

TOILETS FOR HEALTH

A REPORT BY THE LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE
IN COLLABORATION WITH DOMESTOS

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MEDICINE



TOILETS FOR HEALTH

FOREWORD



Having access to sanitation is a basic human right, yet almost a third of the world's population suffer on a daily basis from a lack of access to a clean and functioning toilet. Without toilets, untreated human waste can impact a whole community, affecting many aspects of daily life and ultimately posing a serious risk to health. The issue runs deeper into societal impacts, such as teenage girls often leaving school at the onset of menstruation due to lack of privacy and the risk of attack or rape associated with being forced to defecate in the open during nightfall.

Furthermore, it is reported that every year more children die from diarrhoea related disease than from HIV, malaria and tuberculosis combined. This situation could be solved simply by providing improved water, sanitation and hygiene facilities.

Finding sanitation solutions that solve these problems is one of the most complex issues in the World today and one that we at Unilever are committed to helping solve. Finding the solution will require collaborative working, bringing together the best brains in Public Health, Science, Engineering, Business and Communications. However, it is also one of the most difficult issues to communicate – sanitation is often referred to as the “last taboo.”

By consolidating the knowledge available about improvements that can be made to people's lives by the simple intervention of a clean, safe toilet, we can begin to drive action and help address this crisis.

Sean Gogarty, Senior Vice President, Unilever.

PREFACE



Few problems affect so many in such a profound manner as poor sanitation. It is estimated that 2.5 billion people in the world do not have access to improved sanitation (i.e.: a safe, functioning toilet). The cost of inaction on sanitation is high; from the children's lives lost to easily preventable causes such as diarrhoea to the macro-effects on developing countries' economies.

Despite the scale of the crisis, sanitation remains a low priority for governments and recent efforts to address this fall far short of what is required. Progress depends on adequate investment and collaborative action across developing country and donor governments, civil society, multilateral agencies, academia and the private sector. All parties have an urgent role to play in supporting national efforts to improve access to sanitation for all.

This paper is a contribution to the efforts to address the sanitation crisis. It summarises the evidence of the scale of the problem, points to the potential benefits of addressing the crisis and gives clear and actionable recommendations for all those who can help find a solution.

Dr Val Curtis, Director of the Hygiene Center, London School of Hygiene and Tropical Medicine.

FACTS



1 bn

Approximately 2.5 billion people live without improved sanitation, of which almost 1 billion people continue to defecate in the open.

1/5



Sanitation remains a neglected issue with financial investments representing only 1/5 of the total water, sanitation and hygiene sector expenditure.

0.85m



Diarrhoeal diseases are the second leading cause of child deaths in the world. Every year 0.85 million children die from diarrhoea. 88% of these deaths are caused by poor sanitation and unimproved water.



120m

To reach the MDG target on sanitation in 2015, more than 120 million people would need to gain access to improved sanitation every year.

43%



Globally, 43% of those living in rural areas do not have access to improved sanitation. This compares to 27% of those in urban areas.

<5



The health implications of poor sanitation fall disproportionately on the poorest households and particularly on children under the age of five.



443m

It is estimated that 443 million school days are lost every year due to WASH related diseases.

\$5

The World Health Organization estimates a rate of return of \$5 for each \$1 invested in water and sanitation, depending on the context and system adopted.



Improved sanitation and handwashing facilities have a particularly positive impact on the education opportunities of young girls, who are disproportionately affected by lack of privacy and cleanliness during their period.



Diarrhoeal diseases caused by inadequate sanitation, and unhygienic conditions put children at multiple risks leading to vitamin and mineral deficiencies, high morbidity, malnutrition, stunting and death.



There is some anecdotal evidence that lack of toilets in schools may affect the concentration of learners, due to them having to wait for longer periods before being able to relieve themselves.

1/3



Studies have estimated that improved sanitation can contribute to an approximate one third reduction in diarrhoeal diseases.

