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

This issue of Abstract Digest is special indeed. We have put together a selection of articles from four journal supplements, one anniversary issue and other interesting articles. Here are some of the highlights:

- Nguyen and colleagues (2018) used two rounds of National Family Health Survey data and identified drivers of changes in haemoglobin (Hb) and anaemia among women and children in India from 2006 to 2016, that included maternal schooling, coverage of nutrition and health interventions, socioeconomic status, sanitation, and meat and fish consumption.
- In a UNICEF-supported supplement of *Maternal and Child Nutrition* 'Higher Heights: A Greater Ambition for Maternal and Child Nutrition in South Asia,'
    - Krishna and colleagues (2018) used time-series analysis of data from Demographic and Health Surveys in Bangladesh, India, Nepal, and Pakistan and analysed socio-economic inequalities in stunting in South Asia and investigated disparities associated with factors at the individual, caregiver, and household levels (poor dietary diversity, low maternal education, and household poverty).
    - Benedict and colleagues (2018) examined time trends and predictors of early initiation of breastfeeding (EIBF), avoidance of prelacteal feeding (APF), exclusive breastfeeding (EBF), and continued breastfeeding (CBF) to 2 years using survey data from Afghanistan, Bangladesh, India, Nepal, and Pakistan since 1990.
    - Nguyen and colleagues (2018) used data from the 2015–2016 and 2005–2006 National Family Health Surveys in India and examined trends and changes in inequalities for infant and young child feeding (IYCF) practices over 2006–2016 and identified factors that may explain differences in IYCF across socio-economic status (SES) groups.
    - Harding and colleagues (2018) pooled recent national surveys from six South Asian countries to explore associations between low birthweight (LBW) and suboptimal infant and young child feeding (IYCF) practices with child wasting, severe wasting, and the co-occurrence of wasting and stunting.
    - Goudet and colleagues (2018) conducted a systematic review of evidence (2000–2017) to identify barriers and programme approaches to improving the coverage of maternal nutrition interventions in South Asia.
    - Benedict and colleagues (2018) conducted a scoping review to identify and collate evidence on the effectiveness of interventions to support optimal breastfeeding in five countries in South Asia: Afghanistan, Bangladesh, India, Nepal, and Pakistan.
- De-Onis and colleagues (2018) reported from the WHO–UNICEF Technical Expert Advisory Group on Nutrition Monitoring (TEAM) that was charged with the task of reconsidering the prevalence levels for stunting and wasting and establishing new ones for overweight in children under 5 years.
- Stobaugh and colleagues (2018) systematically reviewed current literature and conducted secondary data analyses of studies that captured relapse rates, up to 18-month post-discharge, in children following recovery from severe acute malnutrition (SAM) treatment.
- Scott and colleagues (2018) conducted a double-blind, randomized controlled efficacy trial to determine the efficacy of iron-biofortified pearl millet in improving attention and memory in Indian school-going adolescents.

- Blankenship and colleagues (2018) conducted a systematic review to assess the effect of iodized salt, which is widely recognized as the most cost-effective intervention to eliminate iodine deficiency, on the organoleptic properties of processed foods and condiments.
- In a Children' Investment Fund Foundation supported supplement of *Maternal and Child Nutrition* 'Eggs: A High Potential Food for Improving Maternal and Child Nutrition,'
    - Lutter and colleagues (2018) provided recent national and regional data on egg consumption among young children in low- and middle-income countries to highlight the contribution of eggs to maternal and child nutritional requirements, how maternal consumption of eggs may influence breast-milk composition, how specific of key nutrients in eggs likely contribute to brain development, and the role of cultural beliefs and taboos around egg consumption.
    - In an attempt to increase egg availability through smallholder business models, Beesabathuni and colleagues (2018) investigated constraints in egg production in four countries; Kenya, Ethiopia, Malawi, and India and identified five business models that are viable and sustainable.
    - Alders and colleagues (2018) highlighted key issues associated with ecologically and financially sustainable smallholder family poultry production systems and factors that must be taken into account to achieve increased egg consumption in support of both improved maternal and child nutrition and sustainable, nutrition-sensitive agricultural practices.
    - Summarizing information on the current status of egg availability and consumption, Morris and colleagues (2018) identified the most important demand- and supply-side barriers to greater consumption of eggs, especially by children, and determined which interventions could accelerate egg consumption by 2030, the end of the SDG period.
- Maastrup and colleagues (2018) conducted a cross-sectional survey aimed to measure compliance on a global level with the Baby-friendly Hospital Initiative for Neonatal Wards (Neo-BFHI)'s expanded Ten Steps to successful breastfeeding and three Guiding Principles in neonatal wards.
- In a special supplement of *The British Medical Journal* 'Making multisectoral collaboration work,' that was launched at the Partners' Forum 2018
    - Gurnani and colleagues (2018) reported an analysis from the Intensified Mission Indradhanush strategy in India, showing that cross-sectoral participation can contribute to improved vaccination coverage of children at high risk.
- In a special supplement of *Global Health Science and Practice* 'Digital Health and Health Systems of the Future,' that was launched at 2018 Global Symposium on Health Systems Research
    - Orton and colleagues (2018) reviewed, summarized and discussed key advances in health service delivery, particularly in the context of using digital health strategies for mitigating human resource constraints.
    - Through a scoping review, Long and colleagues (2018) presented, at a high level, the state of the evidence and best practices in digital strategies for human resources for health and proposed a roadmap for a research agenda to fill identified gaps in the evidence.
- In *The Journal of Nutrition*'s 90th Anniversary Collection
    - Stein (2018) highlighted a highly cited paper by Arimond and Ruel, originally published in 2004, that describes the association between a measure of child diet diversity, derived from dietary recall data obtained from the mother, and child length.

