carbohydrates (collectively called Western diet, WD) worldwide, contribute to the prevalence of obesity and type 2 diabetes, and could place these populations at an increased risk for severe COVID-19 pathology and mortality. WD consumption activates the innate immune system and impairs adaptive immunity, leading to chronic inflammation and impaired host defense against viruses. Furthermore, peripheral inflammation caused by COVID-19 may have long-term consequences in those that recover, leading to chronic medical conditions such as dementia and neurodegenerative disease, likely through neuroinflammatory mechanisms that can be compounded by an unhealthy diet. Thus, now more than ever, wider access to healthy foods should be a top priority and individuals should be mindful of healthy eating habits to reduce susceptibility to and long-term complications from COVID19.

Associations of maternal resources with care behaviours differ by resource and behaviour

Basnet, S., E.A. Frongillo, P.H. Nguyen, S. Moore, and M. Arabi. 2020. "Associations of maternal resources with care behaviours differ by resource and behaviour". *Maternal & Child Nutrition*. https://doi.org/10.1111/mcn.12977

Care is important for children's growth and development, but lack or inadequacy of resources for care can constrain appropriate caregiving. The objectives of this study were to examine whether maternal resources for care are associated with care behaviours specifically infant and young child feeding, hygiene, health-seeking, and family care behaviours. The study also examined if some resources for care are more important than others. This study used baseline Alive & Thrive household surveys from Bangladesh, Vietnam, and Ethiopia. Measures of resources for care were maternal education, knowledge, height, nourishment, mental well-being, decision-making autonomy, employment, support in chores, and perceived instrumental support. Multiple regression analyses were conducted to examine the associations of resources for care with child-feeding practices (exclusive breastfeeding, minimum meal frequency, dietary and diversity), hygiene

practices (improved drinking water source, improved sanitation, and cleanliness), health-seeking (full immunization), and family care (psychosocial stimulation and availability of adequate caregiver). The models were adjusted for covariates at child, parents, and household levels and accounted for geographic clustering. All measures of resources for care had positive associations with care behaviours; in a few instances, however, the associations between the resources for care and care behaviours were in the negative direction. Improving education, knowledge, nutritional status, mental well-being, autonomy, and social support among mothers would facilitate provision of optimal care for children.

Association between milk consumption and child growth for children aged 6–59 months

Herber, C., L. Bogler, S.V. Subramanian, and S. Vollmer. 2020. "Association between milk consumption and child growth for children aged 6-59 months". *Scientific Reports* 10: 6730. https://doi.org/10.1038/s41598-020-63647-8

Apart from high levels of energy, proteins, micro- and macronutrients, milk contains calcium and the insulin-like growth factor-1 that are of major relevance for children's development and growth. Using Demographic and Health Survey data between 1990 and 2017 with information on milk consumption and anthropometric measurements from all low- and middle-income countries available, we investigate whether milk consumption in childhood is associated with stunting, wasting, and underweight. We specify logistic regression models and adjust for a range of covariates and fixed effects on the primary sampling unit level. We analyze heterogeneity in the association by wealth quintiles and age groups and present country-specific estimates. The final samples for wasting, underweight and stunting include 668.463, 693.376, and 673.177 observations of children aged 6 to 59 months, respectively. Our results suggest that milk consumption is associated with a reduced probability of being underweight of 1.4 percentage points (95% confidence interval −0.02, −0.01) and a reduced probability of being stunted of 1.9 percentage points (95% confidence interval −0.02, −0.01). The association for wasting is not robust. The association is stronger for children from wealthier households, which might indicate that milk consumption is a proxy for better overall nutrition or socio-economic status.

Factors Associated With Child Stunting, Wasting, and Underweight in 35 Low- and Middle-Income Countries

Li, Z., R. Kim, S. Vollmer, and S.V. Subramanian. 2020. "Factors Associated With Child Stunting, Wasting, and Underweight in 35 Low- and Middle-Income Countries". *JAMA Network Open* 3(4):e203386. doi:10.1001/jamanetworkopen.2020.3386 https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2764662

