

EDITOR'S NOTE

We are delighted to present another issue of Abstract Digest with a collection of interesting and insightful articles on various aspects of maternal and child nutrition, from around the world, with relevance to India. Four articles in this issue used different rounds of the National Family Health Survey data to examine a range of issues including trends in mortality rates, developing an algorithm for predicting newborns' risk of undernutrition in the first 5 years of life, estimating burden of malnutrition, and coverage and equity of Integrated Child Development Services program. Here are some of the highlights:

- Using three rounds of National Family Health Survey data (NFHS – 1, 3, and 4), [Bhatia and colleagues](#) (2019) analyzed the patterns and trends in the mortality rates of infants and children under the age of 5 in India and concluded that while a majority of the states have witnessed over 50 percent reduction in both infant and under-5 mortality rates, there is huge inter-state variability.
- Using the NFHS-4 data, [Soni and Allison](#) (2019) developed an algorithm that can be used at the time of delivery to characterise newborns' risk of undernutrition in the first 5 years of life.
- [Leroy and Frongillo](#) (2019) critically examined the current evidence and understanding of mechanisms pertaining to linear growth retardation and stunting and multiple outcomes. The authors addressed the confusion and misunderstanding between using linear growth retardation and stunting as markers of other outcomes vis-à-vis as outcomes of their own intrinsic value.
- [Varghese and colleagues](#) (2019) used NFHS-4 data to examine the prevalence of a comprehensive list of dual burdens of malnutrition in individuals and households across the 36 states and 640 districts of India and concluded that while dual burdens of anemia, stunting, and underweight are prevalent, there is no evidence of clustering of overweight with other forms of malnutrition in India.
- In a prospective observational cohort study of 72,750 pregnant women, [Patel and colleagues](#) (2019) documented the prevalence of anaemia and low BMI among pregnant women and found that 90 percent of women were anemic and a third were underweight and maternal anaemia is associated with enhanced risk of stillbirth, neonatal deaths and low birth weight (LBW) in babies.
- [Bhatnagar and colleagues](#) (2019) presented a cohort study protocol of pregnant women in India to identify clinical, epidemiologic, genomic, epigenomic, proteomic, and microbial correlates, discover molecular-risk markers by using an integrative -omics approach and generate a risk-prediction algorithm for preterm birth.
- [Ghosh and colleagues](#) (2019) proposed a new Estimated Average Requirement (EAR) for iron in Indian women. Based on the new EAR, the prevalence of risk of dietary iron inadequacy in women of reproductive age is much lower than previously thought and should be used to evaluate with precision, the benefits and risks of iron fortification and supplementation policies.
- Communicable diseases still account for nearly half of deaths in India in children aged 5–14 years unlike in Brazil, China, and Mexico ([Fadel et al.](#) 2019).

- Using data from multiple datasets [Azzopardi and colleagues](#) (2019) examined changes in adolescent health and wellbeing from 1990 to 2016 and presented country-level estimates for indicators pertaining to health outcomes, health risks, and social determinants of health. The authors found that although the disease burden declined in many settings, in 2016, adolescents were living in multi-burden countries and faced a heavy and complex diseases burden.
- [India State-Level Disease Burden Initiative Diabetes Collaborators](#) (2018) examined the prevalence of diabetes, its disease burden, and its risk factors across the states of India from 1990 to 2016 under the Global Burden of Diseases project and found that the increase in health loss from diabetes since 1990 in India was the highest among major noncommunicable diseases. The group recognized the state-level differences and called for policy action to control “potentially explosive public health situation”.
- Responding to a cluster-randomised trial by [Humphrey and colleagues](#) (2019) and an accompanying comment by [Maleta and Manary](#) (2019), [Russell and Azzopardi](#) (2019) have argued that WASH remains a crucial intervention for child health and development and is central to sustainable development for three key reasons.
- In a cross-country study linking panel data on government distortions to agriculture incentives and the demographic health surveys, [Adjaye-Gbewonyo and colleagues](#) (2019) examined associations between government policies on agricultural trade prices and child nutrition outcomes, and found that government assistance to tradable agriculture was associated with small but significant improvements in child nutritional status.
- Using India’s fourth District Level Health Survey (DLHS-4) data and Moderate-Resolution Imaging Spectroradiometer satellite data on fire occurrence, [Chakrabarti and colleagues](#) (2019) estimated the burden of acute respiratory infection due to agricultural crop-residue burning (ACRB). The authors found that eliminating ACRB would avert 14.9 million disability-adjusted life years lost per year.
- [Chakrabarti and colleagues](#) (2019) investigated coverage and equity of India’s Integrated Child Development Services programme, before and after the programme was universalized and found that while the coverage improved between 2006 and 2016, sub-national variability remains, and the poorest quintile of the population is still left behind.
- [Scott and colleagues](#) (2019) conducted a review of three databases for published research on India’s accredited social health activist (ASHA) community health worker (CHW) programme and found that the literature highlights small-scale innovations and showcases the program’s challenges at scale in the context of the health system.
- [Oliver and Cairney](#) (2019) conducted a systematic review and distilled eight recommendations for academics on the dos and don'ts of influencing policy.

Enjoy reading!

PEER-REVIEWED

Trends, patterns and predictive factors of infant and child mortality in wellperforming and underperforming states of India: a secondary analysis using National Family Health Surveys

Bhatia, M., L. K. Dwivedi, M. Ranjan, P. Dixit, and V. Putcha. 2019. "Trends, patterns and predictive factors of infant and child mortality in wellperforming and underperforming states of India: a secondary analysis using National Family Health Surveys." *BMJ Open* 9(3): e023875.

doi:10.1136/bmjopen-2018-023875.

