

# Sanitation and Stunting in India Undernutrition's Blind Spot

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The puzzle of persistent undernutrition in India is largely explained by open defecation, population density, and lack of sanitation and hygiene. The impact on nutrition of many faecally-transmitted infections, not just the diarrhoeas, has been a blind spot. In hygienic conditions much of the undernutrition in India would disappear.

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**S**tunting (low height for age) is the preferred indicator of chronic undernutrition. It reflects a child's early development and history of disease. The latest reliable available national-level estimates for India showed 48% of children under five years of age as stunted (IIPS 2010). That children in India are shorter on average than children in Africa has been described as "the Asian enigma" (Ramalingaswami et al 1996). Research by Dean Spears (2012a) sheds light on this puzzle. His analysis of 140 demographic and health surveys has found that the height of Indian children correlates with their and their neighbours' access to toilets, and that open defecation (OD) accounts for much of the excess stunting in India. Considering that 53% of India's population defecates in the open (Government of India 2012) in consequence, children are widely exposed to faecally-transmitted infections (FTIs).

Yet sanitation and hygiene have been a professional blind spot for most of those concerned with child undernutrition.

Journal articles and books repeatedly focus on quantity and quality of food, feeding programmes, and issues of governance and rights. Few if any references are made to insanitary practices and OD. This commentary explores the links between OD and undernutrition, and reasons for the blind spot.

## The 5 As

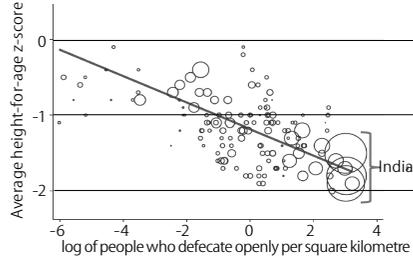
A new framework of analysis – the 5 As – helps to shed light on the issues. The first two As concern getting food to the mouth and into the body. The other three As refer to FTIs which diminish benefits from the food once ingested. The 5 As are:

**(i) Availability:** This is common sense. The food has to be there in the country.

**(ii) Access:** As Amartya Sen (1981) showed, people must be able to obtain the food. For many in India, access remains an acute problem and is a major concern of policy and practice.

**(iii) Absorption:** Much food that is ingested is not absorbed: bacterial infections and parasites damage the small intestine and reduce its capacity to absorb nutrients; diarrhoeas dehydrate and evacuate nutrients unabsorbed; and worms and other intestinal parasites steal nutrients.

**(iv) Antibodies:** Producing antibodies to fight infections diverts nutritional energy and proteins from growth to defence.

**Figure 1: The Double Threat of OD and Population Density**

Source: Spears 2012a.

**(v) Allopathogens** (Greek *allos* =other): Numerous other FTIs take their toll including Hepatitis A, B and E, typhoid fever, liver fluke, poliomyelitis and other enteroviruses, trachoma, neurocysticercosis and other zoonoses.

### The Blind Spot

The last three As have been undernutrition's blind spot, and especially the non-diarrhoeal FTIs. Among FTIs, the diarrhoeas have received by far the most attention. Nothing should detract from their seriousness. In India, diarrhoeas caused the deaths of 2,12,000 children younger than five years in 2010, accounting directly for 12.6% of child deaths (Liu et al 2012). Diarrhoeas cause undernutrition and diarrhoeal episodes reduce resistance to infections and impair growth and development when repeated and prolonged (Ejemot et al 2008). However, the dramatic clinical manifestations of the diarrhoeas, the fact that they can kill, their visibility, their researchability, and the relative ease with which they can be recorded and generate statistics, have attracted attention away from other less visible and less researchable FTIs.

These other FTIs are widespread in India. World Health Organisation (WHO) estimates that in 2011 around 240 million children in India needed preventive chemotherapy treatment for soil-transmitted helminths.<sup>1</sup> *Giardia*, *Ascaris*, hookworms (which suck blood), *Trichuris*, and other FTIs are widespread. The most nutritionally significant, and most neglected, FTI is environmental (earlier known as tropical) enteropathy (Humphrey 2009), a subclinical condition resulting from the ingestion of faecal bacteria. They damage the wall of the small intestine: villi are atrophied

and reduced in area and ability to absorb nutrients. Resulting gut hyperpermeability also evokes energy and protein-consuming immune responses to fight the infections. Though continuously debilitating, it is subclinical, undramatic and difficult to measure and research, and in consequence has been and remains a major blind spot.

