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OVERCOMING CHALLENGES TO ACCELERATING LINEAR GROWTH IN INDIAN CHILDREN

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Early childhood stunting or linear growth retardation predicts poor human capital. While stunting rates in India are unacceptably high, the decline in stunting over the past decade demonstrates that it is feasible to address it. This note highlights the need to use stunting as an indicator of under five undernutrition, and explores the challenges and public health options for accelerating linear growth in children. There is only a narrow window of opportunity in early life–from conception to two years–to address stunting. To accelerate the decline in stunting, a package of effective interventions and high coverage of programs targeted at this period merit urgent investigation.

Child undernutrition is measured by three anthropometric indices, underweight, stunting, and wasting. Stunting represents long-term undernutrition, wasting defines acute undernutrition, and underweight is a composite measure of long- and short-term insults. *Each indicator, thus, reflects a different biological facet of undernutrition, and many interventions can have a variable impact on the three measures.*

The need to focus on stunting

Underweight is the most commonly used measure of undernutrition and an indicator for the Millennium Development Goals. India's nutrition programs, including the recently introduced 'Road to Health and Mother and Child Protection Cards' continue to reflect the focus on weight-for-age. This almost exclusive focus of policy and programs on underweight undermines the public health importance of stunting and wasting. While wasting has recently gained recognition in the context of identification and treatment of Severe Acute Malnutrition (SAM), stunting remains neglected. Evidence indicates that height-for-age at two years is the best predictor of human capital in low- and middle-income countries.[1] Stunting in the first two years of life causes irreversible damage, resulting in shorter adult height, lower schooling attainment, reduced adult income, and lower offspring birth weight.[1] *Thus, policy and program stakeholders must shift the focus to stunting as a primary indicator of childhood undernutrition.*

Recent trends and current magnitude of stunting

Regional and national datasets document a sustained increase in mean height with a concomitant decline in stunting over the past four decades amongst children under five in India.[2] There is some evidence of a sharper decline in the past decade.

Undernutrition data for children under three from the National Family Health Surveys (NFHS) of 1998-99 and 2005-06 shows a modest decline in stunting, a marginal reduction in underweight, but a rise in wasting (Figure 2 of Policy Note# 1). The marginal rise in wasting, often interpreted as worsening of undernutrition, actually reflects that the increase in length has outstripped the simultaneous increase in weight, resulting in taller but thinner children. Linear growth (akin to increase in length of a cylinder) and an increase in weight-for-height (akin to increase in padding of the cylinder) are two distinct biological processes. This time-trend also reaffirms that changes in the three anthropometric indicators can vary both in direction and magnitude.

Since linear growth acceleration in populations has generally been more difficult to achieve than an increase in weight (for height and for age), the decline in stunting in India, even though modest, indicates a positive trend. Further, the larger decline seen in rural areas as compared to urban areas (54 to 47 percent versus 41 to 37 percent) between the two NFHSs demonstrates the feasibility of improving stunting even in the more deprived rural settings.

In summary, India's high stunting levels are disconcerting.[3] However, the decline in stunting, especially its relatively greater pace in the past decade, even in the underprivileged rural areas, demonstrates that a modest improvement in linear growth is feasible in India under prevailing conditions. Accelerating the pace of this decline is critical.

The following sections examine the evidence base for

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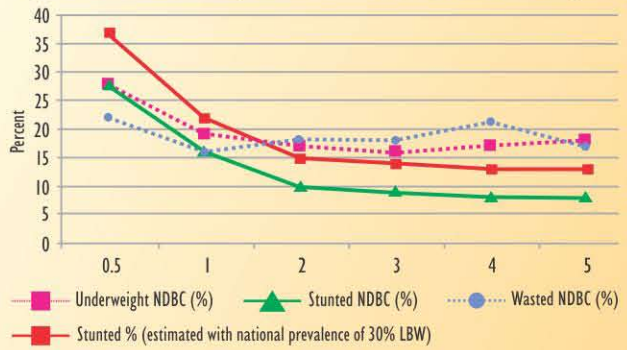
improving linear growth and the potential programmatic options to consider. Two crucial deficits, namely low birth size and growth faltering in the first two years of life, are central to this discussion.