This comes with Season's Greetings and Best Wishes for 2019!

PEER-REVIEWED

Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016

Nguyen, P. H., S. Scott, R. Avula, L. M. Tran, and P. Menon. 2018. *BMJ Global Health* 3(5). doi:10.1136/bmjgh-2018-001010. https://gh.bmj.com/content/3/5/e001010

Introduction: India carries the largest burden of anaemia globally. Progress to reduce anaemia has been slow despite substantial economic growth and 50 years of programmatic efforts. Identification of the factors that contribute to anaemia reductions is needed to accelerate progress. We examined changes in haemoglobin (Hb) and anaemia among women and children in India from 2006 to 2016 and identified drivers of changes in these outcomes over time. **Methods**: We used two rounds of National Family Health Survey data collected in 2005–2006 and 2015–2016 (n=245 346 children 6–59 months; 37 165 pregnant women (PW) 15–49 years; 760 460 non-pregnant women (NPW) 15–49 years). We first examined trends in Hb and anaemia, and changes in 30 selected variables (including immediate and underlying determinants, and nutrition and health interventions (NHIs)). We identified drivers of Hb and anaemia using multivariate regression and estimated their contribution to changes in these outcomes over time using regression-based decomposition. **Results**: Hb and anaemia improved significantly between 2006 and 2016 in children (4.5 g/L and 11 percentage points (pp), respectively) and PW (3.2 g/L and 7.6 pp), but not in NPW. Despite these changes, anaemia is still very high (>50%) and progress varied considerably by state (−33 pp to +16 pp). Most immediate and underlying determinants, and NHIs improved significantly over time. Changes among a set of drivers common to children and PW accounted for the changes in Hb; these included maternal schooling (children, 10%; PW, 24%), coverage of NHIs (children, 18%; PW, 7%), socioeconomic status (children, 7%; PW, 17%), sanitation (children, 3%; PW, 9%), and meat and fish consumption (children, 3%; PW, 1%). The decomposition models moderately explained Hb changes over time (children, 49%; PW, 66%). **Conclusions**: Multiple common drivers have contributed to the anaemia changes among children and pregnant women in India. Further improvements in these drivers can have population-level effects by simultaneously influencing both maternal and child anaemia.

SPECIAL SUPPLEMENT

Higher Heights: A Greater Ambition for Maternal and Child Nutrition in South Asia

Maternal & Child Nutrition
https://onlinelibrary.wiley.com/toc/17408709/2018/14/S4

Trends in inequalities in child stunting in South Asia

Krishna, A., I. Mejía-Guevara, M. McGovern, V. M. Aguayo, and S. V. Subramanian. 2018. *Maternal & Child Nutrition* 14(S4): e12517.
https://doi.org/10.1111/mcn.12517

Abstract: We analysed socio-economic inequalities in stunting in South Asia and investigated disparities associated with factors at the individual, caregiver, and household levels (poor dietary diversity, low maternal education, and household poverty). We used time-series analysis of data from 55,459 children ages 6–23 months from Demographic and Health Surveys in Bangladesh, India, Nepal, and Pakistan (1991–2014). Logistic regression models, adjusted for age, sex, birth order, and place of residency, examined associations between stunting and multiple types of socio-economic disadvantage. All countries had high stunting rates. Bangladesh and Nepal recorded the largest reductions—2.9 and 4.1 percentage points per year, respectively—compared to 1.3 and 0.6 percentage points in India and Pakistan, respectively. Socio-economic adversity was associated with increased risk of stunting, regardless of disadvantage type. Poor children with inadequate diets and with poorly

educated mothers experienced greater risk of stunting. Although stunting rates declined in the most deprived groups, socio-economic differences were largely preserved over time and in some cases worsened, namely, between wealth quintiles. The disproportionate burden of stunting experienced by the most disadvantaged children and the worsening inequalities between socio-economic groups are of concern in countries with substantial stunting burdens. Closing the gap between best and worst performing countries, and between most and least disadvantaged groups within countries, would yield substantial improvements in stunting rates in South Asia. To do so, greater attention needs to be paid to addressing the social, economic, and political drivers of stunting with targeted efforts towards the populations experiencing the greatest disadvantage and child growth faltering.

Trends and predictors of optimal breastfeeding among children 0–23 months, South Asia: Analysis of national survey data

Benedict, R. K., H. C. Craig, H. Torlesse, and R. J. Stoltzfus. 2018. *Maternal & Child Nutrition* 14(S4): e12698.
https://doi.org/10.1111/mcn.12698

Abstract: Optimal breastfeeding practices, including early initiation of breastfeeding (EIBF) within 1 hr of birth, exclusive breastfeeding (EBF) for the first 6 months of age, and continued breastfeeding (CBF) for 2 years of age or beyond with appropriate complementary foods, are essential for child survival, growth, and development. Breastfeeding norms differ within and between countries in South Asia, and evidence is needed to inform actions to protect, promote, and support optimal practices. This study examines time trends and predictors of EIBF, avoidance of prelacteal feeding (APF), EBF, and CBF to 2 years using survey data from Afghanistan, Bangladesh, India, Nepal, and Pakistan since 1990. EIBF, APF, and EBF increased in Bangladesh, India, and Nepal from 1990 to 2016. EIBF and EBF increased in Pakistan from 1990 to 2013, but both EIBF and APF decreased in recent years. In Afghanistan, EIBF, APF, and EBF decreased from 2010 to 2015. CBF remained fairly constant across the region although prevalence varied by country. Significant ($p < 0.05$) predictors of suboptimal practices included caesarian delivery (4–25%), home delivery, small size at birth, and low women's empowerment. Wealth, ethnic group, and caste had varied associations with breastfeeding. Progress towards optimal breastfeeding practices is uneven across the region and is of particular concern in Afghanistan and Pakistan. There are some common predictors of breastfeeding practices across the region, however country-specific predictors also exist. Policies, programs, and research should focus on improving breastfeeding in the context of women's low empowerment and strategies to support breastfeeding of infants born small or by caesarian section, in addition to country-specific actions.