The nutritional and health significance of many non-diarrhoeal FTIs has also been masked by their diversity, their multiple presence in the same child, and their often subclinical nature, hindering the absorption of nutrients, even without the child seeming sick. The resulting undernutrition has knock-on health effects, predisposing to infections and other opportunistic diseases such as pneumonia (Fewtrell et al 2007). Undernutrition is the underlying cause of about half the deaths of children under five from infectious diseases in conditions like rural India (Schlaudecker et al 2011). The effects of the diarrhoeas on stunting appear to be far less than those of other FTIs; Jean Humphrey has indeed called the diarrhoeas only the visible tip of the iceberg (pers comm November 2011).

### Sanitation and Hygiene Effects

The economic effects of FTIs may have been underestimated. In *Economic Impacts of Inadequate Sanitation in India* (wsp 2011) the Water and Sanitation Program of the World Bank estimated that the total annual economic impact of inadequate sanitation in India in 2006 was \$48 per person or about 6.4% of gross domestic product, while most African countries were in the range of only 1% to 2%. Costs took account of diarrhoeas, intestinal helminths and some other FTIs but notably neither environmental enteropathy nor cognitive deficits, suggesting that the 6.4% figure may be low.

Much evidence shows that sanitation and hygiene prevent and reduce stunting and that effective Water, Sanitation and Hygiene (WASH) interventions are vital for improving nutritional status (Bhutta et al 2008). Esrey (1996) showed that improvements in sanitation resulted in height increases larger than those found in many nutritional interventions. Research on the effects of toilets constructed in

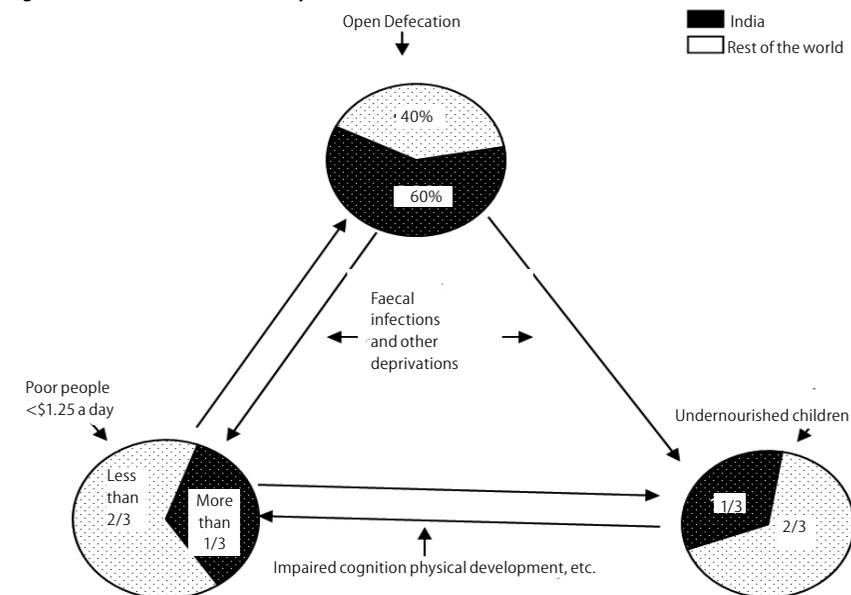
India's national Total Sanitation Campaign (Spears 2012b) has found reduced stunting in the districts where the campaign was implemented comparable with the average impact of other health and nutritional programmes. Meta-analyses have shown that hand washing with soap can reduce the incidence of diarrhoea in children under five by 37%-48% (Waddington et al 2009; Cairncross et al 2010; Ejemot et al 2008; Curtis and Cairncross 2003; Fewtrell et al 2005), and that sanitation reduces diarrhoea risk by 32%-36% (Waddington et al 2009; Cairncross et al 2010; Fewtrell et al 2005). Similar reductions can be expected with other FTIs. A WHO publication stated that worldwide 100% of cases of *Ascaris*, *Trichuris* and hookworm infestation were attributable to inadequate sanitation and hygiene (Prüss-Üstün et al 2004).

