

SANITATION AND HEALTH: AN OVERVIEW

Dr. B. MANICKAVASAGAM

Associate Professor, Department of Sociology and Social Work, Annamalai University

ABSTRACT: *The study aims to examine the sanitation and health. The secondary data has been used for the study, collected from books, research articles, newspapers, Government documents, websites etc. The study accessed that 2.6 billion people in the world lack adequate sanitation—the safe disposal of human excreta. Lack of sanitation contributes to about 10% of the global disease burden, causing mainly diarrhoeal diseases. In the past, government agencies have typically built sanitation infrastructure, but sanitation professionals are now concentrating on helping people to improve their sanitation and to change their behaviour. Improved sanitation has significant impacts not only on health but on social and economic development, particularly in developing countries. The health sector has a strong role to play in improving sanitation in developing countries through policy development and the implementation of sanitation programmes. The government should need to the strategy which is manifested by establishing clear institutional responsibility and specific budget lines for sanitation, and by ensuring that public sector agencies working in health, in water resources, and utility services work together better.*

Keywords: Health, Sanitation

INTRODUCTION

Adequate sanitation, together with good hygiene and safe water, is fundamental to good health and to social and economic development. That is why, in 2008, the Prime Minister of India quoted Mahatma Gandhi who said in 1923, “sanitation is more important than independence”. Improvements in one or more of these three components of good health can substantially reduce the rates of morbidity and the severity of various diseases and improve the quality of life of huge numbers of people, particularly children, in developing countries (Singh M.; 2008). Although linked, and often mutually supporting, these three components have different public health characteristics. This paper focuses on sanitation. It seeks to present the latest evidence on the provision of adequate sanitation, to analyse why more progress has not

been made, and to suggest strategies to improve the impact of sanitation, highlighting the role of the health sector. It also seeks to show that sanitation work to improve health, once considered the exclusive domain of engineers, now requires the involvement of social scientists, behaviour change experts, health professionals, and, vitally, individual people.

Throughout this paper, we define sanitation as the safe disposal of human excreta (WHO; 2010). The phrase “safe disposal” implies not only that people must excrete hygienically but also that their excreta must be contained or treated to avoid adversely affecting their health or that of other people.

HEALTH IMPACTS OF SANITATION

Lack of sanitation leads to disease, as was first noted scientifically in 1842 in Chadwick's seminal “Report on an inquiry into the sanitary condition of the labouring population of Great Britain” (Chadwick E; 1842). A less scientifically rigorous but professionally significant indicator of the impact on the health of poor sanitation was provided in 2007 when readers of the BMJ (British Medical Journal) voted sanitation the most important medical milestone since 1840 (Ferriman A; 2007).

The diseases associated with poor sanitation are particularly correlated with poverty and infancy and alone account for about 10% of the global burden of disease (Pruss-Ustun A, et al; 2008). At any given time close to half of the urban populations of Africa, Asia, and Latin America have a disease associated with poor sanitation, hygiene, and water (WHO; 1999). Of human excreta, faeces are the most dangerous to health. One gram of fresh faeces from an infected person can contain around 10^6 viral pathogens, 10^6 – 10^8 bacterial pathogens, 10^4 protozoan cysts or oocysts, and 10 – 10^4 helminth eggs (Feachem RG; 1983). The major faeco-oral disease transmission pathways are demonstrated in the “F Diagram” (Wagner EG; 1958), which illustrates the importance of particular interventions, notably the safe disposal of faeces, in preventing disease transmission.

Diarrhoeal Diseases

Diarrhoeal diseases are the most important of the faeco-oral diseases globally, causing around 1.6–2.5 million deaths annually, many of them among children under 5 years old living in

developing countries (Kosek M, et al; 2003). In 2008, for example, diarrhoea was the leading cause of death among children under 5 years in sub-Saharan Africa, resulting in 19% of all deaths in this age group (Black R; 2008).