Importance: Evidence on the relative importance of various factors associated with child anthropometric failures (ie, stunting, underweight, and wasting) and their heterogeneity across countries can inform global and national health agendas. **Objective**: To assess the relative significance of factors associated with child anthropometric failures in 35 low- and middle-income countries (LMICs). **Design, Setting, and Participants**: This cross-sectional study of 299 353 children who were born singleton and aged 12 to 59 months with nonpregnant mothers and valid anthropometric measures assessed the strengths of associations of 26 factors with child stunting, underweight, and wasting, using Demographic and Health Surveys (2007-2018) from 35 LMICs. Data analysis was conducted from July 2019 to February 2020. **Exposures:** A total of 9 direct factors (ie, dietary diversity score; breastfeeding initiation; vitamin A supplements; use of iodized salt; infectious disease in past 2 weeks; oral rehydration therapy for children with diarrhea; care seeking for suspected pneumonia; full vaccination; and indoor pollution) and 17 indirect factors (household wealth; maternal and paternal education; maternal and paternal height and body mass index; maternal autonomy for health care, movement, and money; water source; sanitation facility; stool

disposal; antenatal care; skilled birth attendant at delivery; family planning needs; and maternal marriage age) were assessed. **Main Outcomes and Measures**: Three anthropometric failure outcomes were constructed based on the 2006 World Health Organization child growth standards: stunting (height-for-age z score less than −2 standard deviations [SDs]), underweight (weight-for-age z score less than −2 SDs), and wasting (weight-for-height z score less than −2 SDs). **Results**: Among the 299 353 children aged 12 to 59 months included in the analysis, 38.8% (95% CI, 38.6%-38.9%) had stunting, 27.5% (95% CI, 27.3%-27.6%) had underweight, and 12.9% (95% CI, 12.8%-13.0%) had wasting. In the pooled sample, short maternal height was the strongest factor associated with child stunting (odds ratio [OR], 4.7; 95% CI, 4.5-5.0; P < .001), followed by lack of maternal education (OR, 1.9; 95% CI, 1.8-2.0; P < .001), poorest household wealth (OR, 1.7; 95% CI,1.6-1.8; P < .001), and low maternal body mass index (OR, 1.6; 95% CI, 1.6-1.7; P < .001). Short paternal height was also significantly associated with higher odds of stunting (OR, 1.9; 95% CI, 1.7-2.2; P < .001). Consistent results were found for underweight (eg, short maternal height: OR, 3.5; 95% CI, 3.3-3.7; P < .001; lack of maternal education: OR, 1.8; 95% CI, 1.7-2.0; P < .001) and wasting (eg, low maternal body mass index: OR, 2.3; 95% CI, 2.1-2,4; P < .001; poorest household wealth: OR, 1.2; 95% CI, 1.1-1.3; P < .001). Parental nutritional status and household socioeconomic conditions ranked the strongest (1st to 4th) for most countries, with a few exceptions (eg, lack of maternal education ranked 18th-20th in 8 countries for child wasting). Other factors were not associated with anthropometric failures in pooled analysis and had large country-level heterogeneity; for example, unsafe water was not associated with child underweight in the pooled analysis (OR, 0.97; 95% CI, 0.95-1.00; P < .001), and it ranked from 4th to 20th across countries. **Conclusions and Relevance**: In this study, socioeconomic conditions and parental nutritional status were the strongest factors associated with child anthropometric failures. Poverty reduction, women's education, and nutrition programs for households could be important strategies for reducing child undernutrition; however, country-specific contexts should be considered in national policy discussions.

Commentary

India's food system in the time of COVID-19

Bhamoriya, A.V., P. Gupta, M. Kaushik, A. Kishore, R. Kumar, A. Sharma, and S. Verma. 2020. "India's Food System in the Time of COVID-19". *Economic and Political Weekly* 55(15): 12-14.
https://www.epw.in/journal/2020/15/commentary/indias-food-system-time-covid-19.html

India's complete lockdown has caused unnecessary disruptions in the food supply chain, with the scarcity of labour making it even worse. A sharp decline in demand is imminent with the financial sector being in a freeze and incomes having shrunk for everyone, except for the small salaried class. Consumer sentiment and business outlook on recovery are bleak. While ensuring the free movement of essential goods and availability and safety of labour can mitigate the immediate disruptions in the supply chain, unclogging the financial sector and restoring optimism in the market will take time and heroic efforts from the government.

Association of Poor Sanitation With Growth Measurements Among Children in India

Chakrabarti, S., P. Singh, and T. Bruckner. 2020. "Association of Poor Sanitation With Growth Measurements Among Children in India". *JAMA Network Open* 3(4): e202791. doi:10.1001/jamanetworkopen.2020.2791.
https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2764400#:~:text=Findings%20This%20cross%2Dsectional%20analysis,ages%20in%20childhood%20and%20adolescence.