Birth deficit persists

Longitudinal data from developing countries indicates that Low Birth Weight (LBW) newborns (<2500 grams) are substantially predisposed to undernutrition. The New Delhi Birth Cohort (NDBC) longitudinal database, [4] a database that till date follows children born during 1969-72, shows that LBW increased the risk of being underweight (3 to 5 times), stunted (2.1 to 4.3 times), and wasted (2.2 to 2.9 times) in the first five years of life. The risk decreased with increasing age.[5] A short newborn (12 percent in NDBC) was at a greater risk of developing stunting (2.5 to 8.1 times). In the NDBC, stunting attributable to LBW was 28 percent at 6 months, and 8 to 16 percent from age 1 to 5 years. With the national LBW prevalence of 30 percent in comparison to the 21 percent in the NDBC, stunting attributable to LBW is estimated to be 37 percent at 6 months, and 13 to 22 percent from age 1 to 5 years (Figure 1). *It is, therefore, imperative to intervene before birth to address linear growth retardation in children.*

Figure I. Proportion of undernutrition (children under five) attributable to low birth weight



Interventions before conception and birth

On the basis of current evidence, [2] it is pertinent to examine the potential of all ongoing major national initiatives including social sector and public health and nutrition programs for increasing birth size, and addressing relevant social issues that impact birth weight.

Early marriage and childbirth are important risk factors for delivering a LBW newborn. NFHS-3 data indicates that infants born to mothers married before the age of 18 years are at 1.22 times higher risk of stunting [6] and childbirth before 20 years of age increases the risk of both delivering a LBW newborn (1.5 times) and stunting.[5] Longitudinal, unpublished data from NDBC shows that childbirth at an early age resulted in lower birth weight and length, with these deficits persisting till 6 months, 2 years, 11 years of age and even into adulthood. This observation suggests an inter-generational handicap [1] for stunting. While Indian law prohibits child marriage, and some states provide incentives to delay marriage and childbirth, NFHS-3 data [3] indicates that 73 percent of births occur to mothers married before age 18 years. The median age at first delivery is 19.9 years and 22 percent of all childbirths occur before 20 years of age. *Thus, appropriate socio-cultural interventions are urgently needed to effectively delay age of marriage and childbirth.*

Provision of adequate antenatal care, including detection and treatment of illnesses, improves birth size.[2] NFHS-3 data shows that one-fifth of pregnant women received no antenatal care, and one-fourth had one or two antenatal care visits.[3] The recently introduced Janani Suraksha Yojana (JSY), a conditional cash transfer program to promote institutional deliveries, has demonstrated an increase in antenatal care and in-facility births.[7] UNICEF coverage evaluation survey (2009) shows that only 9.6 percent pregnant women did not receive any antenatal care, and 73 percent of deliveries occurred in institutions (47 percent in public and 26 percent in private). While encouraging, these findings do not provide any direct evidence of effects on birth size. A recent evaluation concluded that the poorest and least-educated women did not always have the highest chance of receiving JSY payments. *The data emphasized the need to target the poorest women and improve the quality of obstetric care in health facilities.[7]*

There is convincing evidence that maternal iron supplementation improves birth weight.[8] Despite several decades of an iron-folic acid (IFA) supplementation program for pregnant women, NFHS-3 data indicates that 65 percent pregnant women received (or bought) iron-folic acid supplements for their most recent birth and only 23 percent took the supplements for the recommended 90 days.[3] Multiple micronutrient deficiencies being common in developing countries, their supplementation during pregnancy is being advocated to improve maternal and fetal outcomes. In a recent pooled analysis of 12 randomized controlled trials from developing countries, [9] compared with control supplementation (mainly IFA), multiple micronutrient supplementation was associated with a 22 grams increase in birth weight and 11 percent reduction in risk of LBW. However, there was an increased risk of excessively large babies prone to complications (13 percent), early neonatal mortality (23 percent) and perinatal mortality (11 percent).[10] Currently data are unconvincing for replacing antenatal IFA supplementation with multiple micronutrients.[8] *Hence, it is prudent to focus on increasing the coverage of IFA supplementation.*

Food supplementation is often advocated for improving undernutrition. A 2010 update of Cochrane review on this subject [11] documented the following findings. In 5 trials (1,135 women), nutritional advice increased energy and protein intake but no consistent benefit was observed on pregnancy outcomes. In 13 trials (4,665 women), balanced

energy/protein supplementation was associated with modest increases in birth size (weight: 37.6 grams, length: 0.1 cm) and a substantial reduction in risk of Small-for-Gestational-Age (SGA) birth (32 percent). However, these effects did not appear greater in undernourished women. In 2 trials (529 women), high-protein supplementation was associated with a non-significant reduction in mean birth weight and a significantly increased risk of SGA birth. These data, mostly from developed country settings, suggest that supplementation in food secure pregnant women is unlikely to reduce linear growth retardation. Thus, universal propagation of nutrition education and behavior change communication is needed to improve feeding and care during pregnancy. Experiments, on a pilot basis, with conditional cash transfers and/or food supplementation targeting pregnant women in food insecure settings through the Integrated Child Development Services (ICDS) or alternative infrastructure, may be considered.