Systematic reviews suggest that improved sanitation can reduce rates of diarrhoeal diseases by 32%–37% (Waddington H, & Snilstveit B.; 2009). While many of the studies included in those reviews could not rigorously disaggregate the specific effects of sanitation from the overall effects of wider water, sanitation, and hygiene interventions, a longitudinal cohort study in Salvador, Brazil, found that an increase in sewerage coverage from 26% to 80% of the target population resulted in a 22% reduction of diarrhoea prevalence in children under 3 years of age; in those areas where the baseline diarrhoea prevalence had been highest and safe sanitation coverage lowest, the prevalence rate fell by 43% (Barreto ML; 2007). Similarly, a recent meta-analysis that explored the impact of the provision of sewerage on diarrhoea prevalence reported a pooled estimate of a 30% reduction in diarrhoea prevalence and up to 60% reduction in areas with especially poor baseline sanitation conditions (Norman G.; 2010). Another longitudinal study in urban Brazil found that the major risk factors for diarrhoea in the first three years of life were low socioeconomic status, poor sanitation conditions, presence of intestinal parasites, and absence of prenatal examination. The study concluded that diarrhoeal disease rates could be substantially decreased by interventions designed to improve the sanitary and general living conditions of households (Genser B.; 2006)

Further, it is not just the provision and adult use of sanitation that is important. A meta-analysis of observational studies of infants' faeces disposal practices found that unsafe disposal increased the risk of diarrhoea by 23%, highlighting the importance of the safe management of both adults' and infants' faeces (Lanata CF.; 1998).

Neglected Tropical Diseases

Neglected tropical diseases, while resulting in little mortality, cause substantial disability-adjusted life year (DALY) losses in developing countries (Hotez PJ.; 2007). Many of these diseases have a faeco-oral transmission pathway. Thus, improved sanitation could contribute significantly to a sustained reduction in the prevalence of many of them, including trachoma, soil-transmitted helminthiases, and schistosomiasis. Unfortunately, the current policy focus in

most parts of the world is on treatment by medication, which, unlike good sanitation, is not a preferred solution because, in part, it is much more expensive.

Trachoma is endemic in many of the world's poorest countries. It is caused by the bacterium *Chlamydia trachomatis* and is the world's leading cause of preventable blindness (Resnikoff S.; 2002). Trachoma control is predominantly antibiotic-based despite the existence of the SAFE control strategy (surgery, antibiotics, face-washing, and environmental measures, namely sanitation promotion) (Cook JA.; 2008).

Soil-transmitted helminths such as the large human roundworm, the human whipworm, and the human hookworms cause many millions of infections every year and many individuals are infected with more than one of these geohelminths (de Silva NR, et al; 2004). Helminthic infections negatively impact the nutritional status of infected individuals, with consequent growth faltering in young children, and anaemia, particularly in pregnant women (Stephenson LS. et al; 2000). Adult helminths live in the human gastrointestinal tract where they reproduce sexually. Their eggs are discharged in the faeces of the infected host and thus, mainly via open defecation, to other people. Ending the practice of open defecation with good sanitation can cut this transmission path completely, but most current helminth-control programmes focus on medication, which must be repeated periodically in the absence of sanitation (Albonico M.; 2006).

Globally, some 190 million people are infected with schistosomiasis, which can result in chronic debilitation, haematuria, impaired growth, bladder and colorectal cancers, and essential organ malfunction. Adult schistosomes live in the portal veins where they pass their eggs into the environment via the urine (*Schistosoma haematobium*) or faeces (the other human schistosomes). After passing part of their life cycle in aquatic snails where they multiply asexually, cercariae are discharged into the water where they come into contact with and infect their human hosts through their skin. Thus, sanitation (and water) interventions are essential to any long-term control and elimination of schistosomiasis, whereas the current standard intervention is repeated medication (Albonico M.; 2006).

