

Undernutrition and Illbeing: 2Fs, 5As, CLTS and the MDGs

Please note: This is a *DRAFT* for correction, comment and addition. Please correspond with Robert Chambers r.chambers@ids.ac.uk and Petra Bongartz P.Bongartz@ids.ac.uk

2 Fs = Food and Faecal Infection

5As = Availability, Access, Absorption, Antibodies, and Allopathogens

CLTS = Community-Led Total Sanitation

MDGs = Millennium Development Goals

Overview

The thesis that emerges from this exploratory note is that reducing faecal infections through sanitation and hygienic behaviour is a major means for reducing the undernutrition of children, enhancing the wellbeing of children, women and men, and achieving MDGs. Achieving open defecation free (ODF) conditions may matter much more than has been commonly recognised. One main pathway is through reducing or eliminating subclinical infections. The infections transmitted through open defecation (OD) and poor hygiene are varied and on a vast scale. Those which manifest clinically, like the diarrhoeas, receive most attention. However, those which are subclinical are less visible but may be more significant for undernutrition and child development. One way forward is CLTS. In favourable conditions, this can lead to communities rapidly achieving ODF status which, together with hygienic behaviour, has the potential to eliminate the whole range of faecally transmitted diseases, and also bring other benefits. It has been estimated that so far (October 2010) some 10 million people are living in communities which have with reasonable credibility been declared ODF as a result of CLTS. Finding ways of going to scale with high quality CLTS deserves and demands special efforts.

Finding out about faecal infections

I have had difficulty compiling a comprehensive list of faecal infections, their scale and seriousness. I request corrections, references and additions from anyone who reads this. I will share subsequent revisions. Failing to find a full list of infections, I compiled the best I could for my own enlightenment as a layperson. I have been startled and struck by the range and extent of what I have found. This may not be news to professionals in the field. But if the evidence and arguments that follow are sound, the potential from facing up to faeces, making them central and eliminating faecal pathways to infection is vaster than I, and perhaps some or many others, have appreciated. I am therefore circulating this note without delay and without further refinement.

5 As¹

5 As relating to food and faecal infections are relevant. The first two concern food and are obvious and widely acted on.

¹ The idea of the 5As originates in a discussion with Kamal Kar. It was inspired and provoked by M.S. Swaminathan's 3 As, repeated here.

1. **Availability.** This could be described as the FAO approach and agricultural approach. There has to be enough food in the world for people to eat. When stocks run low, prices rise and those who are poorer lose out. This affects
2. **Access.** This is the great contribution of Amartya Sen, now a commonplace of understanding. People can die of famine when there is food available if they do not have 'entitlements', meaning that they cannot obtain it. Governments and WFP now intervene widely and full-blown famines are rare.

These first two As are now regularly tackled in many ways. Nothing in this note should undervalue the importance of efforts to maintain and increase food production (though who produces it, and where, affects access) or of WFP and governments to provide relief food, subsidies, school feeding programmes and the like.

Three more As are all related to faecal infections. These are less visible, less measured, less dramatic, less political and less acted on.

3. **Absorption.** This third A was highlighted in his keynote speech by M.S.Swaminathan at the Third South Asia Sanitation Conference in Delhi in November 2008, after mentioning the first two. His point was that much food that is ingested is not absorbed. This may have three dimensions:
 1. *Damage to the wall of the gut.* In particular, infections and parasites damage the villi of the small intestine, reducing absorptive capacity.
 2. *Diarrhoeas* including
 - a. Cholera ' a major cause of death in the world' (Wikipedia)
 - b. Shigellosis (bacillary dysentery) (165 million cases a year, more than 1 million deaths)(Wikipedia)
 - c. Rotavirus. Worldwide more than 500,000 children under five years of age still die from rotavirus infection each year (WHO Rotavirus vaccines position paper) and almost 2 million more become severely ill.
 - d. Cryptosporidiosis (protozoan parasite) In developing countries, 8-19 per cent of all diarrheal diseases. Children are the most affected.
 - e. Campylobacter

These not only dehydrate and evacuate nutrients but may be presumed (is this correct?) to also damage the gut and reduce absorptive capacity.
 3. *Intestinal parasites* which consume nutrients in the stomach as well as (presumably, is this correct?) damaging the wall to which they adhere. Parasites implicated include
 - a. Gardiasis (protozoan) (very widespread indeed). Asymptomatic.
 - b. Amoebiasis (protozoan)
 - c. Ascariasis (roundworm). Infection rates of 45 per cent in Latin America and 95 per cent in Africa. Often asymptomatic. Feeds off nutrients in the gut. A heavy worm infestation can cause nutritional

deficiency. Roughly 1.5 billion people are infected, primarily in Africa and Asia.