<http://dx.doi.org/10.1136/bmjopen-2018-023875>

Objectives: This paper analyses the patterns and trends in the mortality rates of infants and children under the age of 5 in India (1992–2016) and quantifies the variation in performance between different geographical states through three rounds of nationally representative household surveys. **Design:** Three rounds of cross-sectional survey data. **Setting:** The study is conducted at the national level: India and its selected good-performing states, namely Haryana, Kerala, Maharashtra, Punjab and Tamil Nadu, and selected poor-performing states, namely Bihar, Chhattisgarh, Madhya Pradesh and Uttar Pradesh. **Participants:** Adopting a multistage, stratified random sampling, 601 509 households with 699 686 women aged 15–49 years in 2015–2016, 109 041 households with 124 385 women aged 15–49 years in 2005–2006, and 88 562 households with 89 777 ever married women in the age group 13–49 years in 1992–1993 were selected. **Results:** Through the use of maps, this paper clearly shows that the overall trend in infant and child mortality is on a decline in India. Computation of relative change shows that majority of the states have witnessed over 50% reduction in both infant and under-5 mortality rates from National Family Health Survey (NFHS)-I to NFHS-4. However, the improvements are not evenly distributed, and there is huge variation in performance between states over time. Funnel plots show that the most populous states like Uttar Pradesh Bihar and Madhya Pradesh have underperformed consistently across the survey period from 1992 to 2016. Regression analysis comparing high-performing and low-performing states revealed that female infants and women with shorter birth intervals had greater risk of infant deaths in poorperforming states. **Conclusion:** Attempts to reduce infant and child mortality rates in India are heading in the right direction. Even so, there is huge variation in performance between states. This paper recommends a mix of strategies that reduce child and infant mortality among the high-impact states where the biggest improvements can be expected, including the need to address neonatal mortality.

Identification of infants at risk of child undernutrition in India: building a predictive algorithm with data from a nationally representative survey

Soni, A., and J. Allison. 2019. "Identification of infants at risk of child undernutrition in India: building a predictive algorithm with data from a nationally representative survey." *The Lancet* 7(Supplement 1): S24.

[https://doi.org/10.1016/S2214-109X\(19\)30109-3](https://doi.org/10.1016/S2214-109X(19)30109-3)

Background: India is at the centre of global child undernutrition, with a burden of malnourished children nearly twice that of all sub-Saharan African countries. The Indian government has established many national-level initiatives to address this public health crisis. However, there is substantial variation between and within states in the prevalence of child undernutrition, and strategies to identify at-risk populations are needed in the context of limited resources. Here, we describe the development of an algorithm that can be deployed at the time of delivery to characterise newborns' risk of undernutrition in the first 5 years of life. **Methods:** We extracted data on 232440 children younger than 5 years from the 2015–16 National Family Health Survey. A child was considered undernourished if either height-for-age, weight-for-height, or weight-for-age was

more than 2 SD below median WHO child growth standards. We used predictor variables identified in published studies if they could be measured at the time of delivery and used multilevel logistic regression to model the outcome. Model calibration was assessed using the Hosmer-Lemeshow test. We tested internal validity of the model using 200 bootstrapped samples to derive an optimism-adjusted c-statistic. All analyses were done with svy command in STATA to account for complex clustered sampling. **Findings:** In 2016, 54.7% of Indian children younger than 5 years were either stunted (38.4%), underweight (35.8%), or wasted (21.0%). The predictive model for overall undernutrition included maternal factors (height, education, reproductive history, number of antenatal visits), child factors (sex and birthweight), and household characteristics (district of residence, caste, rural residence, toilet availability, presence of a separate kitchen). The model demonstrated good discrimination ability (c-statistic: 0.688, optimism-adjusted c: 0.686). The prevalence of child undernutrition in the lowest decile risk group was 24.0%, and in the highest decile risk group it was 77.9%. **Interpretation:** We are developing a mobile-based app to collect the information and categorise children into a risk decile at the time of delivery. Since more than 80% of births in India are registered by community health workers, who are also responsible for implementing child nutrition programmes, this tool could help workers identify infants at risk of malnutrition and prioritise their interventions.

Perspective: What Does Stunting Really Mean? A Critical Review of the Evidence

Leroy, J. L., and E. A. Frongillo. 2019. "Perspective: What Does Stunting Really Mean? A Critical Review of the Evidence." *Advances in Nutrition* 10(2): 196–204.
<https://doi.org/10.1093/advances/nmy101>.

Abstract: The past decade has seen an unprecedented increase in attention to undernutrition, and drastically reducing child stunting has become a global development objective. The strong focus on linear growth retardation and stunting has enabled successful advocacy for nutrition, but with this focus has come some confusion and misunderstanding about the meaning of linear growth retardation and stunting among researchers, donors, and agencies active in nutrition. Motivated by the belief that a sharp focus will further accelerate progress in reducing undernutrition, we critically reviewed the evidence. The global attention to stunting is based on the premise that any intervention aimed at improving linear growth will subsequently lead to improvements in the correlates of linear growth retardation and stunting. Current evidence and understanding of mechanisms do not support this causal thinking, with 2 exceptions: linear growth retardation is a cause of difficult births and poor birth outcomes. Linear growth retardation is associated with (but does not cause) delayed child development, reduced earnings in adulthood, and chronic diseases. We thus propose distinguishing 2 distinctly different meanings of linear growth retardation and stunting. First, the association between linear growth retardation (or stunting) and other outcomes makes it a useful marker. Second, the causal links with difficult births and poor birth outcomes make linear growth retardation and stunting outcomes of intrinsic value. In many cases a focus on linear growth retardation and stunting is not necessary to improve the well-being of children; in many other cases, it is not sufficient to reach that goal; and for some outcomes, promoting linear growth is not the most cost-efficient strategy. We appeal to donors, program planners, and researchers to be specific in selecting nutrition outcomes and to target those outcomes directly.