Acute Respiratory Infections

With 4.2 million deaths each year (1.6 million among children under 5 years), acute respiratory infections are the leading cause of mortality in developing countries (WHO. 2006). Although sanitation is not directly linked to all acute respiratory infections, a recent study reported that 26% of acute lower respiratory infections among malnourished children in rural Ghana may have been due to recent episodes of diarrhoea (Schmidt WP.; 2009). Thus, sanitation could be a powerful intervention against acute respiratory infections.

Undernutrition

Poor sanitation, hygiene, and water are responsible for about 50% of the consequences of childhood and maternal underweight, primarily through the synergy between diarrhoeal diseases and undernutrition, whereby exposure to one increases vulnerability to the other (World Bank. 2008)

Wider Benefits of Sanitation

In addition to its impact on health, improved sanitation generates both social and economic benefits. Householders understand these wider benefits but scientists have only recently begun to study individuals' motivations for improving sanitation and changing sanitation behaviour.

The economic benefits of improved sanitation include lower health system costs, fewer days lost at work or school through illness or through caring for an ill relative, and convenience time savings (time not spent queuing at shared sanitation facilities or walking for open defecation) (Table-1) (Hutton G.; 2007).

Economic benefits resulting from meeting the MDG sanitation target and from achieving universal sanitation access

Population Benefitted and Economic Benefit	Meeting the MDG Sanitation Target	Achieving Universal Sanitation Access
Population using improved sanitation (millions)	564	2,226
Diarrhoeal disease cases averted (millions per year)	190	673
Diarrhoeal disease deaths averted (thousands per year)	180	592
Health system costs saved (\$ millions per year)	552	1,659
Patient non-medical costs saved (\$ millions per year)	57	203
Value of lost working days avoided (\$ millions per year)	1,056	4,010
Value of lives saved (\$ millions per year)	1,718	7,294
Value of convenience time savings (\$ millions per year)	31,320	149,923

In total, the prevention of sanitation- and water-related diseases could save some \$7 billion per year in health system costs; the value of deaths averted, based on discounted future earnings, adds another \$3.6 billion per year (Hutton G. & Haller H.; 2004). Furthermore, in much of the developing world at any one time around half the hospital beds are occupied by people with diarrhoeal diseases (UNDP; 2006). Expressed at a national scale, poor sanitation and hygiene costs the Lao People's Democratic Republic 5.6% of its GDP per year (Hutton G.; 2009) and studies in Ghana and Pakistan suggest that general improvements in environmental conditions could save 8%–9% of GDP annually (World Bank.; 2008).

Table 2 shows the cost-benefit ratios associated with achieving the Millennium Development Goal (MDG) sanitation target (a reduction of 50% in the proportion of people without improved sanitation by 2015 from the 1990 baseline figure) and with achieving universal sanitation access in the non-OECD (Organisation for Economic Co-operation and Development) countries. Thus, one dollar spent on sanitation could generate about ten dollars' worth of economic benefit, mainly by productive work time gained from not being ill if either of these goals were achieved.

Cost-benefit ratios for achieving the MDG water supply and sanitation targets and for universal water supply and sanitation coverage

Region	Cost-Benefit Ratio of Achieving the MDG Sanitation Target	Cost-Benefit Ratio of Achieving Universal Sanitation Access
Sub-Saharan Africa	6.6	6.5
Arab States	5.3	12.7
East Asia & Pacific	12.5	13.8
South Asia	6.9	6.8
Latin America & Caribbean	37.8	39.2
Eastern Europe & CIS	27.9	29.9
Average for all non-OECD countries	9.1	11.2

Finally, the Disease Control Priorities Project recently found hygiene promotion to prevent diarrhoea to be the most cost-effective health intervention in the world at only \$3.35 per DALY loss averted, with sanitation promotion following closely behind at just \$11.15 per DALY loss averted (Cairncross S. & Valdmanis V.; 2006).