Importance: Much research on sanitation and linear growth in low- and middle-income countries focuses on children younger than 5 years. However, poor sanitation may be associated with growth faltering during middle and late childhood to a greater extent than previously recognized. **Objective**: To characterize the association of poor sanitation with height-for-age z (HAZ) scores in children and adolescents in India aged 0 to 18 years. **Design, Setting, and Participants**: This cross-sectional study

examined 134 882 children and adolescents aged 0 to 18 years who were surveyed in the fourth round of India's District Level Household and Facilities Survey (survey conducted August 2012 to February 2014). Data were analyzed from June 1, 2019, to August 20, 2019. **Exposures**: Proportion of households reporting open defecation at the village level (to account for its high negative externality) and household-level access to boiled or filtered drinking water. **Main Outcomes and Measures:** Individual-level HAZ scores were measured in standard deviations. The association of exposures with outcomes was estimated using ordinary least-squares regression stratified by sex (boys and girls) and 4 age groups (≤1, >1 to ≤7, >7 to ≤12, >12 to ≤18 years). Models controlled for parental height and education, socioeconomic status, maternal age at birth, hemoglobin level, and indicators for state and birth year to adjust for regional (state) and temporal (birth year) fixed effects. **Results**: The sample comprised 70 463 male (52.5%) and 64 419 female (47.8%) children and adolescents aged 0 to 18 years; 46 722 participants (34.6%) were aged older than 12 to 18 years. Open defecation was inversely associated with HAZ score among all age groups except boys aged 1 year and younger (>1 to ≤7 years: β, −0.22; 95% CI, −0.35 to −0.10; >7 to ≤12 years: β, −0.15; 95% CI, −0.24 to −0.06; >12 to ≤18 years: β, −0.10; 95% CI, −0.19 to −0.01) and among girls aged between 7 and 18 years (>7 to ≤12 years: β, −0.22; 95% CI, −0.33 to −0.12; >12 to ≤18 years: β, −0.16; 95% CI, −0.23 to −0.09). Boiled or filtered drinking water was positively associated with HAZ score among younger girls (≤1 year: β, 0.26; 95% CI, 0.07 to 0.45; >1 to ≤7 years: β, 0.07; 95% CI, 0.01 to 0.14) and across all age groups in boys (≤1 years: β, 0.19; 95% CI, 0.03 to 0.35; >1 to ≤7 years: β, 0.07; 95% CI, 0.00 to 0.14; >7 to ≤12 years: β, 0.08; 95% CI, 0.03 to 0.13; >12 to ≤18 years: β, 0.06; 95% CI, 0.01 to 0.11). **Conclusions and Relevance**: In this study, open defecation and lack of boiled or filtered drinking water were inversely associated with height-for-age measures across all ages in children and adolescents in India. Improved sanitation may benefit growth among children and adolescents older than 5 years.

Strategies to address anaemia among pregnant and lactating women in India: a formative research study

Williams, P.A., J. Poehlman, K. Moran, M. Siddiqui, I. Kataria, A.M. Rego, P. Mehrotra, and N. Saldanha. 2020. "Strategies to address anaemia among pregnant and lactating women in India: a formative research study". *Public Health Nutrition* 23(5): 795-805.
https://doi.org/10.1017/S1368980019003938

Objective: Over half of pregnant women in India are affected by anaemia, which can lead to premature birth, low birth weight and maternal and child mortality. Using formative research, we aimed to understand social and cultural factors around iron and folic acid (IFA) supplement provision and adherence to identify potential strategies for improving adherence and behaviours to prevent and treat anaemia among pregnant and lactating Indian women. **Design**: In-depth interviews and focus group discussions with women and key informant interviews with health officials and workers. **Setting**: Four districts in two Indian states: Allahabad and Bara Banki districts in Uttar Pradesh and Chikkballapura and Mandya districts in Karnataka. **Participants**: Pregnant and lactating women (n 65) and district officials and community health workers (n 14). **Results**: Most women were aware of anaemia but did not understand its seriousness and consequences. All women received IFA supplements (predominantly for free), but many were not adherent because of side effects; lack of information from healthcare providers on the causes of anaemia, its seriousness and solutions and low social support. To address anaemia, women were most confident in their ability to prepare and eat healthier foods but lacked control over resources such as appropriate food availability. **Conclusions**: Based on the findings, we recommend multicomponent interventions to train healthcare providers, address systemic barriers and involve family members to support IFA supplement adherence and dietary changes. Future research will determine which strategies are most effective to reduce the burden of anaemia in India among pregnant and lactating women.