Malnutrition among women and children in India: limited evidence of clustering of underweight, anemia, overweight, and stunting within individuals and households at both state and district levels

Varghese, J.S., and A.D. Stein. 2019. "Malnutrition among women and children in India: limited evidence of clustering of underweight, anemia, overweight, and stunting within individuals and

households at both state and district levels.” *The American Journal of Clinical Nutrition*. <https://doi-org.ifpri.idm.oclc.org/10.1093/ajcn/nqy374>.
<https://doi-org.ifpri.idm.oclc.org/10.1093/ajcn/nqy374>

Background: In India, the prevalences of stunting and anemia have declined in the last decade, but continue to remain high in many regions, whereas those of overweight and obesity have increased in all age and socioeconomic groups. Determining whether these forms of malnutrition cluster is important for the development of appropriate interventions. **Objectives:** Our objective was to describe the prevalence of a comprehensive list of dual burdens of malnutrition in individuals and households across the 36 states and 640 districts of India. **Methods:** We analyzed data from the National Family Health Survey-4, 2015–2016, including 655,156 women aged 15–49 y and 145,653 children aged 6–59 mo in India. We measured the coexistence of 19 combinations of women's anemia, underweight, and overweight and children's stunting, underweight, overweight, and anemia at the individual and household levels. We aggregated this information to the state (n = 36) and district (n = 640) levels. We examined whether the observed dual burden prevalence exceeded the expected prevalence, and whether any such excess was related to household wealth. **Results:** Of the 19 dual burdens examined, 8 had significant excess prevalence at the state level and 5 had significant excess prevalence at the district level. All but 1 of these instances reflected an excess dual burden of undernutrition as opposed to clustering of overweight with a form of undernutrition. Household wealth was not positively associated with any clustering of burdens. **Conclusions:** While dual burdens of anemia, stunting, and underweight are prevalent, there is no evidence of clustering of overweight with other forms of malnutrition in India.

Maternal anemia and underweight as determinants of pregnancy outcomes: cohort study in eastern rural Maharashtra, India

Patel, A., A. A. Prakash, P. K. Das, S. Gupta, Y. V. Pusdekar, and P. L. Hibberd. 2018. “Maternal anemia and underweight as determinants of pregnancy outcomes: cohort study in eastern rural Maharashtra, India.” *BMJ Open* 8:e021623. doi: 10.1136/bmjopen-2018-021623.
<http://dx.doi.org/10.1136/bmjopen-2018-02163>

Objectives: To study the trend in the prevalence of anaemia and low BMI among pregnant women from Eastern Maharashtra and evaluate if low BMI and anaemia affect pregnancy outcomes. **Design:** Prospective observational cohort study. **Setting:** Catchment areas of 20 rural primary health centres in four eastern districts of Maharashtra State, India. **Participants:** 72 750 women from the Nagpur site of Maternal and Newborn Health Registry of NIH's Global Network, enrolled from 2009 to 2016. **Main outcome measures:** Mode of delivery, pregnancy related complications at delivery, stillbirths, neonatal deaths and low birth weight (LBW) in babies. **Results:** Over 90% of the women included in the study were anaemic and over a third were underweight (BMI<18 kg/m²) and with both conditions. Mild anaemia at any time during delivery significantly increased the risk (Risk ratio; 95% confidence interval (RR;(95%CI)) of stillbirth (1.3 (1.1–1.6)), neonatal deaths (1.3 (1–1.6)) and LBW babies (1.1 (1–1.2)). The risks became even more significant and increased further with moderate/severe anaemia any time during pregnancy for stillbirth (1.4 (1.2–1.8)), neonatal deaths (1.7 (1.3–2.1)) and LBW babies (1.3 (1.2–1.4)). Underweight at any time during pregnancy increased the risk of neonatal deaths (1.1 (1–1.3)) and LBW babies (1.2;(1.2–1.3)). The risk of having stillbirths (1.5;(1.2–1.8)), neonatal deaths (1.7;(1.3–2.3)) and LBW babies (1.5;(1.4–1.6)) was highest when - the anaemia and underweight co-existed in the included women. Obesity/overweight during pregnancy increased the risk of maternal complications at delivery (1.6;(1.5–1.7)) and of caesarean section (1.5;(1.4–1.6)) and reduced the risk of LBW babies 0.8 (0.8–0.9)). **Conclusion:** Maternal anaemia is associated with enhanced risk of stillbirth, neonatal deaths and LBW. The risks increased if anaemia and underweight were present simultaneously.

A Pregnancy Cohort to Study Multidimensional Correlates of Preterm Birth in India: Study Design, Implementation, and Baseline Characteristics of the Participants

Bhatnagar, S., P. P. Majumder, and D. M. Salunke. 2019. "A Pregnancy Cohort to Study Multidimensional Correlates of Preterm Birth in India: Study Design, Implementation, and Baseline Characteristics of the Participants." *American Journal of Epidemiology* 188(4): 621–631. <https://academic.oup.com/aje/article-abstract/188/4/621/5321226?redirectedFrom=fulltext>

Abstract: Globally, preterm birth is a major public health problem. In India, 3.6 million of the 27 million infants born annually are preterm. Risk stratification of women based on multidimensional risk factors assessed during pregnancy is critical for prevention of preterm birth. A cohort study of pregnant women was initiated in May 2015 at the civil hospital in Gurugram, Haryana, India. Women are enrolled within 20 weeks of gestation and are followed until delivery and once postpartum. The objectives are to identify clinical, epidemiologic, genomic, epigenomic, proteomic, and microbial correlates; discover molecular-risk markers by using an integrative -omics approach; and generate a risk-prediction algorithm for preterm birth. We describe here the longitudinal study design, methodology of data collection, and the repositories of data, biospecimens, and ultrasound images being created. A total of 4,326 pregnant women, with documented evidence of recruitment before 20 weeks of gestation, have been enrolled through March 2018. We report baseline characteristics and outcomes of the first 2,000 enrolled participants. A high frequency of preterm births (14.9% among 1,662 live births) is noteworthy. The cohort database and the repositories will become global resources to answer critical questions on preterm birth and other birth outcomes.