THE ROLE OF THE HEALTH SECTOR IN IMPROVING SANITATION

Sanitation promotion is one of the most important roles the health sector can have in environmental health planning, because behaviours must be changed to increase householders' demand for and sustained use of sanitation, especially in rural areas where the pressure for change is lower. Thus, two of the most promising large-scale sanitation programmes in Africa are centred around demand creation and are both led and delivered by the Ministry of Health and its associated structures (Jenkins MW & Curtis V.; 2005).

Sanitation can be promoted by the health sector through a stand-alone programme such as sanitation marketing or CLTS or included in disease-specific control programmes such as the 'SAFE' approach to trachoma (Mariotti SP. & Prüss A.; 2000). Alternatively, it can be incorporated into a wider integrated community health package such as Ethiopia's HEP (Health Extension Programme), which was developed in 2004 to prevent the five most prevalent diseases in the country; safe sanitation and hygiene became a major focus within HEP because of the recognition that these diseases are all linked with poor environmental health.

Promotion alone by the health sector may be insufficient, however, to ensure sanitation adoption and maintenance. A “carrot and stick” approach may be needed in which sanitation coverage is increased through a combination of community-based promotion and enforcement of national or local legislation that every house must have a toilet (Rothschild M. Carrots.; 1999). In many countries, Environmental Health Officers are responsible for ensuring the sanitary condition and hygienic emptying of toilets and have the power to sanction dissenting households with fines and court action. This enforcement role of the health sector is particularly important in urban areas where high-density living increases the risks of faecal contamination of the environment and where one person's lack of sanitation can affect the health of many other people.

The health sector also has an important role to play in advocacy and leadership. Politicians and the general public listen to doctors. That puts an onus on the medical profession to speak out on all-important health issues, including sanitation. Historically, this has not happened.

Given the huge potential health-cost savings achieved through improved sanitation, the health sector should be advocating for stronger institutional leadership, stronger national planning, and the establishment of clear responsibilities and budget lines for sanitation. Unfortunately, although the international health community puts large human and financial resources into many low- to medium-cost health interventions such as immunization and bed net distribution, it has been slow to act on the evidence showing that sanitation promotion and hygiene promotion are among the most cost-effective public health interventions available to developing countries.

Finally, the well-honed epidemiology and surveillance skills of health professionals must also now be applied to sanitation to establish clear links between national health information systems and sanitation planning and financing, which has historically been separate from health in most countries.

STRATEGIES TO ACHIEVE SUCCESS IN SANITATION

Sanitation is a complex topic, with links to health and social and economic development. It affects many but is championed by few. From our analysis of the situation, we believe that three major strategies could achieve success in sanitation.

The most important of these strategies is political leadership, which is manifested by establishing clear institutional responsibility and specific budget lines for sanitation, and by ensuring that public sector agencies working in health, in water resources, and utility services work together better. The regional sanitation conference declarations released during the International Year of Sanitation, in which many government ministers were personally involved, were an important step forward.

The second strategy is the shift from centralised supply-led infrastructure provision to decentralised, people-centred demand creation coupled with support to service providers to meet that demand. This strategy is transforming sanitation from a minor grant-based development sector into a major area of human economic activity and inherently addresses the problem of affordability since people install whatever sanitation systems they can afford and subsequently upgrade them as economic circumstances permit.

The final strategy is the full involvement of the health sector in sanitation. The health sector has a powerful motivation for improving sanitation, and much strength to contribute to achieving this goal. The Declaration of Alma Ata in 1978 emphasised the importance of primary health care and included “an adequate supply of safe water and basic sanitation” as one of its eight key elements. Many years have passed since this Declaration, and the body of evidence about sanitation has increased substantially. The health sector now needs to reassert its commitment and leadership to help achieve a world in which everybody has access to adequate sanitation.

