Dietary and Nutritional Change in India: Implications for Strategies, Policies and Interventions

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Abstract

Despite the global transition to overnutrition, stunting affected approximately 159 million children worldwide in 2014, while an estimated 50 million children were wasted. India is an important front in the fight against malnutrition, and is grappling with the coexistence of undernutrition, overnutrition and micronutrient deficiencies. This report is the outcome of a workshop organized by the Sackler Institute for Nutrition Science, New York Academy of Sciences, that involved expert discussions on trends in malnutrition in India, its evolution in the context of economic growth, intra-household aspects, infant and young child feeding practices, women's status, maternal nutrition and nutrition policymaking. The discussion focused on a review of trends in malnutrition and dietary intakes in India in the context of economic change over the past four decades; identification of household dynamics affecting food choices and their consequences for family nutritional status in India; and effective malnutrition prevention and treatment interventions and programs in India and associated policy challenges.

Introduction

Stunting affected approximately 159 million children worldwide while an estimated 50 million children were wasted and 41 million were overweight in 2014.(1) Nutrition affects health throughout life, from pre-pregnancy to the growing and aging population. Malnutrition creates a cycle of poor health outcomes, poverty, and economic inertia.(2)

Although the global burden of malnutrition is increasingly shifting to overnutrition, undernutrition continues to persist in countries such as India, causing both conditions to co-exist with micro-nutrient deficiencies.(3, 4) Children affected by malnutrition are more at risk for poor prenatal and early childhood nutrition during the most critical time for child development, the first 1,000 days.

India is a particularly important front in the global fight against malnutrition. Although India's Rapid Survey of Children conducted in 2013-15 shows substantial improvement in child nutrition outcomes in the last decade, 38.7% of Indian children aged 0-59 months are still stunted, and stunting is prevalent across all socio-economic groups.(5) Micronutrient deficiencies also are widespread in India, and even in schoolchildren of affluent families, high prevalence of anemia (14-88%) and low dietary iron intakes (30-50% of RDA) have been observed while 44 to 66% of the affluent schoolchildren had vitamin A, vitamin B2, B6, B12, and vitamin C deficiencies.(6)

While India has faced very substantial undernutrition problems, developing an understanding of its trajectory and key drivers, and designing appropriate strategies for tackling undernutrition has been hampered by a relative lack of data. Another major challenge has been resolving India's strong economic performance with slow, and in some cases, counterintuitive changes in nutrition and dietary indicators. The low status of women and poor maternal nutrition are also major obstacles to improving child nutrition in India. To understand the current status of undernutrition in India, and to review key challenges and approaches to solutions, The Sackler Institute for Nutrition Science, a program of the New York Academy of Sciences, convened a workshop on "Human and Environmental Factors

Contributing to Malnutrition in India: Implications for Nutritional Interventions" on May 20-21, 2015.

The workshop involved expert discussions on trends in malnutrition in India, its evolution in the context of economic growth, intra-household aspects, infant and young child feeding practices, women's nutrition, and nutrition policymaking. Speakers included Sutapa Agrawal, PhD, Public Health Foundation of India; A. Laxmaiah, MBBS, DPH, PhD, MPH, MBA, PG Cert. in Appl. Nutrition, National Institute of Nutrition (India); Reynaldo Martorell, PhD, Emory University; Saskia Osendarp, PhD, Osendarp Nutrition; D. Prabhakaran, MD, DM, MSc, Centre for Chronic Disease Control (India); Bhavani Shankar, PhD, SOAS, University of London. This paper summarizes the presentations and discussions at the workshop, and aims to: 1) review the trends in malnutrition and dietary intakes in India in the context of economic change over the past four decades; 2) identify household dynamics affecting food choices and their consequences for family nutritional status in India; 3) identify effective malnutrition prevention and treatment interventions and programs in India and associated policies challenges. It also includes supplemental discussion and clarifications to the workshop report as suggested by the reviewers.

