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Health Impacts of Improved Household Sanitation

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Abstract

The health benefits of improved household sanitation are broad in scope, ranging from reductions in diarrhoea, helminth infections and trachoma through reduced risk of accidents and/or sexual harassment, to enhanced psycho-social well-being afforded via such factors as improved dignity and social standing. Despite methodological issues in quantifying the health benefits of improved sanitation, there is no doubt it can have significant impact on household health. The provision and consistent use of sanitation isolates contaminated faeces from the environment breaking down the faecal-oral transmission of disease. The evidence for the protective effect of sanitation against diarrhoea is greatest, with latrines potentially reducing the diarrhoea disease by an average of 36%.

Introduction

In this fact sheet, sanitation refers to the safe disposal of human excreta. Sanitation affords many health benefits, both in the narrow sense of disease avoidance and in the wider sense of enhanced psychological and physical well-being. Yet globally 2.6 billion people still lack access to improved sanitation. In Africa sanitation coverage rates lie at just 36%.

This fact sheet gives a brief overview of the disease categories associated with sanitation. Followed by an exploration of the varying factors affecting the potential health impact of sanitation, a review of the difficulties of ascertaining precise health impacts, a summary of the current evidence for the disease-preventive effect of improved sanitation and a discussion of the wider health benefits. Finally interactions between sanitation, hygiene and water supply are discussed.

Diseases Associated with Lack of Sanitation (Hunt, 2001)

Faecal-oral diseases represent the largest health burden associated with a lack of improved sanitation, diarrhoea being the most burdensome of these and accounting for over 1.6million child deaths each year. Their major transmission routes are shown in Figure 1.

The major *soil-transmitted helminths* showing association with poor access to improved sanitation are hookworm, roundworm and whipworm, all of which are transmitted when eggs are passed in human faeces which is then left in the environment.

Beef and pork tapeworms infect humans when infected and inadequately cooked animal meat is eaten. Humans can then contribute to the continued life cycle by defecating in such a manner that the eggs in their faeces are eaten by the original animal hosts.

Water-based helminths have aquatic intermediate hosts, for example snails, and are responsible for diseases such as schistosomiasis/bilharzias. Humans can become infected through contact with water carrying schistosome larvae and contribute to the transmission cycle when the excreta or urine of infected persons contaminates water bodies containing the aquatic snail hosts.

Excreta-related insect vectors include mosquitoes, flies and cockroaches which breed in sites contaminated with human faeces. Sanitation-related diseases in this category include trachoma, transmitted in part via *Musca sorbens* flies which breed in scattered human faeces, and filariasis which is spread via *Culex* mosquitoes

which breed in septic tanks and flooded latrines.

Most evidence exists for the impact of sanitation on diarrhoeal diseases, though there is also evidence for the protective effect against hookworm, roundworm and whipworm, and a growing body of evidence for prevention of trachoma transmission via reductions in fly populations.

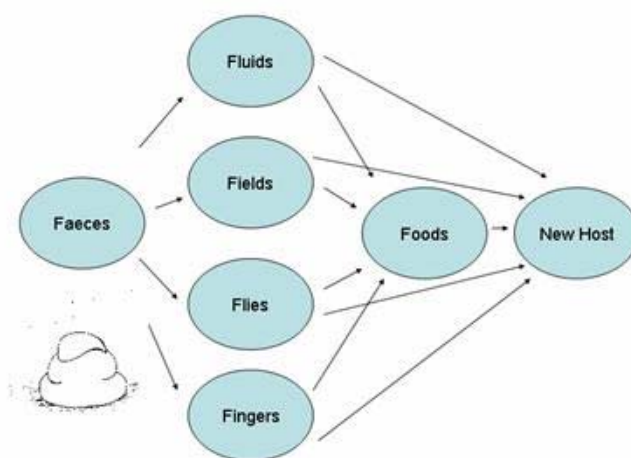


Figure 1: The F-Diagram (after Wagner & Laniox 1958 in Hunt 2001) illustrating the major transmission pathways of faecal-oral diseases. Sanitation breaks transmission by preventing the contamination of 'fluids' and 'fields' and via removal of breeding grounds for flies.