CONCLUSION

Lack of sanitation leads to disease, as was first noted scientifically in 1842 in Chadwick's seminal “Report on an inquiry into the sanitary condition of the labouring population of Great Britain”. A less scientifically rigorous but professionally significant indicator of the impact on the health of poor sanitation was provided in 2007 when readers of the BMJ (British Medical

Journal) voted sanitation the most important medical milestone since 1840 (Ferriman A; 2007). Systematic reviews suggest that improved sanitation can reduce rates of diarrhoeal diseases by 32%–37% (Waddington H, & Snilstveit B.; 2009). While many of the studies included in those reviews could not rigorously disaggregate the specific effects of sanitation from the overall effects of wider water, sanitation, and hygiene interventions, a longitudinal cohort study in Salvador, Brazil, found that an increase in sewerage coverage from 26% to 80% of the target population resulted in a 22% reduction of diarrhoea prevalence in children under 3 years of age; in those areas where the baseline diarrhoea prevalence had been highest and safe sanitation coverage lowest, the prevalence rate fell by 43%. Expressed at a national scale, poor sanitation and hygiene costs the Lao People's Democratic Republic 5.6% of its GDP per year and studies in Ghana and Pakistan suggest that general improvements in environmental conditions could save 8%–9% of GDP annually (World Bank.; 2008).

REFERENCES

1. Albonico M, Montresor A, Crompton DWT, Savioli L. Intervention for the control of soil-transmitted helminthiasis in the community. *Trends Parasitol.* 2006;61:311–48.
2. Barreto ML, Genser B, Strina A, Teixeira MG, Assis AM, et al. Effect of city-wide sanitation programme on reduction in rate of childhood diarrhoea in northeast Brazil: assessment by two cohort studies. *Lancet.* 2007;370:1622–28.
3. Blackett I. Low-cost urban sanitation in Lesotho. Washington, DC: World Bank; 1994. 53.
4. Black R, Cousens S, Johnson H, Lawn J, Rudan I, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. *Lancet.* 2010;375:1969–1987.
5. Blossner M, de Onis M. Malnutrition: quantifying the health impact at national and local levels. Geneva: World Health Organization; 2005. 51.
6. Burra S, Patel S, Kerr T. Community-designed, built and managed toilet blocks in Indian cities. *Environ Urban.* 2003;15:11–32.
7. Chadwick E. Report on an inquiry into the sanitary condition of the labouring population of Great Britain. London: Her Majesty's Stationery Office; 1842. 279.
8. Cook JA. Eliminating blinding trachoma. *N Engl J Med.* 2008;358:1777–1799.

9. de Silva NR, Brooker S, Hotez PJ, Montresor A, Engels D, et al. Soil-transmitted helminth infections: updating the global picture. *Trends Parasitol.* 2004;19:547–551.
10. Feachem RG, Bradley DJ, Garelick H, Mara DD. Sanitation and disease. Health aspects of wastewater and excreta management. Chichester: John Wiley & Sons; 1983. 326.
11. Ferriman A. BMJ readers choose the ‘sanitary revolution’ as greatest medical advance since 1840. *BMJ.* 2007;334:111.
12. Genser B, Strina A, Teles CA, Prado MS, Barreto ML. Risk factors for childhood diarrhoea incidence: dynamic analysis of a longitudinal study. *Epidemiology.* 2006;17:658–67.
13. Hotez PJ, Bundy DAP, Beegle K, et al. Helminth infections: soil–transmitted helminth infections and schistosomiasis. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, editors. *Disease control priorities in developing countries*, 2nd edn. New York: Oxford University Press; 2006. pp. 467–82.
14. Hotez PJ, Molyneux DH, Fenwick A, et al. Control of neglected tropical diseases. *N Engl J Med.* 2007;357:1018–1027.
15. Hutton G. Economic impacts of sanitation in Lao PDR. Jakarta: World Bank and Water & Sanitation Program; 2009. 49.
16. Hutton G, Haller H. Evaluation of the costs and benefits of water and sanitation improvements at the global level. Geneva: World Health Organization; 2004. 87.
17. Hutton G, Haller L, Bartram J. Economic and health effects of increasing coverage of low-cost household drinking-water supply and sanitation interventions to countries off-track to meet MDG target 10. Geneva: World Health Organization; 2007. 68.
18. Kar K, Chambers J. Handbook on community-led total sanitation. London: Plan International UK; 2008. 51.
19. Kosek M, Bern C, Guerrant RL. The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bull World Health Organ.* 2003;81:197–204.
20. Lanata CF, Huttly SR, Yeager BA. Diarrhea – whose faeces matter? Reflections from studies in a Peruvian shanty town. *J Paediatr Infect Dis.* 1998;17:7–9.