Nutritional Status, Socio-economic Status and Economic Growth

The National Nutrition Monitoring Board (NNMB) Rural Surveys

The third rural repeat survey conducted by National Nutrition Monitoring Bureau (NNMB 2011-12) assessed nutritional status as well as time trends in diet and nutrition.(7) In addition, data were gathered on diet related chronic diseases amongst the rural population in 10 major Indian states (Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, West Bengal, Orissa, and Uttar Pradesh). Reviewing the NNMB survey and its results, a total of 86,898 individuals were sampled for data collection on socio-demographic particulars, anthropometry and clinical measurements from 23,889 households (HHs) in 1,195 villages from the above 10 NNMB surveyed states. Data on food and nutrient intakes were also collected from 11,910 HHs.

Prevalence of Undernutrition and Time Trends

The overall current prevalence of underweight, stunting and wasting among boys of less than five years of age were 42.1%, 44.3%, and 22.5% respectively. The corresponding figures for girls were 41.4%%, 41.9%, and 21.5%[a]. Thus, although the general perception is that female children are generally disadvantaged in India,the NNMB survey finds the prevalence of undernutrition to be marginally higher among boys. In general, the prevalence of stunting was high in the states of Karnataka, Andhra Pradesh, Gujarat, Madhya Pradesh, Orissa, and Uttar Pradesh. For adolescents, the NNMB rural surveys (2011-12) showed that the prevalence of thinness (BMI-Z-Scores < -2SD) was 35% and overweight and obesity was 2.2%. However, there were significant differentials observed in the prevalence of thinness between males (43.1%) and females (27.6%) and, as in the case of children, there were significant variations observed between states. Among adults, Chronic Energy Deficiency (CED) (BMI <18.5kg/m^2) was approximately 35% each in men and women and overweight/obesity (BMI>25kg/m^2) was 10% and 14%, among men and women. The prevalence of abdominal obesity among men and women was 13.6% and 30% respectively.

A comparison across NNMB surveys over the period 1975-79 to 2011-12 showed that overall prevalence of underweight (75.5% to 41.1%), stunting (82.2 to 45.7%) and wasting (27.0 to 15.5%) declined among pre-school children of both genders. The prevalence of CED among adult men (59.3% to 32.4%) and women (52.4% to 33.3%) also declined, while overweight and/or obesity significantly increased in both men (2% to 11.8%) as well as women (3.2% to 15.5%). Marginal improvement in overall nutritional status has been observed despite no improvement in dietary intakes. These improvements in nutritional status could arise due to non-dietary factors, such as improved accessibility to health care facilities, sanitation, protected water supply and increase in literacy status (7).

Consumption Pattern of Food and Nutrients and Time Trends

[a] Note that the NNMB results differ from the RSOC figures reported above, since i) the NNMB was conducted two years before the RSOC, ii) the RSOC had national coverage, while the NNMB is restricted to 10 states, and iii) the RSOC includes urban and rural areas, while the NNMB is only rural. The periodic NNMB has the advantage of providing an idea of trends over time computed using a consistent methodology, however.

The 2012 NNMB survey revealed that cereals and millets continued to form the bulk of the diets of the rural population in the 10 states surveyed. In India, Recommended Dietary Intakes (RDI) are set for food intake while Recommended Dietary Allowances (RDA) are set for nutrient intake. In general, the rural population can be described as subsisting on inadequate diets, as the mean intakes of all the food groups, except roots and tubers, were found to be below the RDI (8) for Indians. Across the states, in between 54 and 70% of households, the intake of green leafy vegetables, milk and milk products were lower than 50% of the RDI. As a notable exception, the intakes of green leafy vegetables (GLV) and other vegetables were above the RDI in the state of Orissa.