OVERVIEW

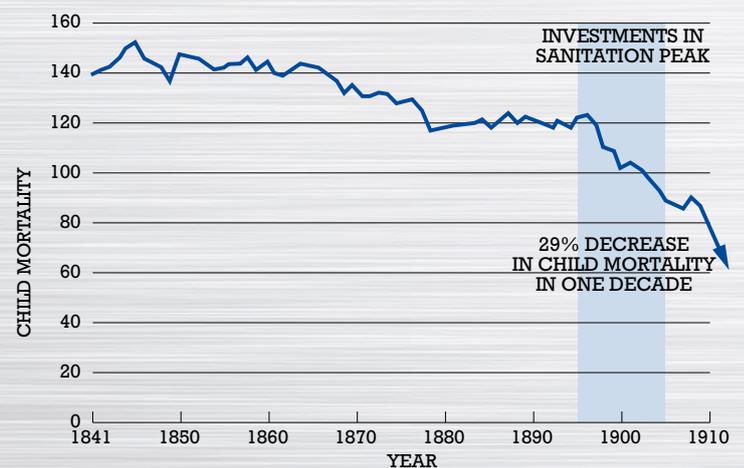
History demonstrates that poor sanitation is one of the most important contributors to the world's morbidity¹ and mortality, with progress in sanitation providing significant benefits to public health as well as to social, economic and environmental factors.¹

The 'Great Stink' of Victorian London epitomised the terrible environmental conditions that prevailed in many European cities in the nineteenth century (see Figure 1). By 1858 the sewage system of the city was overburdened, causing extremely unpleasant conditions and threatening the operation of the Government. The Great Stink mobilised political will that led to sustained investment in sanitation resulting in a dramatic reduction in infant mortality rates (29% in one decade)² (See Figure 2).

Figure 1: "Father Thames Introducing His Offspring to the Fair City of London" – Punch, 1858



Figure 2: Decrease in deaths in UK coinciding with sanitation improvements



Source: Adapted from WaterAid 2008

The conditions seen in nineteenth century England are comparable to those now experienced in many developing countries. Inadequate sanitation remains a leading cause of poor health and death at a global level: in 2012, diarrhoeal diseases are the second leading cause of child deaths in the world according to recent studies.³ A recent report by the World Health Organization and UNICEF estimates that approximately 2.5 billion people live without improved sanitation, of which almost 1 billion people continue to defecate in open. Despite this, sanitation remains a neglected issue with global financial investments representing only 1/5 of the total water, sanitation and hygiene (WASH) sector expenditure.⁴

¹ The rate of incidence of a disease.

WHAT IS SANITATION?

Sanitation can be defined as the safe disposal of human excreta and associate hygiene promotion.⁵ Sanitation so described is important as it separates humans from excreta. A safe toilet accompanied by hand washing with soap, provides an effective barrier to transmission of diseases. The F-diagram (Figure 4, overleaf) illustrates how sanitation prevents this transmission.

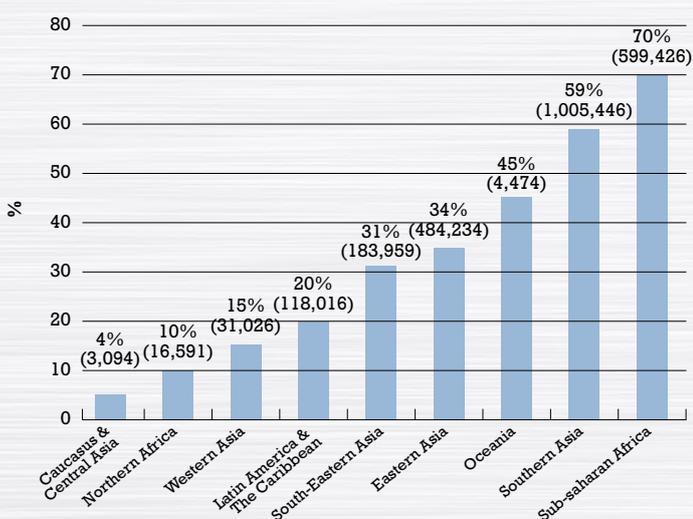
WHAT IS BEING DONE?

The Millennium Development Goals (MDGs), agreed by governments in 2000, outlined clear targets for water and sanitation provision (see Box 1). These targets were ambitious in their aim of reducing by half those who lacked access by 2015 but far short of ensuring universal access.

Efforts over the past decade have yielded some progress. The target for water supply was reported as being met in 2010, with 2 billion people gaining access to improved water since 1990.⁶ However, this achievement is somewhat overshadowed by the fact that achievement of the MDG target for sanitation now appears beyond reach.⁷

The number of people living without improved sanitation is disproportionately high in South Asia and sub-Saharan Africa (see Figure 3).

Figure 3: Proportion of population without improved sanitation.