Revisiting Dietary Iron Requirement and Deficiency in Indian Women: Implications for Food Iron Fortification and Supplementation

Ghosh, S., S. Sinha, T. Thomas, H.S. Sachdev, and A.V. Kurpad. 2019. "Revisiting Dietary Iron Requirement and Deficiency in Indian Women: Implications for Food Iron Fortification and Supplementation." *The Journal of Nutrition* 149(3): 366–371. <https://doi.org/10.1093/jn/nxy283>

Abstract: Anemia in Indian women continues to be highly prevalent, and is thought to be due to low dietary iron content. The high risk of dietary iron deficiency is based on the Indian Council of Medical Research recommendation of 21 mg/d, but there is a need for a secure and transparent determination of the Estimated Average Requirement (EAR) of iron in this population. In nonpregnant, nonlactating women of reproductive age (WRA), the EAR of iron was determined to be 15 mg/d. Applying this value to daily iron intakes among WRA in nationally representative Indian state-based data showed that the median risk of dietary iron deficiency was lower than previously thought (65%; IQR: 48–78%), with considerable heterogeneity between states (range: 25–93%). However, in a validation, this risk matched the risk of iron deficiency as defined by blood biomarkers in a recently completed survey. When the risk of dietary iron deficiency was modelled for an increase in iron intake through food fortification of a single dietary staple, that provided 10 mg/d, the median risk reduced substantially (from 65% to 20%), and it virtually disappeared when supplementary iron intakes through the national iron supplementation program were considered. The risk of exceeding the tolerable upper level (TUL) of intake of iron remains low in the population when receiving fortification of 10 mg/d, but is much higher if they consume greater amounts of iron through supplements (range: 0–54%). This newly and transparently defined Indian EAR of iron should be used to evaluate, with precision, the benefits and risks of iron fortification and supplementation policies.

Trends in cause-specific mortality among children aged 5–14 years from 2005 to 2016 in India, China, Brazil, and Mexico: an analysis of nationally representative mortality studies

Fadel, S.A., C. Boschi-Pinto, S. Yu, L.M. Reynales-Shigematsu, G.R. Menon, L. Newcombe, K.L. Strong, Q. Wang, and P. Jha. 2019. "Trends in cause-specific mortality among children aged 5–14 years from 2005 to 2016 in India, China, Brazil, and Mexico: an analysis of nationally representative mortality studies." *The Lancet* 393(10176): 1119-1127.

[https://doi.org/10.1016/S0140-6736\(19\)30220-X](https://doi.org/10.1016/S0140-6736(19)30220-X)

Background: With global survival increasing for children younger than 5 years of age, attention is required to reduce the approximately 1 million deaths of children aged 5–14 years occurring every year. Causes of death at these ages remain poorly documented. We aimed to explore trends in mortality by causes of death in India, China, Brazil, and Mexico, which are home to about 40% of the world's children aged 5–14 years and experience more than 200 000 deaths annually at these ages.

Methods: We examined data on 244 401 deaths in children aged 5–14 years from four nationally representative data sources that obtained direct distributions of causes of death: the Indian Million Death Study, the Chinese Disease Surveillance Points, mortality data from the Mexican Instituto Nacional de Estadística y Geografía, and mortality data from the Brazilian Institute of Geography and Statistics. We present data on 12 main disease groups in all countries, with breakdown by communicable and nutritional diseases, non-communicable diseases, injuries, and ill-defined causes. To calculate age-specific and sex-specific death rates for each cause, we applied the national cause of death distribution to the UN mortality envelopes for 2005–16 for each country. **Findings:** Unlike Brazil, China, and Mexico, communicable diseases still account for nearly half of deaths in India in children aged 5–14 years (73 920 [46·1%] of 160 330 estimated deaths in 2016). In 2016, India had the highest death rates in nearly every category, including from communicable diseases. Fast declines among girls in communicable disease mortality narrowed the gap by 2016 with boys in India (32·6 deaths per 100 000 girls vs 26·2 per 100 000 boys) and China (1·7 vs 1·5). In China, injuries accounted for the greatest proportions of deaths (20 970 [53·2%] of 39 430 estimated deaths, in which drowning was a leading cause). The homicide death rate at ages 10–14 years was higher for boys than for girls in Brazil, increasing annually by an average of 0·7% (0·3–1·1). In India and China, the suicide death rates were higher for girls than for boys at ages 10–14 years. By contrast, in Mexico it was higher for boys than for girls, increasing annually by an average of 2·8% (2·0–3·6). Deaths from transport injuries, drowning, and cancer are common in all four countries, with transport accidents among the top three causes of death for both sexes in all countries, except for Indian girls, and cancer in the top three causes for both sexes in Mexico, Brazil, and China.

Interpretation: Most of the deaths that occurred between 2005 and 2016 in children aged 5–14 years in India, China, Brazil, and Mexico arose from preventable or treatable conditions. This age group is important for extending some of the global disease-specific targets developed for children younger than 5 years of age. Interventions to control noncommunicable diseases and injuries and to strengthen cause of death reporting systems are also required.

Progress in adolescent health and wellbeing: tracking 12 headline indicators for 195 countries and territories, 1990–2016

Azzopardi, P.S., S.J.C. Hearps, K.L. Francis, E.C. Kennedy, A.H. Mokdad, N.J. Kassebaum, S. Lim, C.M.S. Irvine, T. Vos, A.D. Brown, S. Dogra, S.A. Kinner, N.S. Kaoma, M. Naguib, N.J. Reavley, J. Requejo, J.S. Santelli, S.M. Sawyer, V. Skirbekk, M. Temmerman, J. Tewhaiti-Smith, J.L. Ward, R.M. Viner, and G.C. Patton. 2019. "Progress in adolescent health and wellbeing: tracking 12 headline indicators for 195 countries and territories, 1990–2016." *The Lancet* 393(10176): 1101-1118.

[https://doi.org/10.1016/S0140-6736\(18\)32427-9](https://doi.org/10.1016/S0140-6736(18)32427-9)

Background: Rapid demographic, epidemiological, and nutritional transitions have brought a pressing need to track progress in adolescent health. Here, we present country-level estimates of 12 headline indicators from the Lancet Commission on adolescent health and wellbeing, from 1990 to 2016.