Utilization of Integrated Child Development Services in India: Programmatic Insights from National Family Health Survey, 2016

Rajpal, S., W. Joe, M.A. Subramanyam, R. Sankar, S. Sharma, A. Kumar, R. Kim, and S.V. Subramanian. 2020. "Utilization of Integrated Child Development Services in India: Programmatic Insights from National Family Health Survey, 2016". *International Journal of Environmental Research and Public Health* 17(9): 10.3390/ijerph17093197. https://doi.org/10.3390/ijerph17093197

The Integrated Child Development Services (ICDS) program launched in India in 1975 is one of the world's largest flagship programs that aims to improve early childhood care and development via a range of healthcare, nutrition and early education services. The key to success of ICDS is in finding solutions to the historical challenges of geographic and socioeconomic inequalities in access to various services under this umbrella scheme. Using birth history data from the National Family Health Survey (Demographic and Health Survey), 2015–2016, this study presents (a) socioeconomic patterning in service uptake across rural and urban India, and (b) continuum in service utilization at three points (i.e., by mothers during pregnancy, by mothers while breastfeeding and by children aged 0–72 months) in India. We used an intersectional approach and ran a series multilevel logistic regression (random effects) models to understand patterning in utilization among mothers across socioeconomic groups. We also computed the area under the receiver operating characteristic curve (ROC-AUC) based on a logistic regression model to examine concordance between service utilization across three different points. The service utilization (any service) by mothers during pregnancy was about 20 percentage points higher for rural areas (60.5 percent; 95% CI: 60.3; 30.7) than urban areas (38.8 percent; 95% CI: 38.4; 39.1). We also found a lower uptake of services related to health and nutrition education during pregnancy (41.9 percent in rural) and early childcare (preschool) (42.4 percent). One in every two mother–child pairs did not avail any benefits from ICDS in urban areas. Estimates from random effects model revealed higher odds of utilization among schedule caste mothers from middle-class households in rural households. AUC estimates suggested a high concordance between service utilization by mothers and their children (AUC: 0.79 in rural; 0.84 in urban) implying a higher likelihood of continuum if service utilization commences at pregnancy.

Lasting Impact of Early Life Interventions: Evidence from India's Integrated Child Development Services

Dhamija and Sen. 2020. "Lasting Impact of Early Life Interventions: Evidence from India's Integrated Child Development Services". *The Journal of Development Studies*
https://doi.org/10.1080/00220388.2020.1762861

In the year 1975, the Indian government initiated the Integrated Child Development Services (ICDS), the largest national programme in the world targeting long-term nutrition and holistic development of children, to be implemented through the Anganwadi Centres (AWC). Combining differences across villages in the year of AWC construction with birth-year of children, we capture the variation in 'exposure' to the programme, to estimate the impact of the ICDS exposure through access to AWCs on later life health outcomes of children. Our findings suggest that a 10–13 year old cohort fully exposed to the scheme during first three years of life has higher height (by 2.3 cm) and weight (by 1 kg) as compared to the same cohort, not exposed to the services in initial three years. The Z score of height-for-age (ZHFA) and Z score of weight-for-age ZWFA, although not statistically significant, seem to increase as well. The average impacts seem to be as high as 0.74 cm and 0.33 kg for an extra year of exposure, for measures of height and weight, respectively. Our findings are robust to changing age cohorts and several specifications. The effects seem to be larger among girls and in poor households.

Child Undernutrition and Convergence of Multisectoral Interventions in India: An Econometric Analysis of National Family Health Survey 2015–16

Rajpal, S., W. Joe, R. Kim, A. Kumar and S.V. Subramanian. 2020. "Child Undernutrition and Convergence of Multisectoral Interventions in India: An Econometric Analysis of National Family Health Survey 2015–16" *Frontiers in Public Health* 8. https://doi.org/10.3389/fpubh.2020.00129