Another WHO source (Fewtrell 2007) concluded that improved sanitation, along with other WASH components, was essential for sustainable reduction in intestinal nematode infections, to which may be added all the other FTIs. Yet another authoritative WHO review of evidence concluded that "overall, 50% (39% – 61%) of the health burden of malnutrition was [...] attributable to the environment, and in particular to poor water, sanitation and hygiene" (Prüss-Üstün and Corvalán 2006: 44). This accumulation of evidence suggests that the nutritional significance of sanitation and hygiene is not only a blind spot but also easy to underestimate.

### Open Defecation

High rates of OD are associated with stunting: of the 20 countries with the highest numbers of open defecators, 17 have stunting rates of 35% or higher (UNICEF 2012; WHO and UNICEF 2013). OD is particularly harmful where population density is high. India's widespread OD and high population density constitute a double threat. From Figure 1, it appears that OD per square kilometre can linearly explain 65% of all cross-country variation in child height (Spears 2012a).

In Figure 1, each circle represents a single demographic and health survey round, reflecting one country in one year.

**Figure 2: Links between OD, Poverty and Undernutrition**

Source: Original.

The linear trend shows that children are shorter, on average, in countries where they are exposed to more OD. The circle sizes are proportional to population. The three largest circles represent surveys at different times in India (Spears 2012a).

Population density and OD help to explain the unresolved puzzles noted by Deaton and Dreze (2009: 63) of the high prevalence of stunting among privileged children. OD is a “public bad” which has spillover effects even on those who use improved sanitation. According to Spears (2012a), even the richest 2.5% of children in India, all in urban households and using toilets, are shorter on average than healthy norms, and almost exactly as short as children exposed to similar nearby OD in other countries.

### OD, Poverty and Undernutrition

Although around 275 million people in India gained access to improved sanitation between 1990 and 2011, 615 million still defecated in the open in 2011 (WHO and UNICEF 2013). India’s proportion of OD in the world has risen from 55% in 2006 to 58% in 2008 and around 60% in 2011 (WHO and UNICEF 2013). The distribution of OD by wealth quintile is also sharply skewed: the wealthiest 40% of Indians are 10 times more likely than the poorest 40% to use improved sanitation (Narayanan et al 2011). Strong causal

links can be postulated between India’s high rates of OD, stunted children and poverty (Figure 2).

### Vision and Action

Undernutrition in rural Indian children has been an intractable puzzle. This commentary argues that lack of sanitation and hygiene go far in explaining why stunting in India remains so stubbornly high. It is a call to policymakers and other professionals to remove the blind spot, and recognise OD and lack of sanitation and hygiene as powerful and persistent causes of undernutrition. The vision of India’s national Nirmal Bharat Abhiyan (NBA) sanitation programme is an OD-free rural India by 2022. If that were achieved, besides many other benefits, much of the undernutrition of Indian children would disappear. Given past experience, it is difficult to see how the elimination of OD could be achieved without a radical transformation of sanitation and hygiene policies and practices. Without such transformation, the tragic prospect is that India will stand almost alone in the world, left even further behind by Africa, with FTIs continuing to afflict and stunt children in all income groups for decades to come.

### NOTE

[The views expressed herein are those of the authors and do not necessarily reflect the views

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- 1 Viewed on 21 December 2012 ([http://www.who.int/neglected\\_diseases/preventive\\_chemotherapy/sth/en/index.html](http://www.who.int/neglected_diseases/preventive_chemotherapy/sth/en/index.html)).