Progress and inequalities in infant and young child feeding practices in India between 2006 and 2016

Nguyen, P. H., R. Avula, D. Headey, L. M. Tran, M. T. Ruel, and P. Menon. 2018. *Maternal & Child Nutrition* 14(S4): e12663.
https://doi.org/10.1111/mcn.12663

Abstract: Limited evidence exists on socio-economic status (SES) inequalities in infant and young child feeding (IYCF) in India. We examine trends and changes in inequalities for IYCF practices over 2006–2016 and identify factors that may explain differences in IYCF across SES groups. We use data from the 2015–2016 and 2005–2006 National Family Health Surveys (n = 112,133 children < 24 months). We constructed SES quintiles (Q) and assessed inequalities using concentration and slope indices. We applied path analyses to examine the relationship between SES inequalities, intermediate determinants, and IYCF. Breastfeeding improved

significantly over 2006–2016: from 23% to 42% for early initiation of breastfeeding (EIBF) and 46% to 55% for exclusive breastfeeding (EBF). Minimum dietary diversity (MDD) improved modestly (15% to 21%), but adequate diet did not change (~9%). Large SES gaps (Q5–Q1) were found for EIBF (8–17%) and EBF (−15% to −10%) in 2006; these gaps closed in 2016. The most inequitable practices in 2006 were MDD and iron-rich foods (Q5 ~ 2 –4 times higher than Q1); these gaps narrowed in 2016, but levels are low across SES groups. Factors along the path from SES inequalities to IYCF practices included health and nutrition services, information access, maternal education, number of children < 5 years, and urban/rural residence. The improvements in breastfeeding and narrowing of equity gaps in IYCF practices in India are significant achievements. However, ensuring the health and well-being of India's large birth cohort will require more efforts to further improve breastfeeding, and concerted actions to address all aspects of complementary feeding across SES quintiles.

Birthweight and feeding practices are associated with child growth outcomes in South Asia
Harding, K. L., V. M. Aguayo, and P. Webb. 2018. *Maternal & Child Nutrition* 14(S4): e12650. https://doi.org/10.1111/mcn.12650

Abstract: Although there has been a focus on preventing stunting over the past decade, wasting has received less policy and programmatic attention. Recent national surveys from six South Asian countries were pooled to generate a dataset of 62,509 children aged 0 to 59 months to explore associations between low birthweight (LBW) and suboptimal infant and young child feeding (IYCF) practices with child wasting, severe wasting, and the co-occurrence of wasting and stunting. Logistic regression models accounted for the surveys' clustered designs and adjusted for a potential confounding factors. Children with reported LBW had significantly higher odds of being wasted (adjusted odds ratio [95% CI]: 1.60 [1.45, 1.76]) or severely wasted (1.57 [1.34, 1.83]), compared with non-LBW children. Similarly, children aged 0 to 23 months who were not breastfed within the first hour post-partum, those who were provided prelacteal feeds, and those aged 0 to 5 months who were not exclusively breastfed, were more likely to be wasted ($P < 0.05$ for all three feeding practices). In India, not achieving minimum diet diversity and minimum adequate diet were significantly associated with the co-occurrence of stunting and wasting. In other words, many key domains of concern to development agents who seek to address stunting are also of direct concern to those focused on wasting. The co-occurrence of wasting and stunting requires more integrated interventions. That is, programmes aimed at preventing LBW and poor IYCF to avert stunting should be linked more effectively with actions aimed at the management of wasting.

Effectiveness of programme approaches to improve the coverage of maternal nutrition interventions in South Asia
Goudet, S., Z. Murira, H. Torlesse, J. Hatchard, and J. Busch-Hallen. 2018. *Maternal & Child Nutrition* 14(S4): e12699. https://doi.org/10.1111/mcn.12699

Abstract: The nutritional status of women before pregnancy, during pregnancy, and after delivery has far reaching consequences for maternal health and child survival, growth, and development. In South Asia, the high prevalence of short stature, thinness, and anaemia among women of reproductive age underlie the high prevalence of child undernutrition in the region, whereas overweight and obesity are rising concerns. A systematic review of evidence (2000–2017) was conducted to identify barriers and programme approaches to improving the coverage of maternal nutrition interventions in the region. The search strategy used 13 electronic bibliographic databases and 14 websites of development and

technical agencies and identified 2,247 citations. Nine studies conducted in Bangladesh (n = 2), India (n = 5), Nepal (n = 1), and Pakistan (n = 1) were selected for the review, and outcomes included the receipt and consumption of iron and folic acid and calcium supplements and the receipt of information on dietary intake during pregnancy. The studies indicate that a range of barriers acting at the individual (maternal), household, and health service delivery levels affects intervention coverage during pregnancy. Programme approaches that were effective in improving intervention coverage addressed barriers at multiple levels and had several common features: use of formative research and client assessments to inform the design of programme approaches and actions; community-based delivery platforms to increase access to services; engagement of family members, as well as pregnant women, in influencing behavioural change; actions to improve the capacity, supervision, monitoring, and motivation of front-line service providers to provide information and counselling; and access to free supplement.