Methods: Indicators included those of health outcomes (disability-adjusted life-years [DALYs] due to communicable, maternal, and nutritional diseases; injuries; and non-communicable diseases); health risks (tobacco smoking, binge drinking, overweight, and anaemia); and social determinants of health (adolescent fertility; completion of secondary education; not in education, employment, or training [NEET]; child marriage; and demand for contraception satisfied with modern methods). We drew data from the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2016, International Labour Organisation, household surveys, and the Barro-Lee education dataset. **Findings:** From 1990 to 2016, remarkable shifts in adolescent health occurred. A decrease in disease burden in many countries has been offset by population growth in countries with the poorest adolescent health profiles. Compared with 1990, an additional 250 million adolescents were living in multi-burden countries in 2016, where they face a heavy and complex burden of disease. The rapidity of nutritional transition is evident from the 324.1 million (18%) of 1.8 billion adolescents globally who were overweight or obese in 2016, an increase of 176.9 million compared with 1990, and the 430.7 million (24%) who had anaemia in 2016, an increase of 74.2 million compared with 1990. Child marriage remains common, with an estimated 66 million women aged 20–24 years married before age 18 years. Although gender-parity in secondary school completion exists globally, prevalence of NEET remains high for young women in multi-burden countries, suggesting few opportunities to enter the workforce in these settings. **Interpretation:** Although disease burden has fallen in many settings, demographic shifts have heightened global inequalities. Global disease burden has changed little since 1990 and the prevalence of many adolescent health risks have increased. Health, education, and legal systems have not kept pace with shifting adolescent needs and demographic changes. Gender inequity remains a powerful driver of poor adolescent health in many countries.

The increasing burden of diabetes and variations among the states of India: the Global Burden of Disease Study 1990–2016

India State-Level Disease Burden Initiative Diabetes Collaborators. 2018. “The increasing burden of diabetes and variations among the states of India: the Global Burden of Disease Study 1990–2016.” *The Lancet* 6(12): E1352-E1362.

[https://doi.org/10.1016/S2214-109X\(18\)30387-5](https://doi.org/10.1016/S2214-109X(18)30387-5)

Background: The burden of diabetes is increasing rapidly in India but a systematic understanding of its distribution and time trends is not available for every state of India. We present a comprehensive analysis of the time trends and heterogeneity in the distribution of diabetes burden across all states of India between 1990 and 2016. **Methods:** We analysed the prevalence and disability-adjusted life-years (DALYs) of diabetes in the states of India from 1990 to 2016 using all available data sources that could be accessed as part of the Global Burden of Diseases, Injuries, and Risk Factors Study 2016, and assessed heterogeneity across the states. The states were placed in four groups based on epidemiological transition level (ETL), defined on the basis of the ratio of DALYs from communicable diseases to those from non-communicable diseases and injuries combined, with a low ratio denoting high ETL and vice versa. We assessed the contribution of risk factors to diabetes DALYs and the relation of overweight (body-mass index ≥ 25 kg/m² or more) with diabetes prevalence. We calculated 95% uncertainty intervals (UIs) for the point estimates. **Findings:** The number of people with diabetes in India increased from 26.0 million (95% UI 23.4–28.6) in 1990 to 65.0 million (58.7–71.1) in 2016. The prevalence of diabetes in adults aged 20 years or older in India increased from 5.5% (4.9–6.1) in 1990 to 7.7% (6.9–8.4) in 2016. The prevalence in 2016 was highest in Tamil Nadu and Kerala (high ETL) and Delhi (higher-middle ETL), followed by Punjab and Goa (high ETL) and Karnataka (higher-middle ETL). The age-standardised DALY rate for diabetes increased in India by

39.6% (32.1–46.7) from 1990 to 2016, which was the highest increase among major non-communicable diseases. The age-standardised diabetes prevalence and DALYs increased in every state, with the percentage increase among the highest in several states in the low and lower middle ETL state groups. The most important risk factor for diabetes in India was overweight to which 36.0% (22.6–49.2) of the diabetes DALYs in 2016 could be attributed. The prevalence of overweight in adults in India increased from 9.0% (8.7–9.3) in 1990 to 20.4% (19.9–20.8) in 2016; this prevalence increased in every state of the country. For every 100 overweight adults aged 20 years or older in India, there were 38 adults (34–42) with diabetes, compared with the global average of 19 adults (17–21) in 2016. **Interpretation:** The increase in health loss from diabetes since 1990 in India is the highest among major noncommunicable diseases. With this increase observed in every state of the country, and the relative rate of increase highest in several less developed low ETL states, policy action that takes these state-level differences into account is needed urgently to control this potentially explosive public health situation.

Correspondence

The burden of diabetes in India

Atre, S. 2019. "The burden of diabetes in India." *The Lancet* 7(4): E418.

[https://doi.org/10.1016/S2214-109X\(18\)30556-4](https://doi.org/10.1016/S2214-109X(18)30556-4)

WASH: a basic human right and essential intervention for child health and development

Russell, F., and P. Azzopardi. 2019. "WASH: a basic human right and essential intervention for child health and development." *The Lancet* 7.

[https://doi.org/10.1016/S2214-109X\(19\)30078-6](https://doi.org/10.1016/S2214-109X(19)30078-6)

In their cluster-randomised trial, Jean Humphrey and colleagues (January, 2019) report that water, sanitation, and hygiene (WASH) interventions in combination with improved infant and young child feeding (IYCF) is unlikely to reduce stunting or anaemia more than implementation of IYCF alone. The accompanying Comment concludes that the "absence of a growth or clinical morbidity response in SHINE does not mean that WASH is totally unimportant as development agencies and agents strive to achieve the Sustainable Development Goals, but it should cause such agencies and agents to carefully reconsider their approaches". We are concerned that this concluding statement could jeopardise essential ongoing investments in WASH. We argue that WASH remains a crucial intervention for child health and development and is central to sustainable development for three key reasons.