Source: WHO/UNICEF, 2012

Pit latrine in Durban informal settlement (Source: Roma, 2011)



(BOX 1) THE MILLENNIUM DEVELOPMENT GOALS (UN 2000)

- 1 Eradicate poverty and extreme hunger
- 2 Achieve universal primary education
- 3 Promote gender equity and empower women
- 4 Reduce child mortality
- 5 Improve maternal health
- 6 Combat HIV/AIDS, malaria and other diseases
- 7 Ensure environmental sustainability
- 8 Develop a global partnership for development

MDG 7c calls on countries to: "Halve, by 2015, the proportion of people without sustainable access to safe drinking-water and basic sanitation".

Source: UN, (2000)

MONITORING PROGRESS AGAINST THE MDG TARGET FOR SANITATION

The WHO / UNICEF Joint Monitoring Programme (JMP) was established in 1990s, at the end of the International Drinking Water Supply and Sanitation Decade (IDWSS), with the purpose of assessing progress towards access of water and sanitation, and rigorously reviewing data from representative national household surveys. The JMP has provided the following classification of improved and unimproved sanitation facilities:

IMPROVED SANITATION:

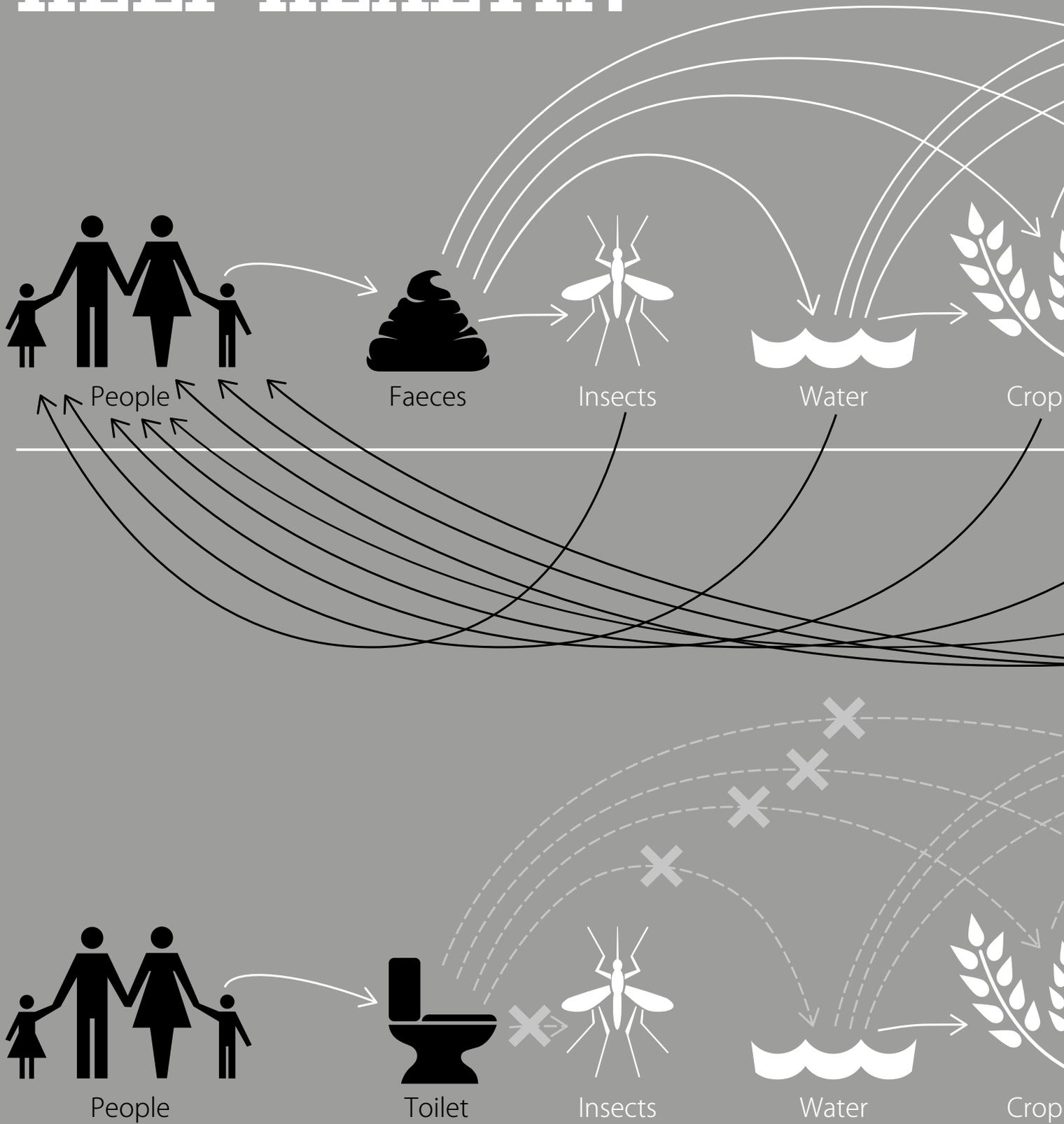
- Flushed toilet
- Piped sewer system
- Septic tank
- Flush/pour flush to pit latrine
- Ventilated improved pit latrine (VIP)
- Pit latrine with slab
- Composting toilet