### REFERENCES

- Bhutta, Z A, Tahmeed Ahmed, Robert E Black, Simon Cousens, Kathryn Dewey, Elsa Giugliani, Batool A Haider, Betty Kirkwood, Saul S Morris, H P S Sachdev and Meera Shekar (2008): “What Works Interventions for Maternal and Child Undernutrition and Survival”, *The Lancet*, 371(9610): 417-40.
- Cairncross, Sandy, Caroline Hunt, Sophie Boisson, Kristof Bostoen, Val Curtis, Isaac C H Fung and Wolf-Peter Schmidt (2010): “Water, Sanitation and Hygiene for the Prevention of Diarrhoea”, *International Journal of Epidemiology*, 39: 1193-1205.
- Curtis, V and S Cairncross (2003): “Effect of Washing Hands with Soap on Diarrhoea Risk in the Community: A Systematic Review”, *The Lancet Infectious Diseases*, 3(5): 275-81.
- Deaton, Angus and Jean Dreze (2009): “Food and Nutrition in India: Facts and Interpretations”, *Economic & Political Weekly*, XLIV(7): 42-65.
- Ejemot, R I, J E Ehiri, M M Meremikwu and J A Critchley (2008): “Hand Washing for Preventing Diarrhoea”, *Cochrane Database of Systematic Reviews*, Issue 1.
- Esrey, S A (1996): “Water, Waste, and Well-Being: A Multicountry Study American Journal of Epidemiology”, 143(6): 608-23.
- Fewtrell, Lorna, Rachel B Kaufmann, David Kay, Wayne Enanoria, Laurence Haller and John M Colford Jr (2005): “Water, Sanitation and Hygiene Interventions to Reduce Diarrhoea in Less Developed Countries: A Systematic Review and Meta-Analysis”, *The Lancet Infectious Diseases*, 5(1): 42-52.
- Fewtrell, Lorna, Prüss-Üstün A, R Bos, F Gore and J Bartram (2007): “Water, Sanitation and Hygiene: Quantifying the Health Impact at National and Local Levels in Countries with Incomplete Water Supply and Sanitation Coverage”, *Environmental Burden of Disease Series*, 15 (Geneva: WHO).
- Government of India (2012): *Census of India 2011, Houses, Household Amenities and Assets*, Government of India.
- Humphrey, Jean (2009) “Child Undernutrition, Tropical Enteropathy, Toilets and Handwashing”, *The Lancet* 374: 1032-35.
- IIPS (2010): *District Level Household and Facility Survey (DLHS-3), 2007-08*, International Institute for Population Sciences, Mumbai.
- Liu, Li, Hope L Johnson, Simon Cousens, Jamie Perin, Susana Scott, Joy E Lawn, Igor Rudan, Harry Campbell, Richard Cibulskis, Mengying Li, Colin Mathers and Robert E Black (2012): “Global, Regional, and National Causes of Child Mortality: An Updated Systematic Analysis for 2010 with Time Trends since 2000”, *The Lancet*, 379: 2151-61.
- Narayanan, R, H Van Norden, A Patkar and L Gosling (2011): *Equity and Inclusion in Sanitation and Hygiene in South Asia, A Regional Synthesis Paper* (UNICEF, WSSCC and WaterAid).
- Prüss-Üstün, A and C Corvalán (2006): *Preventing*

- Disease through Healthy Environments: Towards an Estimate of the Environmental Burden of Disease* (Geneva: WHO).
- Prüss-Üstün A, D Kay, L Fewtrell and J Bartram (2004): "Unsafe Water, Sanitation and Hygiene" in M Ezzati, A D Lopez, A Rodgers, C J L Murray (ed.), *Comparative Quantification of Health Risks* (Geneva: WHO).
- Ramalingaswami, Vulimiri, Urban Jonsson and Jon Rohde (1996): "Commentary: The Asian Enigma", *The Progress of Nations 1996* (New York: UNICEF).
- Schlaudecker, E P, M C Steinhoff and S R Moore (2011): "Interactions of Diarrhoea, Pneumonia and Malnutrition in Childhood: Recent Evidence from Developing Countries", *Current Opinion in Infectious Disease*, 24(5): 496-502.
- Sen, Amartya (1981): *Poverty and Famines: An Essay on Entitlement and Famines* (Oxford: Clarendon Press).
- Spears, Dean (2012a): "How Much International Variation in Child Height Can Sanitation Explain?", Rice Working Paper, 10 December.
- (2012b): "Effects of Rural Sanitation on Infant Mortality and Childhood Stunting: Evidence from India's Total Sanitation Campaign", Rice Working Paper, 3 July.
- UNICEF (2012): *The State of the World's Children 2012: Children in an Urban World* (New York: UNICEF).
- Waddington, Hugh, Birte Snilstveit, Howard White and Lorna Fewtrell (2009): *Water, Sanitation and Hygiene Interventions to Combat Childhood Diarrhoea in Developing Countries*, Synthetic Review 001 (Washington DC: 3ie).
- WHO and UNICEF (2013): *Progress on Sanitation and Drinking Water: 2013 Update* (Geneva and New York: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation).
- WSP (2011): *Economic Impacts of Inadequate Sanitation in India* (Washington DC: Water and Sanitation Programme, World Bank).