Effectiveness of programmes and interventions to support optimal breastfeeding among children 0–23 months, South Asia: A scoping review

Benedict, R. K., H. C. Craig, H. Torlesse, and R. J. Stoltzfus. 2018. *Maternal & Child Nutrition* 14(S4): e12697.
https://doi.org/10.1111/mcn.12697

Abstract: Most children in South Asia are breastfed at some point in their lives; however, many are not breastfed optimally, including the early initiation of breastfeeding (EIBF) within 1 hr of birth, avoidance of prelacteal feeds (APF), exclusive breastfeeding (EBF) for 6 months, and continued breastfeeding (CBF) up to 2 years of age or beyond. This review identifies and collates evidence on the effectiveness of interventions to support optimal breastfeeding in five countries in South Asia: Afghanistan, Bangladesh, India, Nepal, and Pakistan. A scoping review was conducted of peer reviewed and grey literature. The 31 eligible studies included randomized trials and quasi-experimental designs that were conducted between 1990 and 2015. Data were collated regarding intervention design, characteristics, and effectiveness to support EIBF, APF, EBF, and CBF. Most studies reported a positive impact on breastfeeding outcomes, including 21/25 studies that examined EIBF, 15/19 studies that examined EBF, and 10/10 studies that examined APF. The only study that examined CBF reported no effect. Education, counselling, and maternal, newborn, and child health initiatives were common intervention types with positive effects on breastfeeding outcomes. Interventions were delivered in health facility, community, and home/family environments. Programmes and interventions that reached women and their families with repeated exposure and beginning during pregnancy were more likely to improve EIBF and EBF outcomes. Interventions with no impact on breastfeeding were characterized by short duration, irregular frequency, inappropriate timing, poor coverage, and targeting.

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

de Onis, M., E. Borghi, M. Arimond, P. Webb, T. Croft, K. Saha, L. M. De-Regil, F. Thuita, R. Heidkamp, J. Krasevec, C. Hayashi, and R. Flores-Ayala. 2018. *Public Health Nutrition*. doi:10.1017/S1368980018002434.
https://www.cambridge.org/core/journals/public-health-nutrition/article/prevalence-thresholds-for-wasting-overweight-and-stunting-in-children-under-5-years/52FB155B69DC75990CEFEE0C13A65A65#fndtn-information

Objective: Prevalence ranges to classify levels of wasting and stunting have been used since the 1990s for global monitoring of malnutrition. Recent developments prompted a re-examination of existing ranges and development of new ones for childhood overweight. The present paper reports

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

Relapse after severe acute malnutrition: A systematic literature review and secondary data analysis

Stobaugh, H. C., A. Mayberry, M. McGrath, P. Bahwere, N. M. Zagre, M. J. Manary, R. Black, and N. Lelijveld. 2018. *Maternal & Child Nutrition*. doi: 10.1111/mcn.12702
https://www.ncbi.nlm.nih.gov/pubmed/30246929

Abstract: The objectives of most treatment programs for severe acute malnutrition (SAM) in children focus on initial recovery only, leaving post-discharge outcomes, such as relapse, poorly understood and undefined. This study aimed to systematically review current literature and conduct secondary data analyses of studies that captured relapse rates, up to 18-month post-discharge, in children following recovery from SAM treatment. The literature search (including PubMed and Google Scholar) built upon two recent reviews to identify a variety of up-to-date published studies and grey literature. This search yielded 26 articles and programme reports that provided information on relapse. The proportion of children who relapsed after SAM treatment varied greatly from 0% to 37% across varying lengths of time following discharge. The lack of a standard definition of relapse limited comparability even among the few studies that have quantified post-discharge relapse. Inconsistent treatment protocols and poor adherence to protocols likely add to the wide range of relapse reported. Secondary analysis of a database from Malawi found no significant association between potential individual risk factors at admission and discharge, except being an orphan, which resulted in five times greater odds of relapse at 6 months post-discharge (95% CI [1.7, 12.4], P= 0.003). The development of a standard definition of relapse is needed for programme implementers and researchers. This will allow for assessment of programme quality regarding sustained recovery and better understanding of the contribution of relapse to local and global burden of SAM.

Cognitive Performance in Indian School-Going Adolescents Is Positively Affected by Consumption of Iron-Biofortified Pearl Millet: A 6-Month Randomized Controlled Efficacy Trial

Scott, S. P., L. E. Murray-Kolb, M. J. Wenger, S. A. Udipi, P. S. Ghugre, E. Boy, and J. D. Haas. 2018. *The Journal of Nutrition* 148(9). https://doi.org/10.1093/jn/nxy113