Similarly, in the case of nutrients, the median intakes of all the nutrients, except for thiamine, were below the recommended dietary allowances (9) for Indians. The proportion of pre-school children not meeting even 50% of the RDA for calcium, iron, vitamin A, riboflavin and vitamin C was about 51- 82%, while the corresponding figures for adolescents was 52-85%. The intakes of micronutrients, such as iron, vitamin A, riboflavin, vitamin C and folic acid, were less than 50% of RDA in 51-83% of pregnant women. Low micronutrient intake was less frequent in adult men and non-pregnant and non-lactating (NPNL) women compared to the rest of the population. The proportion of pre-school children with adequate intake of both protein and calorie was 49-60%, while the corresponding figure for adult men and NPNL women was about 63% and 71%. Similarly, the proportion of pregnant women and lactating mothers with adequate intakes of both protein and energy was 52% and 60%. Although no data were reported on intakes of other micronutrients (notably zinc, vitamin B12, and vitamin B6), data from smaller studies suggest that intakes of these micronutrients are also significantly lower than the RDA.(10)

The time trends across NNMB surveys uncovered a gradual decline in the household intakes of cereals & millets, and a marginal improvement in the intakes of leafy and non-leafy vegetables (Table 1). With respect to other foods, no definite trend was observed. Similarly, the median intakes of protein, energy, iron, and thiamine have declined over the period of time, while the intakes of calcium and vitamin C have improved. A similar trend was observed with respect to intakes at the individual level (Table 2). In addition, the prevalence

of severe nutritional deficiency signs such as protein energy malnutrition, Bitot's spot, and angular stomatitis have declined.

Economic Aspects of Dietary and Nutrition Change

The Indian economy has grown steadily since the 1980s, between 5 and 8% per annum since the 1980s.(11) Concomitant progress was made in poverty reduction, with the poverty headcount ratio declining from 45% in 1983 to 28% in 2005 in rural areas, and from 40% to 25% in urban areas.(12)The Indian story of dietary and nutritional change is in some ways typical of low-income countries starting from traditional and cereal staple-dominated diets that experience sustained growth in household incomes. Since the 1980s, Indian diets have experienced diversification away from cheaper sources of calories, e.g., cereals, towards higher value foods and more expensive sources of calories, e.g., milk, meat, vegetables, fruit, edible oils, and sugar.

The decline in "coarse grains" consumption (e.g., millets, sorghum, maize, and barley) by approximately 66% over 1983-2004, and to a lesser extent, pulses, by approximately 26% over 1983-2004, has been particularly striking. (13) Their decline partly has been compensated by increases in the consumption of rice and wheat, facilitated by the public distribution system (14, 15). Vegetable consumption has grown significantly, while moderate increases have been witnessed in intakes of animal source foods and edible oils and sugar. These changes are broadly similar within each income class over time, and so are likely to reflect changes induced by food availability, consumer preferences and relative prices, rather than income-induced change.(16) Unsurprisingly, cereal consumption has been least responsive to income change (income elasticity of 0.19). Pulses (0.72), edible oil (0.77), and fruit and vegetables (0.82) display substantially higher income elasticities than cereals. Milk consumption has been shown to be highly responsive to income change, with an elasticity of 1.64. As expected, richer consumers are broadly less responsive to income changes than poorer consumers, with cereals actually being inferior goods (negative income elasticity) for the highest income class. (16)

Dietary diversity has improved in India, with the average number of food groups consumed per household increasing from 8.8 (out of 12 food groups) to 9.7 over 1990-2012 in rural areas, and from 9.3 to 9.5 in urban areas. (14) However, caloric and protein intakes have *declined* over the last four decades.(17-19) Household per capita calorie intake in rural areas declined by about 8.6% between 1983 and 2005, while rural intake decreased by 2.4%. Furthermore, calorie and protein intakes declined for *every* income class, including the poorest. While envisaging the richest curtailing their consumption over time is possible, imagining the poor in a country with rates of malnourishment as high as India lowering their energy intakes over time—in a period when real incomes have been increasing—is difficult and the reasons behind this paradox remain to be addressed in future research. A comparable paradox exists in relation to child nutrition. For a country that has witnessed sustained strong growth and poverty reduction, improvements in child nutrition has been slow. Focusing on rural households with children under 3 years of age between 1998 and 2006, and controlling for a variety of other factors that changed during this period, a co-movement is observed between declining calorie intake identified in the National Sample Survey data and worsening weight-for-age identified in National Family Health Survey Data.(20)