Independent and combined effects of improved water, sanitation, and hygiene, and improved complementary feeding, on child stunting and anaemia in rural Zimbabwe: a cluster-randomised trial

Humphrey, J. H., M. N. N. Mbuya, R. Ntozini, L. H. Moulton, R. J. Stoltzfus, N. V. Tavengwa, K. Mutasa, F. Majo, B. Mutasa, G. Mangwadu, C. M. Chasokela, A. Chigumira, B. Chasekwa, L. E. Smith, J. M. Tielsch, A. D. Jones, A. R. Manges, J. A. Maluccio, and A. J. Prendergast, for the Sanitation Hygiene Infant Nutrition Efficacy (SHINE) Trial Team. 2019. "Independent and combined effects of improved water, sanitation, and hygiene, and improved complementary feeding, on child stunting and anaemia in rural Zimbabwe: a cluster-randomised trial." *The Lancet Global Health* 7(1): e132-e147.

[https://doi.org/10.1016/S2214-109X\(18\)30374-7](https://doi.org/10.1016/S2214-109X(18)30374-7)

Background: Child stunting reduces survival and impairs neurodevelopment. We tested the independent and combined effects of improved water, sanitation, and hygiene (WASH), and

improved infant and young child feeding (IYCF) on stunting and anaemia in Zimbabwe.

Methods: We did a cluster-randomised, community-based, 2 × 2 factorial trial in two rural districts in Zimbabwe. Clusters were defined as the catchment area of between one and four village health workers employed by the Zimbabwe Ministry of Health and Child Care. Women were eligible for inclusion if they permanently lived in clusters and were confirmed pregnant. Clusters were randomly assigned (1:1:1:1) to standard of care (52 clusters), IYCF (20 g of a small-quantity lipid-based nutrient supplement per day from age 6 to 18 months plus complementary feeding counselling; 53 clusters), WASH (construction of a ventilated improved pit latrine, provision of two handwashing stations, liquid soap, chlorine, and play space plus hygiene counselling; 53 clusters), or IYCF plus WASH (53 clusters). A constrained randomisation technique was used to achieve balance across the groups for 14 variables related to geography, demography, water access, and community-level sanitation coverage. Masking of participants and fieldworkers was not possible. The primary outcomes were infant length-for-age Z score and haemoglobin concentrations at 18 months of age among children born to mothers who were HIV negative during pregnancy. These outcomes were analysed in the intention-to treat population. We estimated the effects of the interventions by comparing the two IYCF groups with the two non-IYCF groups and the two WASH groups with the two non-WASH groups, except for outcomes that had an important statistical interaction between the interventions. This trial is registered with ClinicalTrials.gov, number NCT01824940. **Findings:** Between Nov 22, 2012, and March 27, 2015, 5280 pregnant women were enrolled from 211 clusters. 3686 children born to HIV-negative mothers were assessed at age 18 months (884 in the standard of care group from 52 clusters, 893 in the IYCF group from 53 clusters, 918 in the WASH group from 53 clusters, and 991 in the IYCF plus WASH group from 51 clusters). In the IYCF intervention groups, the mean length-for-age Z score was 0.16 (95% CI 0.08–0.23) higher and the mean haemoglobin concentration was 2.03 g/L (1.28–2.79) higher than those in the non-IYCF intervention groups. The IYCF intervention reduced the number of stunted children from 620 (35%) of 1792 to 514 (27%) of 1879, and the number of children with anaemia from 245 (13.9%) of 1759 to 193 (10.5%) of 1845. The WASH intervention had no effect on either primary outcome. Neither intervention reduced the prevalence of diarrhoea at 12 or 18 months. No trial-related serious adverse events, and only three trial-related adverse events, were reported. **Interpretation:** Household-level elementary WASH interventions implemented in rural areas in low-income countries are unlikely to reduce stunting or anaemia and might not reduce diarrhoea. Implementation of these WASH interventions in combination with IYCF interventions is unlikely to reduce stunting or anaemia more than implementation of IYCF alone.

WASH alone cannot prevent childhood linear growth faltering

Maleta, K. M., and M. J. Manary. 2019. "WASH alone cannot prevent childhood linear growth faltering." *The Lancet Global Health* 7(1): e16-e17.

[https://doi.org/10.1016/S2214-109X\(18\)30420-0](https://doi.org/10.1016/S2214-109X(18)30420-0)

Prevention and treatment of childhood stunting, which is a pervasive problem in most low-income and middle-income countries, remain a challenge. Stunting arises from multifactorial biological, social, and environmental causes that are often interlinked at various levels. Despite a worldwide reduction in the prevalence of stunting, as many as 165 million children younger than 5 years remain stunted, most of whom are in low-income and middle-income countries. Children who are stunted have increased mortality, impaired cognitive development, and reduced incomes as adults compared with healthy children.

Agricultural trade policies and child nutrition in low- and middle-income countries: a cross-national analysis

Adjaye-Gbewonyo, K., S. Vollmer, M. Avendano, and K. Harttgen. 2019. "Agricultural trade policies and child nutrition in low- and middle-income countries: a cross-national analysis." *Globalization and Health* 15:21.

<https://doi.org/10.1186/s12992-019-0463-0>

Background: There has been growing interest in understanding the role of agricultural trade policies in diet and nutrition. This cross-country study examines associations between government policies on agricultural trade prices and child nutrition outcomes, particularly undernutrition. **Methods:** This study links panel data on government distortions to agricultural incentives to data from 212,258 children aged 6 to 35 months participating in Demographic and Health Surveys from 22 countries between 1991 and 2010. Country fixed-effects regression models were used to examine the association between within-country changes in nominal rates of assistance to tradable agriculture (government price distortions as a percentage of original prices) and child nutritional outcomes (height-for-age, weight-for-age, and weight-for-height Z-scores) while controlling for a range of time-varying country covariates. **Results:** Five-year average nominal rates of assistance to tradable agriculture ranged from -72.0 to 45.5% with a mean of -5.0% and standard deviation of 18.9 percentage points. A 10-percentage point increase in five-year average rates of assistance to tradable agriculture was associated with improved height-for-age (0.02, 95% CI, 0.00–0.05) and weight-for-age (0.05, 95% CI: 0.02–0.09) Z-scores. Improvements in nutritional status were greatest among children who had at least one parent earning wages in agriculture, and effects decreased as a country's proportion of tradable agriculture increased, particularly for weight-for-age Z-scores. **Conclusions:** Government assistance to tradable agriculture, such as through reduced taxation, was associated with small but significant improvements in child nutritional status, especially for children with a parent earning wages in agriculture when the share of tradable agriculture was not high.