Background: Iron deficiency remains the most prevalent micronutrient deficiency globally, but few studies have examined how iron status relates to cognition in adolescents. Iron biofortification of staple food crops is being scaled up, yet it is unknown whether consuming biofortified crops can benefit cognition. **Objective:** Our objective was to determine the efficacy of iron-biofortified pearl millet in improving attention and memory in Indian school-going adolescents. **Methods:** A double-

blind, randomized, intervention study was conducted in 140 Indian boys and girls, aged 12–16 y, who were assigned to consume iron-biofortified [Fe = 86 parts per million (ppm)] or conventional (Fe = 21–52 ppm) pearl millet. Hemoglobin, ferritin, and transferrin receptor (TfR) were measured and body iron (BI) was calculated at baseline and after 4 and 6 mo. Five measures of cognitive function were obtained at baseline and 6 mo: simple reaction time (SRT), Go/No-Go (GNG) task, Attentional Network Task (ANT), Composite Face Effect (CFE) task, and Cued Recognition Task (CRT). Intention-to-treat analysis was used. **Results:** Daily iron intake from pearl millet was higher in those consuming biofortified compared with conventional pearl millet (19.6 compared with 4.8 mg/d). Effects on ferritin, TfR, and BI at 4 mo, and on TfR at 6 mo (all $P < 0.05$), indicated efficacy of biofortified pearl millet over conventional pearl millet in improving iron status. Compared with conventional pearl millet, the consumption of biofortified pearl millet resulted in greater improvement in attention (SRT, GNG, and ANT) and memory (CFE and CRT). Reaction time decreased twice as much from 0 to 6 mo in those consuming biofortified compared with conventional pearl millet on attention tasks (SRT: −123 compared with −63 ms; GNG: −67 compared with −30 ms; ANT double cue: −74 compared with −32 ms; all $P < 0.01$). **Conclusion:** Consuming iron-biofortified pearl millet improves iron status and some measures of cognitive performance in Indian adolescents.

Effect of iodized salt on organoleptic properties of processed foods: a systematic review

Blankenship, J. L., G. S. Garrett, N. A. Khan, L. M. De-Regil, R. Spohrer, and J. Gorstein. 2018. *Journal of Food Science and Technology* 55(9): 3341-3352. doi: 10.1007/s13197-018-3277-9
https://www.ncbi.nlm.nih.gov/pubmed/30150792

Abstract: Despite the global recommendation for fortification of salt with iodine, including salt used in food processing, most salt iodization programs have focussed only on iodization of household salt. Food manufacturers are frequently concerned about the potential instability of iodine and changes in organoleptic properties of their products if iodized salt is used instead of non-iodized salt. To address these concerns, this paper provides a comprehensive review of studies conducted to assess the effect of iodized salt on the organoleptic properties of processed foods and condiments. A comprehensive review was conducted of eligible studies identified by searching electronic databases (PubMed, Medline) and open Internet searches for studies examining the effect of salt iodized with either potassium iodide (KI) or potassium iodate (KIO3) on processed foods. A total of 34 studies on the effect of iodized salt on 38 types of processed foods are summarized. There is no evidence that the use of iodized salt in production of processed foods or condiments causes adverse organoleptic changes that will affect consumer acceptability or product quality. Universal salt iodization is widely recognized as the most cost-effective intervention to eliminate iodine deficiency. Taking into account increases in the proportion of dietary salt consumed through processed foods, and declines in salt consumed as household salt, iodized salt should be used in the production of processed foods as a means of assuring optimal iodine nutrition without the risk of affecting the organoleptic properties of foods.

SPECIAL SUPPLEMENT

Eggs: A High Potential Food for Improving Maternal and Child Nutrition

Maternal & Child Nutrition
https://onlinelibrary.wiley.com/toc/17408709/2018/14/S3

The potential of a simple egg to improve maternal and child nutrition

Lutter, C. K., L. L. Iannotti, and C. P. Stewart. 2018. *Maternal & Child Nutrition* 14(S3): e12678.
https://onlinelibrary.wiley.com/doi/10.1111/mcn.12678

Abstract: Evidence is mounting about the benefits of eggs for child nutrition and potential benefits for women during pregnancy and birth outcomes. Maternal consumption of eggs during lactation may also enhance the breast-milk composition of certain nutrients, thus contributing to the nutrition and potentially also to the development of breastfed children. Relative to single nutrient supplements, eggs deliver nutrients and other hormone or immune factors in compounds that may be more readily absorbed and metabolized. In addition to macronutrients, eggs contain a number of micronutrients, such as choline, that are known to have brain health promoting effects. Among children less than 2 years of age, consumption nearly universally increases with age. Large regional differences exist; the prevalence of egg consumption among African children is less than half that of most other world regions and threefold less than in Latin America and the Caribbean. Among women of reproductive age, egg consumption is strongly related to socio-economic status in a dose–response fashion with women in the lowest wealth quintile eating the fewest eggs and those in the highest wealth quintile eating the most. Cultural factors likely play a role in around consumption of eggs during pregnancy, lactation, and early childhood, though most reports are anecdotal in nature and few high-quality data exist. Well-informed social marketing and behaviour change communication strategies have led to large increases in egg consumption among young children. Economic barriers that limit access are likely to be far more important than cultural ones in explaining low consumption.

Increasing egg availability through smallholder business models in East Africa and India

Beesabathuni, K., S. Lingala, and K. Kraemer. 2018. *Maternal & Child Nutrition* 14(S3): e12667.
https://doi.org/10.1111/mcn.12667

Abstract: Availability and consumption of eggs, especially in Sub-Saharan Africa and Asia, is low despite their apparent benefits. We investigated constraints in egg production in four countries; Kenya, Ethiopia, Malawi, and India and identified five business models that are viable and sustainable. They are (a) micro-franchising, (b) microfinancing, (c) co-operative farming, (d) enterprise development, and (e) out-grower model. All of them involve smallholder farmers to increase egg production. These farmers have access to soft loans and use improved inputs and extension services to varying degrees. Inputs include resilient breeds of day-old chicks or point-of-lay hens, feed, vaccines, medicines, and housing. Outgrower and enterprise development models have a significant potential of rapidly increasing egg yields, achieve self-sufficiency, operate at or near scale, and provide a high income for the farmers. This study shows how a range of actors in commercial, not-for-profit and microfinance sectors with specialized skills, can facilitate the transformation of the egg production sector. Specific skills include brooding (hatchery operations), feed milling, aggregation, and training of smallholder farmers or large-scale rearing. The five archetypes we describe here are promising ways to increase egg availability in rural areas.