Alternative explanations have been offered in response to this puzzle of declining calorie intakes.(17) A decline in caloric requirements has been proposed as a potential factor. Given increasingly sedentary lifestyles and improved epidemiological environment, calorie reductions may reflect reduced intake requirements.(17) Recent research suggests that the slowly improving disease environment in India could account for one fifth or more of the decline in calorie intake. (21) Complex substitution among food categories in response to changes in relative prices over time of different foods has been proposed as another explanation.(19) The increasing importance of food eaten away from home in India[b], and the inability of the main household expenditure surveys to record this aspect accurately, have

[b] Although urban dwellers are more likely to eat food away from home, it is not an exclusively urban phenomenon – Smith (2015) reports IHDS 2005 data showing that 25% of rural households consumed food away from home in the past month, compared to 35% of urban households. (22)

also been proposed as key factors underlying the puzzle[c].(22) Providing robust answers to this important issue remains an active research area.

Compared to analysis of trends in calorie intake, information on the evolution of micronutrient intake remains limited for the case of India, causing some authors to refer to a 'calorie fundamentalism' in the literature on India. (23) This is particularly so given the mounting evidence on the influence of micronutrient deficiencies on maternal and child morbidity and mortality, and social and economic wellbeing. (24) Meenakshi (25) presents information on iron intake computed from NSSO data to show that while iron intake has been stagnant for the lowest income tercile over the period 1991/92 to 2011/12, it has actually declined for the two higher terciles. This trend is consistent with information presented from the NNMB surveys in Table 2, and in the face of high anemia prevalence in India (25), is worrying.

Patterns of Food Acquisition

While large scale surveys such as the NNMB and NSSO surveys help present a broad picture of diets, nutrition, and their socioeconomic drivers, they cannot provide a detailed understanding of food-related household decision-making and intra-household issues relating to food and nutrition. Yet, both women's empowerment and the 'food environment' within which households operate will influence decision-making regarding food acquisition and intra-household distribution, which can be critical to nutrient intakes of individuals. (26-28)

Against the background of a changing food market with a growing Indian economy and escalating food prices, insights were presented from an ongoing micro-level study exploring food acquisition and consumption patterns and its determinants in low- and middle-income Indian households. The study built on the current work being undertaken by the CARRS study[d] on fruit and vegetable consumption and investigated 20 low and medium income

[c] Of these varying explanations, the improved disease environment and the influence of changing relative prices are most pertinent to the food intake and nutrition of infants.

[d]The CARRS (Cardio Metabolic Risk Reduction Surveillance) -surveillance study is the development of a surveillance system for Cardio Metabolic Diseases (CMD) and its risk factors to measure the incidence of CMD

households in two poor areas of urban Delhi, India. Quantitative data were collected on household characteristics, while aspects such as food-related decision making and food purchase patterns were explored through in-depth interviews[e]. Half of the surveyed households earned between 8000-12000 INR (118-178 USD) a month, the average monthly income being 10,550 Indian Rupees (INR) (156 USD).

The study found that the size of the household food budget is decided by the head of the household, typically male, often in consultation with his/her spouse. Nevertheless, women in the household had a significant say on decisions about food budgetary issues. Food purchase was not always done by a specific household member, and was determined by a mix of factors such as the availability of time of the household head, household head's occupation, presence of other older members in the household and distance from the market. Household food expenditure was found to vary substantially, depending upon household income, seasonal availability of foods and food items requirements. The frequency of food purchase was primarily based on budget available for food and the nature of food items.

Quality of the food, followed by price and availability were considered critical by most respondents while buying any specific food items. Situations where price of the food items becomes paramount in food purchase were nevertheless identified.

Younger female members of the household, usually the daughter or daughter-in-law in the joint family, normally undertook the cooking, while decisions regarding items to be cooked were decided and/or influenced by other members of the households. Most of the women

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risk factors and disease events. Households were recruited for CARRS study using a three-step sampling methodology. The COE-CARRS housed at PHFI is one of eleven centers in the world that is supported through the Global Health Initiative of NHLBI and the UnitedHealth Chronic Disease Initiative. For details please visit http://www.coecarrs.org/coe/ or http://www.ccdcindia.org/ongoing-projects.php