- d. Other roundworms which feed on blood and cause anaemia
- e. Tapeworms (flat worms)

4. **Antibodies.** Infections in the intestine and which penetrate into the rest of the body are fought with antibodies. These consist largely or entirely (which?) of proteins. Nutrient energy and proteins are required to manufacture them (how much energy, how significant nutritionally?), and are therefore required to deal with antigens. Energy and proteins which might have been used for growth are diverted to defence.

Tropical enteropathy (Lindenbaum 1973; Fagundes-Neto et al 1984; Humphrey 2009) is a subclinical condition linked with the ingestion of faecal bacteria, resulting in gut hyperpermeability and immune response. Studies of both Gambian infants and chicks reared in dirty conditions without antibiotics (which are known as 'growth permitters' in the industry) had been found to enter 'a near-continuous state of growth-suppressing immune response: dietary nutrients were repartitioned away from anabolism in favour of glucose oxidation and synthesis of acute-phase proteins and other immune mediators' (Humphrey 2009: 1034).

5. **Allopathogens** (Greek allos=other). Besides those pathogens that more directly affect absorption, there are others with faecal-oral and other faecal related pathways

Faecal-oral pathways

1. Hepatitis A (10 million cases a year)
2. Hepatitis B
3. Hepatitis E
4. Typhoid fever (bacterium, salmonella)
5. Poliomyelitis and other enteroviruses

Other faecal-related pathways

1. Hookworm (through soles of the feet) (estimated 740 million infected)
2. Schistosomiasis faecal – water. Over 200 million infected, half in Africa
3. Liverfluke (faecal -food). Perhaps 40 – 70 million infected. Often subclinical.
4. Neurocysticercosis (one third of cases of epilepsy)
5. Other zoonoses that are faecally transmitted with a human host in the cycle²

When all these infections are taken together, the diversity, extent and probable debilitating impact of both diarrhoeal and non-diarrhoeal faecal-related infection on nutritional status is striking. Yet it does not seem common practice to list and consider them as above.³ If it is not common practice, six factors may help in explanation:

1. The normal reflex to seek and implement direct solutions to symptoms. In this case, the first two As are normal, commonsense, within limits feasible, and humane. It is a moral obligation to

² I would be grateful for relevant information about these.

³ I invite correction on this point

provide access to food for those who lack it. Emergencies of food shortages and threats of famine cry out for action, and they properly attract attention not least in the media and funding.

2. The focus has been, again commonsense, within limits feasible, and humane, has been mitigating symptoms with for example the outstanding success of ORT for the diarrhoeas, preventing disease through vaccines and vaccination, and to a lesser extent dosing for worms. Such silver bullet applications have been relatively practicable and effective for symptoms as with the diarrhoeas and with some individual pathogens such as polio, hepatitis and worms (though effects with the latter are temporary if there is reinfection).
3. Professional specialisation combined with the exacting nature of medical research focuses funding, careers, research and journal articles on particular pathogens, not their generality. This applies notably with the development of vaccines. Necessarily, parts are seen and researched, not the whole.
4. What can be and is visible and measurable attracts and receives most attention, generating much cited statistics. Diarrhoeas are spectacular and terrible causes of suffering and death, especially of children. They are amenable to estimation and measurement. They are a natural focus of attention. There is a world-renowned International Centre for Diarrhoeal Disease Research (Bangladesh) but no International Centre for Faecal Infection Research. The *Lancet* Maternal and Child Undernutrition Series was modelled entirely through diarrhoea (Humphrey 2009: 1032). In contrast, tropical enteropathy is a largely continuous condition without acute symptoms, and is difficult to measure.
5. In contrast, conditions which do not manifest clinically are not dramatic, can be less easy to measure, and do not attract the same attention. Diarrhoeas are episodic. Tapeworms, *Ascaris*, other roundworms, *gardia*, liverfluke, schistosomiasis and hookworm are continuously debilitating but less visible because to varying degrees asymptomatic. To measure their impact on nutrition would be challenging. Yet they are so widespread, and may so often combine so that one child or adult is infected with two or more, that it seems right to ask whether their cumulative effect on nutritional status may often be more serious than that of the diarrhoeas.
6. Faeces and faecal transmission may not be a common starting point for research and analysis for any discipline or any course⁴. These may more commonly be based on other categories and classifications. Moreover, human excrement is unattractive – soft, smelly, dirty, and to be put out of sight or flushed away. It is a central concern of sanitary engineers and of public health and hygiene, but it can be asked whether even the latter make the full range of connections between faeces and undernutrition.