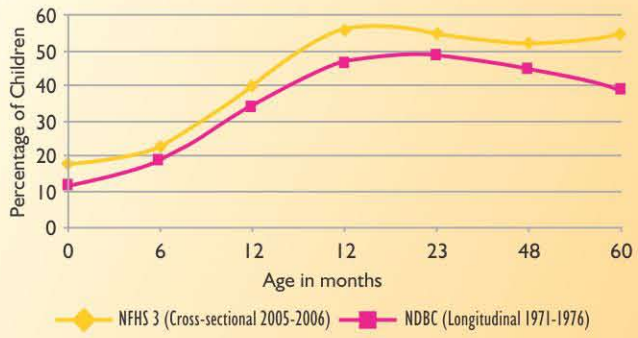
In summary, given that ongoing interventions outlined above have proven beneficial, it is pragmatic to concentrate on improving the sub-optimal coverage and quality of existing programs and ensure equitable access for the poorer and unreached segments of society.

Narrow window of maximal opportunity in early life

In line with global evidence, cross-sectional NFHS-3 data and the longitudinal NDBC data show that the stunting prevalence increases sharply between 6 and 23 months of age to nearly plateau thereafter (Figure 2). A recent pooled longitudinal analysis, [12] from prospective cohorts in five transitioning societies including NDBC in India, reaffirms this narrow window of opportunity in early life. Linear growth failure before 12 months was strongly associated with shorter adult stature, while linear growth failure during 12–24 months and 24 months to mid-childhood was less so. These data emphasize the importance of initiating interventions within the first two years of life, preferably within the first year. Unfortunately, the primary focus and coverage of most interventions to improve undernutrition is beyond this critical window.

Carefully conducted systematic reviews demonstrate that several apparently 'promising' interventions for improving growth have proven ineffective in increasing length of children in developing countries, particularly in the first two years of life. These include community-based supplementary feeding, growth monitoring, routine de-worming, and individual micronutrient supplementation of iron, vitamin A, zinc etc. Multiple micronutrient supplementation may increase linear growth (references for each available with the author), but the benefits are small (0.09 standard deviations) and need further substantiation for infants in India's setting. Given the trivial expected benefit and the associated logistics and cost considerations, introducing a new policy and program may not be viable. However, increasing the micronutrient content of complementary foods (including through fortification) deserves to be explored.

Figure 2. Prevalence of stunting in children under five



Some ongoing child health interventions do have the potential to improve linear growth. These include educational interventions to promote appropriate complementary feeding practices [13]; treatment of infections, particularly diarrhea; and prevention of infections through breast feeding, immunization, water, sanitation and hygiene interventions.[14] Observational data suggests that infections have a substantial effect on linear growth [15]; intervention trials to explore this hypothesis would be unethical. The coverage and convergence of most of these interventions is sub-optimal and reaching under twos at scale remains challenging. Further, the responsiveness of linear growth to any of these interventions received in isolation is probably quite limited (0.1 to 0.2 standard deviations). Thus, increased coverage of the full package of interventions is essential for achieving sizeable reductions in stunting in the short-term.

In summary, individual interventions received in isolation during the first two years of life have not demonstrated a substantial impact on linear growth in the short-term. Maximizing coverage of under twos with the full package of interventions (breast feeding; immunization; appropriate complementary feeding; treatment of infections, especially diarrhea; safe water supply; and sanitation) may be pivotal for improving linear growth.

Key messages

- Early childhood stunting predicts poor human capital. Stunting needs to be used as a primary indicator of child undernutrition.
- Prevalence of stunting in India is very high; the modest decline in stunting in recent years needs to be accelerated.
- There is only a narrow window of opportunity–from conception to two years–to improve stunting.
- It is urgent to improve coverage and quality of pertinent ongoing interventions (delaying childbirth, adequate antenatal care and maternal IFA supplementation;

breastfeeding; immunization; appropriate complementary feeding; treatment of infections; safe water; and sanitation), targeted at this group.

- Equitable access for the poor and unreached needs to be ensured.
- Testing pilots for targeted supplemental feeding/CCTs for pregnant women in food insecure settings, and increasing the micronutrient content of complementary foods are required.

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