[e] The strength of this study is the gathering of qualitative information via in-depth interviews. The study did not attempt to quantify domains such as decision-making roles, instead allowing interpretations to be made by the researcher. (22)

interviewed noted that husbands and other older members usually decided the food items to be consumed by each member of the household as well the sequence in which meals would be taken. The prevalent sequence of eating (i.e., children followed by aged people, adult male members and adult females) was found to be often based on the nature of the work the members were involved in, besides their age and sex. Most household members ate three times a day with the exception of children, who do not follow any fixed number of times for food consumption. Although vegetables were consumed almost daily in these household, fruit consumption was highly occasional. *Roti (chappati)*, rice, milk and milk products, vegetables, and *dal* (pulses) were the most common food items consumed daily. Tea/coffee, sugar, salt and oils were also consumed every day. Rising food prices contributed to households having to make choices and decrease their food consumption. A Male household head (monthly income-4600 INR, household size-4) reported while conducting an in depth interview: *"Due to high food prices, I sometime don't buy certain food items. Like take the case of fruits, such as apple costs 70 rupees per kg, cauliflower comes 80 rupees per kg. We can't eat that. You tell me how can we eat?"*

In addressing the food intakes of household members, no apparent age or gender bias was identified. Both boys and girls had equal access to food items purchased or cooked in the household. Leftover foods were typically minimal, and (if any) were usually eaten by adult females in the household. Specific leftover food items may be given to stray cows. Consuming leftovers was rarely enforced upon females and was often due to individual preferences besides escalating prices. There was no food restriction as such for any household members. Women were found to be the usual intra-household food distributors.

In summary, the CARRS study suggested that policies and programs on food allocation and nutrition interventions need to consider women's roles in food acquisition and consumption patterns, as well as socio-cultural constraints, in order to increase their effectiveness. (29-31) A comprehensive understanding of the determinants of food acquisition and consumption patterns is a precursor to framing any intervention aiming at inclusive growth of the urban poor.

Successful Infant and Young Child Feeding Programs in India

Strategies to Improve Infant and Young Child Feeding Practices

Of all proven preventive health and nutrition interventions, adequate Infant and Young Child Feeding (IYCF) promotion, consisting of promotion of exclusive breastfeeding, continued breastfeeding after 6 months of age and timely and adequate introduction of complementary foods, is one of the most important solutions to directly address causes of childhood undernutrition(32) as recommended by the World Health Organization (WHO) and UNICEF as part of the IYCF Strategy.(33) Data from the National Family Health Survey 2005-2006 revealed that IYCF practices are still far from optimal in India (IIPS & Macro International 2007). Only 42% of infants 0 to 6 months of age are exclusively breastfed, while only 9% of children 6 to 23 months of age receive a minimum acceptable complementary feeding diet (MAD; a composite score of adequate dietary diversity and feeding frequency) and 16% receive a diet with minimum dietary diversity ([MDD]; receive foods from a minimum of four food groups.(34)

Evidence to date indicates that there is no single universal best package of complementary feeding interventions; yet, in every context, consideration of available and culturally acceptable nutrient dense foods is key to potential adoption in both food secure and food insecure populations. Multiple strategies must be combined as shown by ample evidence from studies assessing actual intakes from complementary foods, as well as studies modeling optimal intakes for children 6 to 23 months based on local available foods. These strategies conclude that in most developing country settings, children 6 to 23 months of age are not able to fulfill dietary adequacy for some critical micronutrients, notably iron, zinc, and calcium with local foods alone and thus additional interventions to improve intakes of these micronutrients remain required.(35) Fortified complementary foods and/or the provision of home fortificants, including Multiple Micronutrient Powders (MNPs) or small-quantity Lipid-based Nutrient Supplements (sq-LNS) may be required and have indeed been shown to improve micronutrient intakes and reduce anemia (36,37), without reducing or displacing breast milk intakes in children 6-23 months of age.(38)

Maternal Nutrition

A key strategy to reducing stunting is to improve intrauterine growth, as reflected in the prevalence of low birth weight, which is among the highest in the world in India. (39) About a third of women have a low BMI and more than half of pregnant women are anemic (40), conditions which cause poor fetal growth and lower survival to birth and beyond. Clearly, improving the diets of women and their status within the household are key strategies for addressing stunting