These factors may go some way to explaining why tropical enteropathy has been so largely overlooked. It would otherwise be difficult to understand the neglect of malabsorption of food and gut hyper-permeability and of the diversion of energy from growth to making antibodies to fight infections in or originating in the gut. Tropical enteropathy was named at least as early as 1973 (Lindenbaum 1973), yet even after the *Lancet* published Jean Humphrey's article in September 2009, it was discussed as a hypothesis. This may reflect professional prudence. But her article

⁴ An exception is a course designed by AMREF (the African Medical Research Foundation). There will surely be others.

suggests it that asymptomatic tropical enteropathy – with less absorption through atrophied villi in the small intestine, and with energy consumed by the creation of antibodies to fight infections, is more significant as a cause of undernutrition than the diarrhoeas. This is supported by the finding that the effect of diarrhoea on permanent stunting is small because of catch-up growth between episodes. In contrast, indications are that tropical enteropathy is a continuous largely subclinical condition inhibiting growth. A study in the Gambia found children had diarrhoea 7.3% of the time between birth and 2 years but ‘lactulose to mannitol urinary excretion ratios associated with growth suppression on 76% of the days during this period’ (Humphrey 2009: 1033 citing Lunn et al 1991). And it is to be noted that to the extent that ORT controls and reduces the damage done by diarrhoeas, tropical enteropathy may now be relatively even more significant than it was.

Considering only diarrhoea and tropical enteropathy, Jean Humphreys (2009: 1032-33) cites findings from the MRC Dunn Nutrition Laboratory (Cambridge, UK and Keneba, The Gambia) that dietary intake and diarrhoeas were not associated with growth failure but that the lactulose –mannitol urinary excretion ratio – an indicator of gut permeability – explained 39 per cent of weight (ponderal) and 43 per cent of height (linear) growth. Humphreys does not take account of subclinical allopathogens and intestinal parasites. When these are added to tropical enteropathy, as they must be in many children, the load of multiple infections appears formidable, both those which manifest in acute forms clinically and those which are subclinical and continuously persistent. The scale of the latter is given in the estimates of *Ascaris* (1.5 billion), hookworm (740 million), schistosomiasis (200 million) and liver fluke (40 to 70 million), all of which may be largely asymptomatic and present over long periods. Are the diarrhoeas then only the visible clinical tip of a much more significant subclinical iceberg?

The 5 As, CLTS and the MDGs

H.L. Mencken famously remarked that for every problem there is a solution which is ‘simple, direct and wrong’. Nothing here should undervalue simple and direct solutions where they work, as they do with vaccinations and some feeding programmes. Nor do I wish to undervalue the importance of maternal and child health programmes. But can obvious and direct solutions carry a cost to the extent that they divert attention from less obvious causes and the opportunities they present? In this case from the central root causes of open defecation and faecal infections? There is the imagery of the person who saw babies floating down a river and fished them out, not thinking to go upstream to stop whoever was throwing them in. Upstream in this case is defecation, and sanitation and hygiene.

Let us consider India. India has many programmes based on the first two As – availability and access - , food production and stocks together with public distribution shops, subsidised food, midday school meals and the like. Debate on nutrition has focused a good deal on direct dietary measures such as these⁵. But in 2005-06, 46 per cent of Indian children under 3 were still undernourished, a third of those in the world⁶. Prime Minister Manmohan Singh has called undernutrition ‘a curse that we must remove’. Now India also has over half those in the world who defecate in the open⁷. For rural India, one estimate has been 575 million a day. The questions cry out to be asked: are OD and faecal infections a major cause, even the major cause, of the curse of undernutrition in children in India? And does

⁵ See for example IDS Bulletin 40(4) *Lifting the Curse: Overcoming Persistent Undernutrition in India (2009)*

⁶ National Family Health Survey cited in Haddad 2009:2

⁷ JMP 2010 with 2008 data

achieving OD conditions and hygienic behaviour present a powerful, effective and comprehensive way of eliminating the many forms of faecal infections and so much of the curse?

Imagine if tomorrow open defecation had been eliminated in India (or in Sub-Saharan Africa, or elsewhere) together with adoption of hygienic behaviour. Tropical enteropathy and the life cycles of ALL the infections and parasites listed above – diarrhoeas, parasites, worms, and allopathogens - would be interrupted. Except where they have alternative hosts, the pathogens could not survive. Not only the acute conditions but perhaps much more significantly the continuously debilitating subclinical conditions which consume nutrients and inhibit the growth and development of children would be largely or entirely eliminated. It is a vision to hang on to.