Family poultry: Multiple roles, systems, challenges, and options for sustainable contributions to household nutrition security through a planetary health lens

Alders, R. G., S. E. Dumas, E. Rukambile, G. Magoke, W. Maulaga, J. Jong, and R. Costa. 2018. *Maternal & Child Nutrition* 14(S3): e12668.
https://doi.org/10.1111/mcn.12668

Abstract: Achieving sustainable production of eggs by family poultry production systems that meet both environmental health and welfare standards is a complex endeavour. Humans have been raising different species of poultry for thousands of years across many different agroecological zones. The Food and Agriculture Organization of the

United Nations has identified four different family poultry production systems: small extensive, extensive, semi-intensive, and intensive. Each of these systems varies in terms of inputs, outputs, gender dimensions, poultry health and welfare, and environmental impacts. This paper addresses key issues associated with the production of family poultry eggs in support of both improved maternal and child nutrition and sustainable, nutrition-sensitive agricultural practices. It provides an overview of the history of poultry raising; characteristics of the different family poultry production systems; challenges and solutions to poultry production in low-and middle-income countries; poultry husbandry (including breeds, nutrition, and shelter); infectious disease prevention and control in line with national and international animal health regulations; and food safety (microbial pathogens, toxins, and egg storage). To ensure that bird, human, and environmental health can flourish, it is essential for interdisciplinary research and development teams to work in collaboration with communities to ensure the long-term environmental and economic sustainability of family poultry production enterprises that are a good fit with local circumstances.

An egg for everyone: Pathways to universal access to one of nature's most nutritious foods
Morris, S. S., K. Beesabathuni, and D. Headey. 2018. *Maternal & Child Nutrition* 14(S3): e12679.
https://doi.org/10.1111/mcn.12679

Abstract: Eggs are a highly nutritious food but have been shown to be infrequently consumed in many low-income countries, especially by women and children. We collate country-level data on egg production, availability, consumption, prices, industry structure, and contextual trends and use these to estimate current patterns and likely future outcomes under four alternative scenarios. These scenarios are as follows: incremental change based on expected economic growth and urbanisation (the base scenario); enhanced productivity of independent small producers; aggregated production in egg hubs; and the accelerated spread of large-scale intensive production. All scenarios are modelled out to 2030 using a mix of regression and deterministic models. We find that children's consumption of eggs is highly correlated with national availability, and both are a function of egg prices. Eggs are unavailable, expensive, and infrequently consumed by children in much of South Asia and sub-Saharan Africa. The base scenario results in modest increases in production in low-income regions. Focusing efforts on independent small producers can only boost rural consumption in a handful of countries where poultry ownership is unusually high and would be expensive and logistically challenging to scale. Aggregation of production, with minimum flock sizes of 5,000 layers per farm, is a more promising pathway to increasing availability in rural areas. To meet the needs of urban populations, large-scale intensive production is needed. Intensive production brings down prices significantly, allowing many more poor households to access and consume eggs. Recent experience in countries such as Thailand confirms that this is both feasible and impactful.

Compliance with the "Baby-friendly Hospital Initiative for Neonatal Wards" in 36 countries
Maastrup, R., L. N. Haiek, and Neo-BFHI Survey Group. 2018. *Maternal & Child Nutrition*. doi: 10.1111/mcn.12690.
https://onlinelibrary-wiley-com.ifpri.idm.oclc.org/doi/full/10.1111/mcn.12690

Abstract: In 2012, the Baby-friendly Hospital Initiative for Neonatal Wards (Neo-BFHI) began providing recommendations to improve breastfeeding support for preterm and ill infants. This cross-sectional survey aimed to measure compliance on a global level with the Neo-BFHI's expanded Ten Steps to successful breastfeeding and three Guiding Principles in neonatal wards. In 2017, the Neo-

BFHI Self-Assessment questionnaire was used in 15 languages to collect data from neonatal wards of all levels of care. Answers were summarized into compliance scores ranging from 0 to 100 at the ward, country, and international levels. A total of 917 neonatal wards from 36 low-, middle-, and high-income countries from all continents participated. The median international overall score was 77, and median country overall scores ranged from 52 to 91. Guiding Principle 1 (respect for mothers), Step 5 (breastfeeding initiation and support), and Step 6 (human milk use) had the highest scores, 100, 88, and 88, respectively. Step 3 (antenatal information) and Step 7 (rooming-in) had the lowest scores, 63 and 67, respectively. High-income countries had significantly higher scores for Guiding Principles 2 (family-centered care), Step 4 (skin-to-skin contact), and Step 5. Neonatal wards in hospitals ever-designated Baby-friendly had significantly higher scores than those never designated. Sixty percent of managers stated they would like to obtain Neo-BFHI designation. Currently, Neo-BFHI recommendations are partly implemented in many countries. The high number of participating wards indicates international readiness to expand Baby-friendly standards to neonatal settings. Hospitals and governments should increase their efforts to better support breastfeeding in neonatal wards.