Micronutrient Fortification Strategies

A number of interventions exists to improve the micronutrient intakes of populations, including improving dietary diversity, supplementation, voluntary or mandatory food fortification and what is sometimes referred to as home fortification. Food fortification is considered an attractive public health strategy because fortification has the advantage of reaching wider at-risk populations through existing food delivery systems including the public distribution system, without requiring major changes in existing consumption patterns.(41) Compared to other interventions, food fortification may be more cost-effective—and if fortified foods are regularly consumed—has the advantage of maintaining steady body stores.(42) However, infants and young children, due to their smaller stomach sizes, can usually not consume enough of fortified family foods to match their dietary requirements and therefore targeted special fortified infant or complementary foods will be required for this age group. (43)

Recent systematic reviews suggest that micronutrient fortification of foods for children has the potential to significantly increase serum micronutrient concentrations and reduce deficiencies.(41, 44) In addition, some studies reported positive effects of micronutrient fortification on functional outcomes, including linear growth and weight gain, and various cognitive development outcomes, but the overall effects on these functional outcomes are equivocal.(41, 45)Similar findings were observed in India, where iron fortification of wheat flour with 6 mg of iron/day as NaFeEDTA for 7 months, improved iron status, but not cognitive performance in Indian school going children aged 6-15 years of age.(46) The state

of Gujarat has successfully introduced wheat fortification into its social safety net programs, including the PDS, the ICDS and the Mid-Day Meal Scheme, suggesting that these programs may provide an effective vehicle for fortification in the rest of the country as well. (47)

Scope for Improvement in Policies to Combat Undernutrition

The government of India has initiated several nutritional policies and programs to address both macro and micronutrient deficiencies particularly among women and children and vulnerable groups.(48, 49) These policies emanate from different ministries (Health and Family Welfare, Women and Child Welfare, Human Resources Development) with little connectivity and opportunity to act synergistically. Furthermore, there is heterogeneity in policy implementation, as policies are formulated by the Central (Federal) Government and implemented by the State Governments.

The Integrated Child Development Services (ICDS) is an example of a major nutritional policy aimed at improving nutrition in children in India. Though the program has one of the widest outreach (nearly 96 million covered in the year 2013), its effectiveness in reducing the prevalence of stunting and anemia among children has been questioned. Several reasons including poor targeting, low coverage, irregular supply, lack of focus on changing family feeding practices, and inadequate counselling practices and nutrition education have been attributed to this apparent low success.(50) Nevertheless, recent positive trends in the program, including a 50% increase in coverage of 0-3 year children are encouraging and suggest the program may still be an important platform to target the most vulnerable. Recent research (51-52) suggests that the ICDS does improve nutrition amongst the worst-off children, although there is room for improvement in targeting least developed areas.

Other issues relating to programmatic response to undernutrition in India include the need for platforms to recognize the diversity of malnutrition epidemiology in India and choosing appropriate implementation strategies. A need also exists for a coordinated approach to nutrition-sensitive policies in areas such as food security, health care, agriculture, water and sanitation and women's empowerment, all of which have a large role to play in jointly delivering improved nutrition.(28) There is considerable cross-state variation in nutrition

outcomes in India, a significant proportion of which has been attributed to differences in policy making and programmatic quality (53). High-level political support for nutrition and health programmes and effective cross-sectoral collaborations between government and development partners have been identified as major drivers of relative success stories such as Orissa. (54)

Effective Programs at Scale

A 90% coverage for 10 evidence-based nutrition interventions has been estimated to lead to a 15% reduction of mortality among children under five annually and prevent 20% of the existing burden of stunting from occurring.(55)However, this coverage target is far from met in most low- and middle-income countries, including India. In India, the coverage of some major maternal and child health interventions differ by state, but in many states, coverage is well below 50%.(56)