21. Mariotti SP, Prüss A. The SAFE strategy: Preventing trachoma – A guide for environmental sanitation and improved hygiene. Geneva: World Health Organization; 2000. 36.
22. Melo JC. The experience of condominal water and sewerage systems in Brazil. Case studies from Brasília, Salvador and Parauapebas. Lima: Water and Sanitation Program Latin America; 2005. 62.
23. Mukherjee N, Shatifan N. The CLTS story in Indonesia. Empowering communities, transforming institutions, furthering decentralization. 2008. Available: <http://www.communityledtotalsanitation.org/resource/clts-story-indonesia-empowering-communities-transforming-institutions-furthering-decentrali>. Accessed 15 July 2010.
24. Norman G, Pedley S, Takkouche B. Effects of sewerage on diarrhoea and enteric infections: a systematic review and meta-analysis. *Lancet Infect Dis*. 2010;10:536–44.
25. Pruss-Ustün A, Bos R, Gore F, Bartram J. Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health. Geneva: World Health Organization; 2008. 60.
26. Resnikoff S, Pascolini D, Etya'ale D, Kocur I, Pararajasegaram R, et al. Global data on visual impairment in the year 2002. *Bull World Health Organ*. 2004;82:844–851.
27. Robinson A. Total sanitation. Reaching the parts that other approaches can't reach? *Waterlines*. 2006;25:8–10.
28. Rothschild M. Carrots, sticks and promises: a conceptual framework for the management of public health and social issue behaviors. *Journal of Marketing*. 1999;63:24–27.
29. Schmidt WP, Cairncross S, Barreto ML, Clasen T, Genser B. Recent diarrhoeal illness and risk of lower respiratory infections in children under the age of 5 years. *Int J Epidemiol*. 2009;38:766–72.
30. Stephenson LS, Latham MC, Ottesen EA. Malnutrition and parasitic helminth infections. *Parasitology*. 2000;121:23–28.
31. Practical Action Consulting. Bangladesh rural sanitation supply chain and employment impact. New York: UNDP; 2006. 11.

32. Singh M. Opening address to the third South Asian conference on sanitation, New Delhi, 18 November 2008. 2008. Available: <http://pib.nic.in/release/release.asp?relid=44884>. Accessed 15 July 2010.
33. Sugden S. An assessment of mechanical pit emptying services in Maputo. London: London School of Hygiene and Tropical Medicine; 2005.
34. Waddington H, Snilstveit B. Effectiveness and sustainability of water, sanitation, and hygiene interventions in combating diarrhoea. *J Dev Effect*. 2009;1:295–335.
35. Wagner EG, Lanoix JN. Excreta disposal in rural areas and small communities. Geneva: World Health Organization; 1958. 327.
36. Waterkeyn J, Cairncross S. Creating demand for sanitation and hygiene through Community Health Clubs: a cost-effective intervention in two districts of Zimbabwe. *Soc Sci Med*. 2005;61:1958–1970.
37. WHO. Creating healthy cities in the 21st century. In: Satterthwaite D, editor. *The Earthscan reader on sustainable cities*. London: Earthscan Publications; 1999. pp. 137–172.
38. WHO. *Global burden of disease: 2004 update*. Geneva: World Health Organization, 2008; 2008. 160.
39. World Bank. *Environmental health and child survival: epidemiology, economics, experience*. Washington, DC: World Bank; 2008. 135
40. UNDP 2006 Human Development Report 2006: *Beyond scarcity – Power, poverty and the global water crisis*. New York: United Nations Development Programme; 440.