Take just one of the allopathogens – hookworm⁸. Hookworm is a leading cause of maternal and child morbidity in the developing countries of the tropics and subtropics. In susceptible children hookworms cause intellectual, cognitive and growth retardation. They are associated with intrauterine growth retardation, prematurity, and low birth weight among newborns born to infected mothers. WHO estimates 740 million people worldwide are infected (National Institute of Allergy and Infectious Diseases), including a third of all pregnant women in developing countries. The most significant risk of hookworm infection is anaemia. The worms suck blood voraciously and damage the mucosa. 56 per cent of all pregnant women in developing countries suffer from anaemia, and 20 per cent of all maternal deaths are either directly or indirectly related to it (Wikipedia).

If the facts and arguments above are substantially correct, we have a situation in which there is a key central issue. Most interventions tackle symptoms or stages of processes specific to particular diseases. Is it not time, more resolutely and with more imagination, to tackle them all at the same time, at the point that they all have in common in their life cycles, when they leave the body, before they branch out into their varied pathways?

Community-Led Total Sanitation (CLTS) presents an opportunity. It goes straight, radically, to this root, facilitating communities to decide to take their own action to end open defecation.

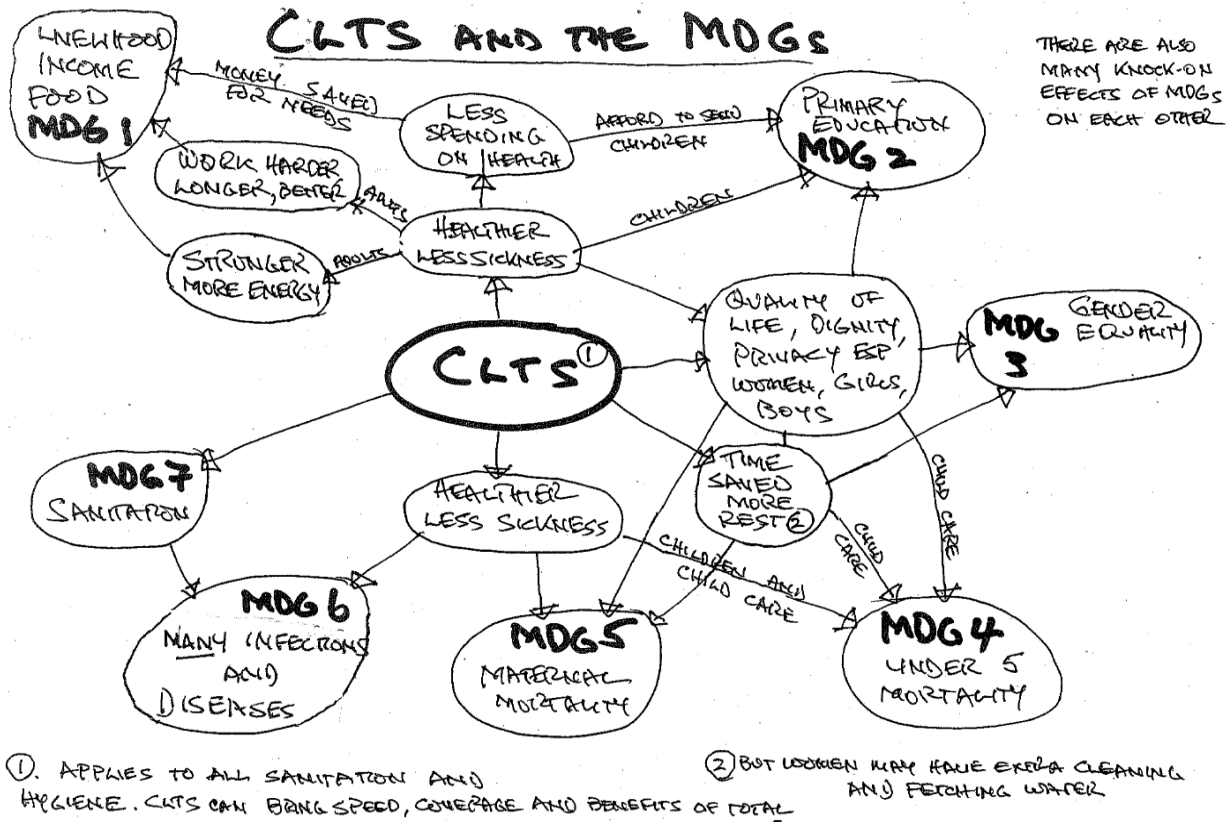
CLTS and ODF and hygienic conditions have many implications for human wellbeing for all, as indicated in the diagram, and especially for children and women. In South Asia, latrines and toilets have special significance for women, liberating them from having to go before dawn or after dark. Beyond that, as the diagram indicates, all the MDGs are implicated.