Risk of acute respiratory infection from crop burning in India: estimating disease burden and economic welfare from satellite and national health survey data for 250 000 persons

Chakrabarti, S., M. T. Khan, A. Kishore, D. Roy, and S. P. Scott. 2019. "Risk of acute respiratory infection from crop burning in India: estimating disease burden and economic welfare from satellite and national health survey data for 250 000 persons." *International Journal of Epidemiology*. doi: dyz022.

<https://doi.org/10.1093/ije/dyz022>

Background: Respiratory infections are among the leading causes of death and disability globally. Respirable aerosol particles released by agricultural crop-residue burning (ACRB), practised by farmers in all global regions, are potentially harmful to human health. Our objective was to estimate the health and economic costs of ACRB in northern India. **Methods:** The primary outcome was acute respiratory infection (ARI) from India's fourth District Level Health Survey (DLHS-4). DLHS-4 data were merged with Moderate-Resolution Imaging Spectroradiometer satellite data on fire occurrence. Mutually adjusted generalized linear models were used to generate risk ratios for risk factors of ARI. Overall disease burden due to ACRB was estimated in terms of disability-adjusted life years. **Results:** Seeking medical treatment for ARI in the previous 2 weeks was reported by 5050 (2%) of 252 539 persons. Living in a district with intense ACRB—the top quintile of fires per day—was associated with a 3-fold higher risk of ARI (mutually adjusted risk ratio 2.99, 95% confidence interval 2.77 to 3.23) after adjustment for socio-demographic and household factors. Children under 5 years of age were particularly susceptible (3.65, 3.06 to 4.34 in this subgroup). Additional ARI risk factors included motor-vehicle congestion (1.96, 1.72 to 2.23), open drainage (1.91, 1.73 to 2.11), cooking with biomass (1.73, 1.58 to 1.90) and living in urban areas (1.35, 1.26 to 1.44). Eliminating ACRB

would avert 14.9 million disability-adjusted life years lost per year, valued at US\$152.9 billion over 5 years. **Conclusions:** Investments to stop crop burning and offer farmers alternative crop-residue disposal solutions are likely to improve population-level respiratory health and yield major economic returns.

India's Integrated Child Development Services programme; equity and extent of coverage in 2006 and 2016

Chakrabarti, S., K. Raghunathan, H. Alderman, P. Menon, and P. H. Nguyen. 2019. "India's Integrated Child Development Services programme; equity and extent of coverage in 2006 and 2016." *Bulletin of the World Health Organization* 97(4): 245-308.

<https://www.who.int/bulletin/volumes/97/4/18-221135-ab/en/>

Objective: To investigate coverage and equity of India's Integrated Child Development Services programme across the continuum of care from pregnancy to early childhood, before and after the programme was expanded to provide universal access. **Methods:** The programme offers nutrition and health services to pregnant and lactating mothers and young children. We used data from nationally representative surveys in 2005–2006 and 2015–2016, including 36 850 mother–child pairs in 2006 and 190 804 in 2016. We assessed changes in the equity of use of programme services by socioeconomic quintile, caste, education and rural or urban residence. We used regression models to investigate the determinants of programme use. **Findings:** The mean proportion of respondents using programme services increased between 2006 and 2016, from 9.6% to 37.9% for supplementary food, 3.2% to 21.0% for health and nutrition education, 4.5% to 28% for health check-ups and 10.4% to 24.2% for child-specific services (e.g. immunization, growth monitoring). Wealth, maternal education and caste showed the largest positive associations with use of services. However, expansion in service use varied at the sub-national level. Although overall use had improved and reached marginalized groups such as disadvantaged castes and tribes, the poorest quintiles of the population were still left behind, especially in the largest states that carry the highest burden of undernutrition. **Conclusion:** India's policy reforms have increased coverage of the programme at the national level, including for marginalized groups. With further scaling-up, the programme needs to focus on reaching households from the lowest socioeconomic strata and women with low schooling levels.

Taking stock of 10 years of published research on the ASHA programme: examining India's national community health worker programme from a health systems perspective

Scott, K., A. S. George, and R. R. Ved. 2019. "Taking stock of 10 years of published research on the ASHA programme: examining India's national community health worker programme from a health systems perspective." *Health Research Policy and Systems* 17(29).

<https://doi.org/10.1186/s12961-019-0427-0>

Background: As India's accredited social health activist (ASHA) community health worker (CHW) programme enters its second decade, we take stock of the research undertaken and whether it examines the health systems interfaces required to sustain the programme at scale. **Methods:** We systematically searched three databases for articles on ASHAs published between 2005 and 2016. Articles that met the inclusion criteria underwent analysis using an inductive CHW–health systems interface framework. **Results:** A total of 122 academic articles were identified (56 quantitative, 29 mixed methods, 28 qualitative, and 9 commentary or synthesis); 44 articles reported on special interventions and 78 on the routine ASHA program. Findings on special interventions were overwhelmingly positive, with few negative or mixed results. In contrast, 55% of articles on the routine ASHA programme showed mixed findings and 23% negative, with few indicating overall

positive findings, reflecting broader system constraints. Over half the articles had a health system perspective, including almost all those on general ASHA work, but only a third of those with a health condition focus. The most extensively researched health systems topics were ASHA performance, training and capacity-building, with very little research done on programme financing and reporting, ASHA grievance redressal or peer communication. Research tended to be descriptive, with fewer influence, explanatory or exploratory articles, and no predictive or emancipatory studies. Indian institutions and authors led and partnered on most of the research, wrote all the critical commentaries, and published more studies with negative results. **Conclusion:** Published work on ASHAs highlights a range of small-scale innovations, but also showcases the challenges faced by a programme at massive scale, situated in the broader health system. As the programme continues to evolve, critical comparative research that constructively feeds back into programme reforms is needed, particularly related to governance, intersectoral linkages, ASHA solidarity, and community capacity to provide support and oversight.