Evidence from programs outside India provide useful insights on possible reasons behind this low coverage. In a comprehensive review documenting the experiences and lessons learned by Alive and Thrive of programs to prevent stunting(57), the lack of scale-up implementation was attributed to a combination of reasons: a lack of scale strategies and resources to support them, incomplete understanding of economic and cultural barriers, and incorrect assumptions about determinants of poor feeding practices, such as assuming that food insecurity or poverty is the underlying cause of poor complementary feeding. Other reasons included lack of clarity on program approaches due to insufficient documentation of different ways to deliver results and the absence of creative behavior change communication strategies, such as social marketing, that are based on successful marketing strategies employed by the private sector.(57)

These reasons also affect the implementation and scale-up of maternal and child health programs in India. In addition, a lack of focus on the most effective target age group (0-2 years), and weak health systems have also been identified as causes for the poor implementation and slow progress of strategies to improve child health and nutrition.(56)

Inadequate historical focus on the nutrition of adolescents has also been an important gap – evidence suggests that nutritional deficiencies and other risk factors influencing maternal and child health are often in place during adolescence, (58)

However, encouraging examples include successful scale-up of programs at the state level. From 1999-2004, with the assistance of UNICEF, the Government of India and several state governments, introduced an intensified nutrition initiative, the Dular program, in addition to the existing Integrated Child Development Services (ICDS) in the states of Jharkhand and Bihar. The programs included intensive counseling on seeking prenatal care; breastfeeding and hygiene practices in the first hours and days after birth; when to introduce complementary foods; immunization; and the inclusion of iodized salt in the diet. The counseling was provided by the local Anganwadi worker, with support of groups of neighborhood-based volunteers, the so-called local resource groups (LRGs). The program resulted in a 45% reduction in severely malnourished children in Jharkhand but only a 10% reduction in Bihar.(59) Maternal education seemed to be one of the critical determinants for success. Compared to severely malnourished children, positive deviant children with a normal nutritional status from the poorest 50% households were introduced to complementary foods earlier (at 7 instead of 9 months of age), were more than twice as likely to use soap for hand-washing after defecation and were more than seven times likely to have literate mothers.(60) Pilot projects implemented in the 2000s to address the nutrition of adolescent girls showed limited impact, but a more comprehensive programme, the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls, has been initiated in 200 districts. (61)

Community-based education and interpersonal counseling have been shown to improve IYCF practices in various settings in India.(56, 62)but these improvements in feeding practices did not always result in significant reductions in malnutrition rates. A stronger focus on the vulnerable age group (0-2 years) and the use of fortified complementary foods or fortified complementary food supplements, targeted to the nutritional needs of young children 6 to 23 months of age, in addition to education, may be required for further improvements.

Available evidence from larger-scale programs both in India as well as other countries, suggests some critical success factors. Successful interventions should include innovative Social Behavioral Change Communication (SBCC) campaigns, based on insights from formative research to identify barriers and enablers for change.(57) Childhood stunting is a complex, multi-causal phenomenon and integrated approaches tackling multiple determinants including hygiene and hand-washing, will therefore be required. In addition, for the Indian context specifically, ensuring maternal education and empowerment of mothers, as well as a strengthening of the health system to ensure larger coverage of interventions, will be required in order to ensure further significant steps towards meeting the country's commitment in reducing the burden of childhood malnutrition.

Workshop Conclusion

Despite sustained high rates of economic growth, significant sections of Indian society remain vulnerable to malnutrition. India is grappling simultaneously with overweight and obesity, undernutrition and micronutrient deficiencies, a triple burden of malnutrition that affects all segments of society, across income quintiles. Investments in improved data collection will be critical to better understanding the slow pace of nutritional and dietary improvement despite strong economic performance. National strategies to alleviate malnutrition also will need to better understand and integrate the socio-cultural context of food acquisition and intra-household aspect of food consumption in India, in order to design more effective interventions.

Community-based education and interpersonal counseling have been shown to improve IYCF practices in various settings in India.(59, 62) but these improvements in feeding practices did not always result in significant reductions in malnutrition rates. A stronger focus on the vulnerable age group (0-2 years) is important. The use of fortified complementary foods or fortified complementary food supplements, targeted to the nutritional needs of young children 6 to 23 months of age, in addition to education, may be

required for further improvements. Making improvements in maternal nutrition will also be crucial.

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