CLTS is not a magic wand. It is sensitive to high quality training and facilitation hands-on in real time with communities (Kar 2010), and to enabling conditions which include no inhibition of self-help through household toilet hardware subsidy programmes. Many factors are involved in its successful spread, and in going to scale⁹. It cannot be ordered suddenly on a huge scale. Targets are counterproductive and generate misleading reports and statistics. It is not a magic bullet like vaccinations. It is not conventional. It challenges embedded professional norms and bureaucratic reflexes. It needs champions at all levels. But thanks to the tireless efforts of inspired champions in and from India and

⁸ The main source for this paragraph is Wikipedia. Other sources would be welcome.

⁹ See Kar with Chambers 2008; Chambers 2009; Bongartz and Chambers with Kar 2009; Bongartz, Petra, Musyoki, Samuel Musembi, Milligan, Angela and Ashley, Holly (2010); Mehta and Movik in press; and the website www.communityledtotalsanitation.org

now across the world, it has been spread. It can now be found in over 40 countries. The scale of achievement so far is difficult to assess. There have been false or



misleading declarations of ODF conditions in many countries. After discounting these, in some cases heavily, the largest number of ODF communities are still to be found in India, not least in Himachal Pradesh. In the world, in total, there are now perhaps some 10 million people living in communities which have been declared ODF with a reasonable degree of credibility. This is just over 10 years since Kamal Kar evolved the approach in Bangladesh. What will be able to say in another 10 years? Will we be able to say that as a result of successful spread there has been been a massive reduction in the disease burden of hundreds of millions of people, that under 5 undernutrition and mortality and maternal mortality have dropped dramatically, and that the wellbeing, quality of life and self-respect of not just tens, but hundreds of millions, of children, women and men have been transformed?

Is this a realistic vision? Can we bring it about? How?

References (to be augmented and completed)

Bongartz, Petra and Robert Chambers, with inputs from Kamal Kar 2009 *Beyond Subsidies – Triggering a Revolution in Rural Sanitation* IDS In Focus Policy Briefing, Issue 10, Institute of Development Studies, Sussex, July

Bongartz, Petra, Musyoki, Samuel Musembi, Milligan, Angela and Ashley, Holly (2010) *Tales of Shit: Community-Led Total Sanitation in Africa, Participatory Learning and Action* 61, London: International Institute for Environment and Development

Chambers, Robert 2009 *Going to Scale with Community-Led Total Sanitation: Reflections on experience, issues and ways forward*, Practice Paper 1, Institute of Development Studies, Sussex, March

Fagundes-Neto, Ulysses et al 1984 Tropical enteropathy (*Environmental Enteropathy*) in Early Childhood: a Syndrome Caused by Contaminated Environment, *Journal of Tropical Pediatrics* vol 30. August: 204-209

Haddad, Lawrence 2009 Lifting the Curse: Overcoming Persistent Undernutrition in India, in Lawrence Haddad and Sushila Zeitlyn eds *Lifting the Curse: Overcoming Persistent Undernutrition in India*, IDS Bulletin (40) number 4, July: 1 - 8

Humphrey, Jean 2009 Child undernutrition, tropical enteropathy, toilets and handwashing, *The Lancet* 374, September 19: 1032-1035

Kar, Kamal and Katherine Pasteur 2005 *Subsidy or Self-Respect? Community-Led Total Sanitation: an update and recent developments*, Working Paper 257, Institute of Development Studies, Sussex, November

Kar, Kamal with Robert Chambers 2008 *Handbook on Community-Led Total Sanitation*, Institute of Development Studies, Sussex, and Plan UK

Kar, Kamal 2010 *Facilitating 'Hands-on' Training workshops for Community-Led Total Sanitation: A Trainers' Training Guide*, CLTS Foundation and Water Supply and Sanitation Collaborative Council, April

Lindenbaum, J. 1973 Tropical enteropathy, *Gastroenterology* 64:637-52 (cited in Fagundes- Neto et al 1984)

Lunn, P.G., Northrop-Clewes C.A., Downes, R.M. 1991 Intestinal permeability, mucosal injury, and growth faltering in Gambian infants, *The Lancet* 338: 907-10

Mehta, Lyla and Synne Movik (forthcoming in 2011) *Shit Matters*, Practical Action Publishing, Rugby, UK

The CLTS website is www.communityledtotalsanitation.org