SPECIAL SUPPLEMENT

Making multisectoral collaboration work

The British Medical Journal

https://www.bmj.com/multisectoral-collaboration

This collection of articles includes twelve country case studies, each an evaluation of multisectoral collaboration in action at scale on women's, children's, and adolescent's health. Each case study relates to one or more of the key thematic priorities from Every Woman Every Child initiative, with diverse country income levels and regions reflected across the series. Collectively these twelve studies inform an overarching synthesis and accompanying commentaries, drawing together lessons learned in achieving effective multisectoral collaboration. These articles, launched at the Partners' Forum 2018, aim to provide insights and ideas that will inform the evolving evidence base on effective multisectoral action.

Improving vaccination coverage in India: lessons from Intensified Mission Indradhanush, a cross-sectoral systems strengthening strategy

Gurnani, V., P. Haldar, M. K. Aggarwal, M. K. Das, A. Chauhan, J. Murray, and N. K. Arora. 2018. *The British Medical Journal* 363. doi: https://doi.org/10.1136/bmj.k4782

Key Messages:

- The Intensified Mission Indradhanush strategy showed that cross-sectoral participation can increase vaccination rates in children at high risk
- Strengthening of the system and practice changes could make it more effective
- Sustained high level political support, advocacy, and supervision across sectors, together with flexibility to reallocate financial resources and staff were essential for success
- Districts must strengthen staff capacity to list household beneficiaries, add additional vaccination sites, and invest in the transportation required for both
- Better communication and counselling skills tailored to local beliefs are needed to deal with barriers to seeking vaccinations
- Districts and primary care facilities work must more effectively with non-health stakeholders by involving them early in logistics planning, communication, and messaging strategies.

SPECIAL SUPPLEMENT

Digital Health and Health Systems of the Future

Global Health: Science & Practice

http://www.ghspjournal.org/content/6/Supplement_1

Strengthening Delivery of Health Services Using Digital Devices

Orton, M., S. Agarwal, P. Muhoza, L. Vasudevan, and A. Vu. 2018. *Global Health: Science and Practice* 6(Supplement 1): S61-S71.
https://doi.org/10.9745/GHSP-D-18-00229

Background: Delivery of high-quality efficient health services is a cornerstone of the global agenda to achieve universal health coverage. According to the World Health Organization, health service delivery is considered good when equitable access to a comprehensive range of high-quality health services is ensured within an integrated and person-centered continuum of care. However, good health service delivery can be challenging in low-resource settings. In this review, we summarize and discuss key advances in health service delivery, particularly in the context of using digital health strategies for mitigating human resource constraints. **Methods:** The review updates the foundational systematic review conducted by Agarwal et al. in 2015. We used PubMed, EMBASE, and CINAHL to find relevant English-language peer-reviewed articles published 2018. Our search strategy for MEDLINE was based on MeSH (medical subject headings) terms and text words of key articles that we identified a priori. Our search identified 92 articles. After screening, we selected 24 articles for abstract review, of which only 6 met the eligibility criteria and were ultimately included in this review. **Results:** Despite encouraging advances in the evidence base on digital strategies for health service delivery, the current body of evidence is still quite limited in 3 main areas: the effectiveness of interventions on health outcomes, improvement in health system efficiencies for service delivery, and the human capacity required to implement and support digital health strategies at scale. Two particular areas, digital health-enhanced referral coordination and mobile clinical decision support systems, demonstrate considerable potential to improve the quality and comprehensiveness of care received by patients, but they require a greater level of standardization and an expanded scope of health worker engagement across the health system in order to scale them up effectively. **Conclusions:** Additional research is urgently needed to inform the effectiveness of interventions on health outcomes, improvement in health system efficiencies, and cost-effectiveness of service delivery. In particular, more documentation and research on ways to standardize and engage health workers in digital referral and clinical decision support systems can provide the foundation needed to scale these promising approaches in low- and middle-income settings.

Digital Technologies for Health Workforce Development in Low-and Middle-Income Countries: A Scoping Review

Long, L., G. Pariyo, and K. Kallander. 2018. *Global Health: Science and Practice* 6(Supplement 1): S41-S48.
https://doi.org/10.9745/GHSP-D-18-00167

Abstract: The collection of journal articles, systematic reviews, and reports published over the last decade that attest to the potential of digital technologies to achieve health workforce improvements across all aspects of the health system is vast. As a capacity-building mechanism, digital technology has potential for low- and middle-income countries (LMICs) to support development of the health workforce, including those health workers based in remote or rural areas, to train, motivate, support, monitor, and pay them. The purpose of this scoping review to present, at a high level, the state of the evidence and best practices in digital strategies for human resources for health and to propose a roadmap for a research agenda to fill identified gaps in the evidence. A variety of peer-reviewed and gray

literature sources were searched using selected key terms related to digital health and health workforce, limited to materials published from 2010 to 2018. More than 70 articles, reports, and blog posts were reviewed, with in-depth analysis of 29 articles. Findings show that a range of digital health solutions for health workforce development have been tested and used, such as for health worker training, provider-to-provider communication and professional networking, and supervision of and performance feedback to health workers. There is some evidence of improved efficiency and effectiveness, at least at the level of pilots or small-scale projects. There is, however, a growing urgency in global health to move beyond small-scale demonstration projects and to define the capital and recurring costs of implementation and scale up of digital health interventions, including the return on investment. The next frontier is to select, adapt, and implement at scale those digital health interventions for health worker development and management found to be most promising.