In India and worldwide, there has been increased strategic focus on multisectoral convergence of nutrition-specific and nutrition-sensitive interventions to attain rapid reductions in child undernutrition. For instance, a Convergence Action Plan in India has been formed to synchronize and converge various nutrition-related interventions across ministries of union and state governments under a single umbrella. Given the large variation in number, nature and impact of these interventions, this paper aims to quantify the contribution of each intervention (proxied by relevant covariates) toward reducing child stunting and underweight in India. The interventions are classified under six sectors: (a) health, (b) women and child development, (c) education, (d) water, sanitation, and hygiene, (e) clean energy, and (f) growth sector. We estimate the potential reduction in child stunting and underweight in a counterfactual scenario of "convergence" where all the interventions across all the sectors are simultaneously and successfully implemented. The findings from our econometric analysis suggests that under this counterfactual scenario, a reduction of 18.37% points (95% CI: 16.77; 19.95) in stunting and 20.26% points (95% CI: 19.13; 21.39) in underweight can be potentially achieved. Across all the sectors, women and child development and clean energy were identified as the biggest contributors to the potential reductions in stunting and underweight, underscoring the importance of improving sanitation-related practices and clean cooking fuel. The overall impact of this convergent action was relatively stronger for less developed districts. These findings reiterate a clear role and scope of convergent action in achieving India's national nutritional goals. This warrants a complete outreach of all the interventions from different sectors.

Measuring coverage of infant and young child feeding counselling interventions: A framework and empirical considerations for survey question design

Choufani, J., S.S. Kim, P.H. Nguyen, R. Heidkamp, L. Grummer-Strawn, K.K. Saha, C. Hayashi, V. Mehra, S. Alayon, and P. Menon. 2020. "Measuring coverage of infant and young child feeding counselling interventions: A framework and empirical considerations for survey question design". *Maternal & Child Nutrition*. https://doi.org/10.1111/mcn.13001

Most countries implement nutrition counselling interventions as part of programmes to support breastfeeding and complementary feeding. However, data to track coverage of counselling interventions are rarely available. As a result, little is known about the coverage of counselling on infant and young child feeding (IYCF). Survey-based data collection systems generally collect data on IYCF practices but do not collect data on coverage of interventions to support IYCF, and those surveys that do collect this information do not do so consistently. We present a framework to guide the design of survey questions to measure IYCF counselling coverage. We provide examples of how large-scale surveys for programme evaluation and national monitoring have included survey questions to address these data gaps. Our review suggests that elements relevant to designing survey questions to capture coverage of counselling interventions include timing of contact, target behaviour and message content, place of contact, type of service provider, frequency of contact and mode of intervention. Application of this framework may help strengthen harmonized measurement of IYCF counselling coverage to enable better tracking of programme investments, document progress in scaling up nutrition services and allow for cross-country comparisons. Thus, improving measurement of counselling coverage may lead to improved reach of programmes to support optimal IYCF practices.

Study protocol

Effects of an mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: protocol for a quasi-experimental mixed-methods evaluation

Nimmagadda, S., L. Gopalakrishnan, R. Avula, D. Dhar, N. Diamond-Smith, L. Fernald, A. Jain, S. Mani, P. Menon, P.H. Nguyen, H. Park, S.R. Patil, P. Singh, and D. Walker. 2020. "Effects of an mHealth intervention for community health workers on maternal and child nutrition and health service delivery in India: protocol for a quasi-experimental mixed-methods evaluation". *BMJ Open* 9(3). http://dx.doi.org/10.1136/bmjopen-2018-025774

Introduction: Millions of children in India still suffer from poor health and under-nutrition, despite substantial improvement over decades of public health programmes. The Anganwadi centres under the Integrated Child Development Scheme (ICDS) provide a range of health and nutrition services to pregnant women, children <6 years and their mothers. However, major gaps exist in ICDS service delivery. The government is currently strengthening ICDS through an mHealth intervention called Common Application Software (ICDS-CAS) installed on smart phones, with accompanying multilevel data dashboards. This system is intended to be a job aid for frontline workers, supervisors and managers, aims to ensure better service delivery and supervision, and enable real-time monitoring and data-based decision-making. However, there is little to no evidence on the effectiveness of such large-scale mHealth interventions integrated with public health programmes in resource-constrained settings on the service delivery and subsequent health and nutrition outcomes. **Methods and analysis:** This study uses a village-matched controlled design with repeated cross-sectional surveys to evaluate whether ICDS-CAS can enable more timely and appropriate services to pregnant women, children <12 months and their mothers, compared with the standard ICDS programme. The study will recruit approximately 1500 Anganwadi workers and 6000+ mother-child dyads from 400+ matched-pair villages in Bihar and Madhya Pradesh. The primary outcomes are the proportion of beneficiaries receiving (a) adequate number of home visits and (b) appropriate level of counselling by the Anganwadi workers. Secondary outcomes are related to improvements in other ICDS services, and knowledge and practices of the Anganwadi workers and beneficiaries. **Ethics and dissemination**: Ethical oversight is provided by the Committee for the Protection of Human Subjects at the University of California at Berkeley, and the Suraksha Independent Ethics Committee in India. The results will be published in peer-reviewed journals and analysis data will be made public.