The dos and don'ts of influencing policy: a systematic review of advice to academics

Oliver, K., and P. Cairney. 2019. "The dos and don'ts of influencing policy: a systematic review of advice to academics." *Palgrave Communications* 5(1).

<https://www.nature.com/articles/s41599-019-0232-y>

Abstract: Many academics have strong incentives to influence policymaking, but may not know where to start. We searched systematically for, and synthesised, the 'how to' advice in the academic peer-reviewed and grey literatures. We condense this advice into eight main recommendations: (1) Do high quality research; (2) make your research relevant and readable; (3) understand policy processes; (4) be accessible to policymakers: engage routinely, flexible, and humbly; (5) decide if you want to be an issue advocate or honest broker; (6) build relationships (and ground rules) with policymakers; (7) be 'entrepreneurial' or find someone who is; and (8) reflect continuously: should you engage, do you want to, and is it working? This advice seems like common sense. However, it masks major inconsistencies, regarding different beliefs about the nature of the problem to be solved when using this advice. Furthermore, if not accompanied by critical analysis and insights from the peer-reviewed literature, it could provide misleading guidance for people new to this field.

NON-PEER REVIEWED

WHO Guideline: counselling of women to improve breastfeeding practices

Guideline: counselling of women to improve breastfeeding practices. 2018. Geneva: World Health Organization.

<https://apps.who.int/iris/bitstream/handle/10665/280133/9789241550468-eng.pdf?ua=1>

Abstract: This guideline examines the evidence and makes recommendations and remarks on the implementation of some of the details of breastfeeding counselling, such as frequency, timing, mode and provider of breastfeeding counselling, to improve breastfeeding practices. The scope of the guideline is limited to this intervention. This guideline does not aim to be a comprehensive guide on all potential interventions that can protect, promote and support breastfeeding. For instance, it will not discuss breastfeeding support in facilities providing maternity and newborn services; potential medical contraindications to breastfeeding; community-based practices; peer support; or support for breastfeeding in the workplace. Neither will it review the articles of the International Code of Marketing of Breast-milk Substitutes⁴ and its subsequent related World Health Assembly resolutions.

Gender equity in the health workforce: Analysis of 104 countries

Boniol, M., M. Mclsaac, L. Xu, T. Wuliji, K. Diallo, and J. Campbell. 2019. *Gender equity in the health workforce: analysis of 104 countries*. Working paper 1. Geneva: World Health Organization (WHO/HIS/HWF/Gender/WP1/2019.1).

<https://apps.who.int/iris/bitstream/handle/10665/311314/WHO-HIS-HWF-Gender-WP1-2019.1-eng.pdf>

Key messages

- Women form 70% of workers in the health and social sector.
- Women's representation in the most highly paid health occupations has been improving steadily since 2000.
- Women are less likely than men to be in full-time employment.
- Overall, an average gender pay gap of around 28% exists in the health workforce. Once occupation and working hours are accounted for, the gender pay gap is 11%.
- Although the sector performs well regarding women's participation, gender transformative policies are needed to address inequities and eliminate gender-based discrimination in earnings, remove barriers to access to full-time employment, and support access to professional development and leadership roles.

APPI/SPREAD Collective Action for Nutrition Social Audit Programme Odisha, India

Gordon, J., J-P. Tranchant, L. Casu, B. Mitchell, and N. Nisbett. 2019. *APPI/SPREAD Collective Action for Nutrition Social Audit Programme Odisha, India: Final Evaluation Report*. Brighton: IDS.

[https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/14412/APPI_SPREAD Collective Action for Nutrition Social Audit Programme Odisha India Final Evaluation Report EM.pdf?sequence=2&isAllowed=y](https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/14412/APPI_SPREAD_Collective_Action_for_Nutrition_Social_Audit_Programme_Odisha_India_Final_Evaluation_Report_EM.pdf?sequence=2&isAllowed=y)

Abstract: This report summarises the background, design and methods, and key findings from an independent evaluation of the Collective Action for Nutrition (CAN) Social Audit programme designed and implemented by the Odisha-based non-governmental organisation (NGO) Society for Promoting Education and Rural Development (SPREAD) and supported by Azim Premji Philanthropic Initiatives (APPI). The evaluation was led by the Institute of Development Studies (IDS), UK in partnership with Development Corner Consulting (DCOR), India. Findings are intended to provide evidence on the effectiveness of the social audit model and feed into future plans for replication and scale-up.

UPCOMING EVENTS & DEADLINES**Call for Applications: Public Health Foundation of India (PHFI)**

Description: The Public Health Foundation of India (PHFI) announces its 'Call for Applications' for the Integrated MSc & PhD, Masters and Post Graduate Diploma programs for the session 2019-20, offered through the Indian Institutes of Public Health (IIPHs). The program brochures and application forms are available on PHFI website: <https://phfi.org/on-campus-courses/>

When: 2019-20 session

Deadline for applications: May 31, 2019

Where: All IIPH campuses

For more information: <https://phfi.org/on-campus-courses/>

8th International Conference on Nutrition and Food Sciences (ICNFS)

Description: It is to bring together innovative academics and industrial experts in the field of Nutrition and Food Sciences to a common forum. All accepted papers of ICNFS 2019 will be published in the [International Journal of Food Engineering](#).

When: May 27-29, 2019

Where: Bali, Indonesia

For more information: <http://www.icnfs.org/index.html>

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

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.