SPECIAL ISSUE
90th Anniversary Collection
The Journal of Nutrition
https://academic.oup.com/jn/pages/90th_anniversary

90th Anniversary Commentary: Dietary Diversity Is the Cornerstone of Good Nutrition
Stein, A. D. 2018. *The Journal of Nutrition* 148(10): 1683–1685.
https://doi.org/10.1093/jn/nxy128

Abstract: A highly cited paper by Arimond and Ruel, originally published in 2004, describes the association between a measure of child diet diversity, derived from dietary recall data obtained from the mother, and child length. The authors analyzed data from nationally representative samples of children <24 mo of age in 11 countries in Africa, Asia, and the Americas, collected between 1999 and 2001. In 10 of the 11 countries, children whose maternal-reported diet was more diverse were taller and less likely to be stunted, even after statistical adjustment for a range of covariates, either as a main effect or in interaction with other contextual variables. The article has been influential in drawing the global nutrition community's attention to the need to focus on both the quality and the quantity of foods provided to infants and young children.

NON-PEER REVIEWED

Third Expert Report – Diet, Nutrition, Physical Activity and Cancer: A Global Perspective
World Cancer Research Fund/American Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: A Global Perspective. Continuous Update Project Expert Report 2018. Available at: dietandcancerreport.org
https://www.wcrf.org/sites/default/files/energy-balance-and-body-fatness.pdf

Abstract: Overweight and obesity, characterised by excess body fat, are widely considered to be one of the most pressing public health concerns of this century. Over the past five decades, the global prevalence of people living with overweight and obesity has increased dramatically. At current estimates, 1.97 billion adults are living with overweight or obesity, with numbers projected to rise. Although the rate of increase has begun to slow in some high-income countries, the prevalence of obesity has tended to accelerate in low- and middle-income countries. These accelerations have occurred in tandem with considerable changes in food systems and dietary patterns, commonly termed the 'nutrition transition'. Overweight and obesity is occurring at an ever earlier age, increasing lifetime exposure to the associated risks.

UPCOMING EVENTS & DEADLINES

Call for Papers: 16th Midwest International Economic Development Conference

Theme: Building New Evidence and Alliances for Improving Nutrition
Description: The Midwest International Economic Development Conference will present papers and organized sessions on all topics in economic development. Each presenter will have a 30-minute presentation slot, which will include a 5-minute commentary by an assigned discussant. The keynote speaker will be Oriana Bandiera, the Sir Anthony Atkinson Chair in Economics in the Department of Economics, London School of Economics and Political Science.
When: April 26-27, 2019
Deadline for submissions: January 11, 2019
Where: University of Wisconsin-Madison, USA
For more information: https://mwiedc.aae.wisc.edu/

Indian Institute of Public Health Delhi – Workshop Series

Project Management of Health Programs

Deadline for registration: Jan 8, 2019
When: Jan 22 – 25, 2019
Where: Indian Institute of Public Health- Delhi, Public Health Foundation of India Plot 47, Sector 44, Institutional area, Near HUDA City Centre metro station, Gurgaon-122002, Haryana, India
For more information: https://phfi.org/wp-content/uploads/2018/09/6_Flyer-Project-Management-Jan-22-25-2019_SR.pdf

Operations Research in Public Health

Deadline for registration: Jan 15, 2019
When: Jan 29 – Feb 1, 2019
Where: Indian Institute of Public Health- Delhi, Public Health Foundation of India Plot 47, Sector 44, Institutional area, Near HUDA City Centre metro station, Gurgaon-122002, Haryana, India
For more information: https://phfi.org/wp-content/uploads/2018/09/7_Flyer_RN-Operations-Reserch-Jan29-Feb1-2019_RN.pdf

Introduction to Economic Evaluation of Vaccines

Deadline for registration: Feb 11, 2019
When: Feb 25 – 28, 2019
Where: Indian Institute of Public Health- Delhi, Public Health Foundation of India Plot 47, Sector 44, Institutional area, Near HUDA City Centre metro station, Gurgaon-122002, Haryana, India
For more information: https://phfi.org/wp-content/uploads/2018/10/Flyer-Economic-Evaluation-of-Vaccines-Feb-25-28-2019_HH.pdf

Approaches for Implementing Adolescent Health Programs

Deadline for registration: Feb 12, 2019
When: Feb 26 – Mar 1, 2019
Where: Indian Institute of Public Health- Delhi, Public Health Foundation of India Plot 47, Sector 44, Institutional area, Near HUDA City Centre metro station, Gurgaon-122002, Haryana, India
For more information: https://phfi.org/wp-content/uploads/2018/10/Flyer_Adol-Health-Progs-Feb-26-Mar-1-2019_JS.pdf

Micronutrient Forum Global Conference 2020

Theme: Building New Evidence and Alliances for Improving Nutrition
Description: While maintaining a broad interest in all aspects of all micronutrients, as well as a balanced focus on research, implementation science, and policy development, the fifth International meeting of the Forum will open itself more broadly to the greater participation of colleagues from the food value chain sectors – agriculture, manufacturing, processing and distribution, retail, and culinary – with a deep-dive into positioning micronutrients at the heart of food systems to advance the achievement of optimal health impacts.
When: March 23-27, 2020
Where: Bangkok, Thailand
For more information: http://micronutrientforum.org/conferences/bangkok2020/

ABOUT POSHAN

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

ABOUT ABSTRACT DIGEST

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

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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.