Determinants of the Health-impacts of Improved Sanitation

Sanitation has a marked impact on the transmission of faecal-oral diseases through prevention of the contamination of the environment and water-sources, and the removal of breeding grounds for certain insect vectors such as *Musca sorbens*.

While it is clear that sanitation breaks the transmission cycle of many diseases, a number of factors influence the degree to which disease protection is afforded. These factors include the sanitation domain (public versus private provision and impact), the sanitation technology, use and maintenance patterns, urban/rural context and seasonality.

Sanitation Technology: "The greatest determinants of the efficacy of alternative facilities are, first, whether they are used by everyone all the time, and second, whether they are adequately maintained..." Pit latrines would, from the viewpoint of health rather than convenience, approximate the same rating as a water-based sewerage system" (Feachem et al, 1983 cited in Cairncross & Valdmanis 2006)

Over the years there has been much debate regarding what constitutes either *safe* or *improved* sanitation. Much of this debate has focussed around evaluations of the available sanitation technologies. While this debate continues, the Global Water Supply and Sanitation Assessment 2000 defined the following systems as *improved*:

- Private and public sewerage systems
- Septic tanks with soak-aways
- Pour-flush latrines
- Pit latrines

Latrines with open pits and service/bucket latrines have been defined as *unimproved*, the former due to their failure to isolate faeces from the environment, and the latter due to potential health-risks associated with manual emptying.

Use & Maintenance Patterns: The most important determinants of the health benefits of latrines/toilets are whether they are a) used consistently by everyone and b) adequately cleaned and maintained. A combination of these two factors will ensure that faeces are kept out of

the environment and further human contact.

While latrine usage patterns have been inadequately studied, anecdotal evidence suggests that in many cases latrines may be used during the day, whilst at night many people practice open defecation; the privacy the latrine superstructure provides during the day is less important in the dark. Latrines may also be restricted to adult use as children (whose stools are more infective) can find them frightening.

Even when used, sanitation facilities may be used incorrectly or be inadequately maintained and thus, continue to pose a health risk. If faeces are on the latrine floor poor maintenance increases health risks and discourages continued use.

Maintenance remains an issue for all sanitation technologies, both "improved" and "unimproved". Sewerage systems and septic tanks can leak, pipes can block and overflow, pits collapse, groundwater become contaminated, and emptying services fail.

Sanitation Domain: While there are situations where public latrines do provide an adequate and accessible sanitation service to communities, overall such public facilities are not regarded as providing 'improved' or adequate sanitation. They frequently become fouled through lack of adequate maintenance thereby creating health risks and deterring use. They are often inaccessible at night leading to open defecation, they may be far from certain users and particularly difficult for children, elderly and disabled people to use. In some contexts (e.g. urban Ghana) there can be long queues in the morning and evenings, further dissuading use.

Rural/Urban Context: It is intuitively likely that improved sanitation has a greater health impact in urban areas where population densities are higher, open defecation more indiscriminate and the possibilities of faecal cross-contamination more numerous, than the health impact in low density rural areas. However, few studies have investigated the differential impact of improved sanitation in urban versus rural areas and the little evidence that is available suggests minimal difference in disease prevalence between the two contexts.

Seasonality: Seasonality has general impacts on the transmission of diarrhoeal diseases. For example, viral agents are more prevalent in winter and bacteria in the summer. The season can also have impacts on the sanitation facilities themselves with heavy rains causing pit latrines and sewerage systems to flood and become inoperable and possibly contaminate the environment.