NON-PEER REVIEWED

Visit POSHAN website to explore issues of our **COVID-19 Nutrition Digest** (May & June 2020) – a collection of recently published peer- and non-peer-reviewed resources, including research articles blogposts, opinion pieces etc. These are collated from various sources, and analyze the impacts of COVID-19 pandemic on the outcomes, determinants and coverage of interventions related to maternal and child nutrition.

COVID-19 Nutrition Digest (June 2020) - http://poshan.ifpri.info/2020/06/05/covid-19-nutrition-digest-june-2020/

COVID-19 Nutrition Digest (May 2020) - http://poshan.ifpri.info/2020/05/21/covid-19-nutrition-digest-may-2020/

Policy Brief: The Impact of COVID-19 on children

United Nations. 2020. *The Impact of COVID-19 on children*. Policy Brief. https://unsdg.un.org/sites/default/files/2020-04/160420_Covid_Children_Policy_Brief.pdf

Children are not the face of this pandemic. But they risk being among its biggest victims. While they have thankfully been largely spared from the direct health effects of COVID-19 - at least to date – the crisis is having a profound effect on their wellbeing. All children, of all ages, and in all countries, are being affected, in particular by the socio-economic impacts and, in some cases, by mitigation measures that may inadvertently do more harm than good. This is a universal crisis and, for some

children, the impact will be lifelong. Moreover, the harmful effects of this pandemic will not be distributed equally. They are expected to be most damaging for children in the poorest countries, and in the poorest neighbourhoods, and for those in already disadvantaged or vulnerable situations.

UPCOMING EVENTS & DEADLINES

Agriculture, Nutrition & Health (ANH) Academy Week

When: Learning Labs – June 23-25, 2020; Research Conference – June 30 – July 2, 2020
Where: Webinar
For more information: https://anh-academy.org/anh2020-registration

Build back better: anaemia programmes post COVID-19

When: June 25, 2020
Where: Webinar
For more information: https://www.who.int/news-room/events/detail/2020/06/25/default-calendar/areacop-webinar-anaemia-programmes-post-COVID-19

7th WHO advanced course on health financing for universal coverage for low- and middle-income countries

About the course: The course is structured in line with WHO's approach to thinking and analyzing health financing policy and its role in improving health system performance, in particular making progress towards universal health coverage. During the course, participants will be able to apply WHO approach to analyze and reflect on their own health systems performance, assess the problems it faces, and discuss ideas with professionals from a wide range of countries.
When: 21–25 September 2020
Where: Geneva, Switzerland/Possibility of a facilitated online version
For more information: https://www.who.int/news-room/events/detail/2020/09/21/default-calendar/seventh-advanced-course-on-health-financing-for-universal-coverage-for-low--and-middle-income-countries

Micronutrient Forum 5th Global Conference and 2nd Global Summit on Food Fortification

Theme: Building New Evidence and Alliances for Improving Nutrition
When: November 8-13, 2020
Where: Bangkok, Thailand
For more information: https://conference.micronutrientforum.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.

CONTACT US

Email us at IFPRI-POSHAN@cgiar.org
IFPRI-NEW DELHI
INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
NASC Complex, CG Block, Dev Prakash Shastri Road, Pusa, New Delhi 110012, India
T +91.11.66166565; F +91.11.66781699
http://poshan.ifpri.info/
IFPRI-HEADQUARTERS
INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW, Washington, DC 20006-1002 USA
T. +1.202.862.5600 F. +1.202.467.4439
Skype: IFPRIhomeoffice; Email: ifpri@cgiar.org
www.ifpri.org

This publication has been prepared by POSHAN with research assistance from Pratima Mathews, IFPRI, and has not been peer reviewed. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies of the International Food Policy Research Institute. Please contact Dr. Rasmi Avula for any questions.