Evaluating the Evidence for the Role of Sanitation in Disease Prevention

An *intervention study* is the only method that could with any certainty show the health impact due to latrine use rather than other factors such as the hygiene habits of a household. A latrine use intervention study has never been undertaken and the best evidence for the impact of sanitation to date is from observational studies. Esrey et al (1991) reviewed all the available evidence and concluded that latrine ownership could reduce:

- Diarrhoea incidence by 37%
- Ascaris prevalence by 28% (range 0 to 83%)
- Hookworm prevalence by 4% (range 0 to 100%)

A further review (Fewtrell et al 2005) investigated the impacts of sanitation, hygiene and water supply interventions. Only 2 studies on diarrhoea and sanitation were deemed rigorous enough for inclusion in the review, but these mirror the reduction found by Esrey et al, suggesting a pooled relative risk of 0.68 (0.57 – 0.87), indicating that latrine ownership could reduce diarrhoea incidence by 32%.

In recent years the evidence for the positive impact of sanitation provision on trachoma has also been growing, with a recent cluster-randomised trial finding that latrine provision was associated with a 30% reduction in trachoma prevalence (Emerson et al 2004). Such impact is brought about via the isolation of faeces from the environment, as the *Musca sorbens* fly vector for the disease breeds

preferentially in scattered human faeces.

The problem with observational studies is that they explore the health impact of sanitation by comparing those who currently use a latrine with those who do not. However, those with latrines can also differ in a number of other important ways. Latrine owners tend to be wealthier, better educated, have good access to water supplies and evidence suggests that they also have better hygiene practice (Hoque et al 1995). With so many confounding factors, it is very difficult to separate the independent effects of the existence a latrine on health status.

Sanitation and Psychological Well-being - The Wider Health Gains

The WHO define health to be:

'Physical, mental and social well-being, not merely the absence of disease or infirmity'

The health benefits of improved sanitation extend beyond reductions in the burden of infectious disease and into good health via the provision of psycho-social well-being.

When exploring the benefits of sanitation within communities and household members, disease prevention is one of the less commonly cited benefits with privacy, improved dignity and status, women's security, children's safety and comfort being cited more frequently. In the most rigorous study of *consumer*-perceived benefits of household sanitation, carried out in Benin, the biggest benefits of sanitation were seen as: avoiding the discomforts of the bush; gaining prestige from visitors; and avoiding dangers at night (see Box 3). Night-time dangers are a particular concern for women who may risk sexual harassment on their journey to or from their defecation site. Similar concerns have been reported anecdotally in a range of other geographical settings.

Benefits of latrine ownership as perceived by 320 households in rural Benin (Jenkins, 1999)	
Benefit	Av. Importance Rating (1-4)
Avoid discomforts of the bush	3.98
Gain prestige from visitors	3.96
Avoid dangers at night	3.86
Avoid snakes	3.85
Reduce flies in compound	3.81
Avoid risk of smelling or seeing faeces in bush	3.78
Protect my faeces from my enemies	3.71
Have more privacy to defecate	3.67
Keep my house properly clean	3.59
Feel safer	3.56
Save time	3.53
Make my house more comfortable	3.50
Reduce my family's healthcare expenses	3.32
Leave a legacy for my children	3.16
Have more privacy for household affairs	3.00
Make my life more modern	2.97
Feel royal	2.75
Make it easier to defecate because of age or illness	2.62
For health (spontaneous mention)	1.27
Be able to increase my tenants' rent	1.17

Interactions between Water Supply, Hygiene and Sanitation

While both Esrey et al (1991) and Fewtrell et al (2005) found that the effects of water supply, sanitation and hygiene promotion interventions on diarrhoea were not additive, logic and understanding of the F-Diagram and the major transmission routes for faecal-oral diseases would suggest that each should have an independent effect on the transmission and prevalence of this disease classification, including diarrhoeal infections. Reasons for Esrey et al and Fewtrell et al failing to find an additive effect of multiple interventions may relate to programme implementation and the difficulties involved in attempting to

implement multiple project components at the same time. Indeed, experience suggests that single focussed messages are most likely to yield a desired impact on behaviour and that a household's motivations for investing in water supply or sanitation facilities tend to be very different. Thus, at the current time, despite a lack of evidence, it is suggested that programmers work on the assumption that the effects of water and sanitation interventions are independent, while hygiene promotion be viewed as a necessary component of either to ensure correct, consistent and sustained use and maintenance.

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