UNIMPROVED SANITATION:

- Flush/pour flush to elsewhere (not into a pit, septic tank, or sewer).
- Pit latrine without slab
- Bucket
- Hanging toilet or hanging latrine
- Shared facilities
- Open defecation: no facilities or bush or field

Figure 4:

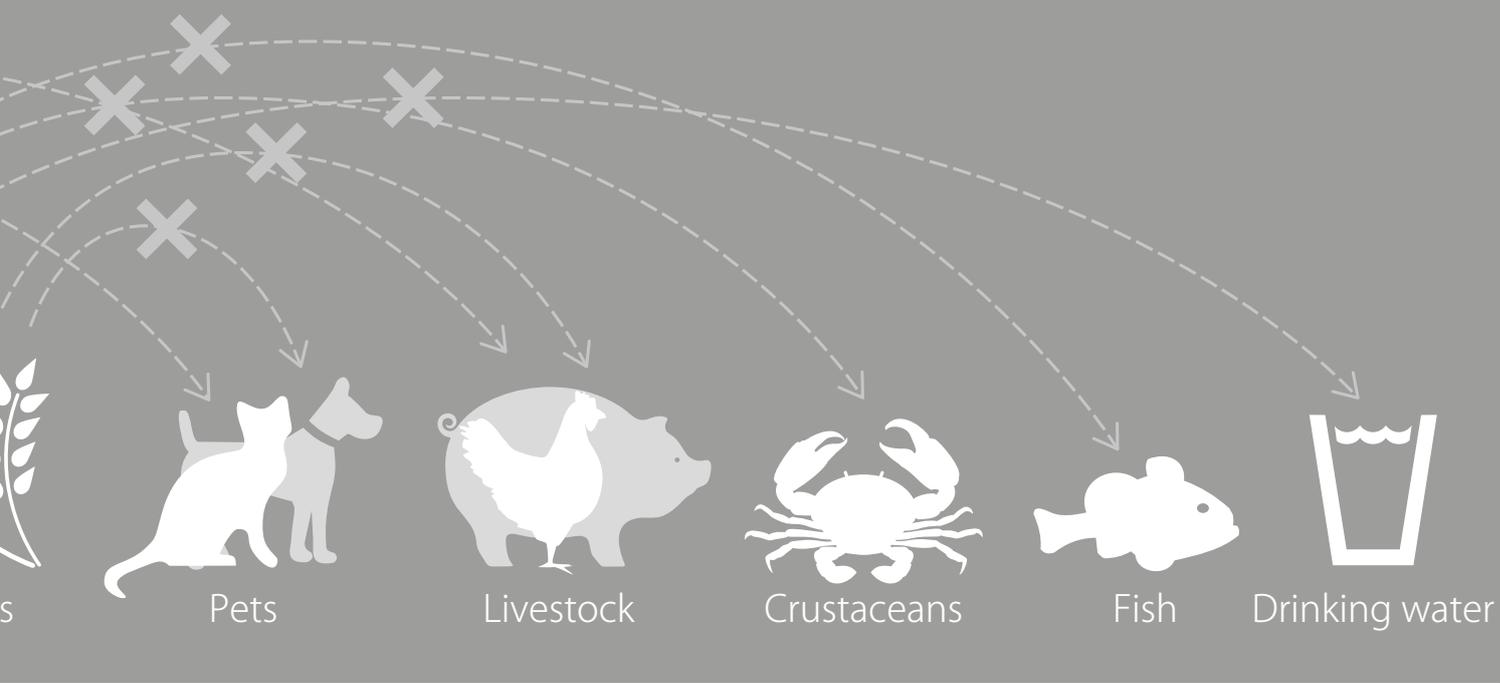
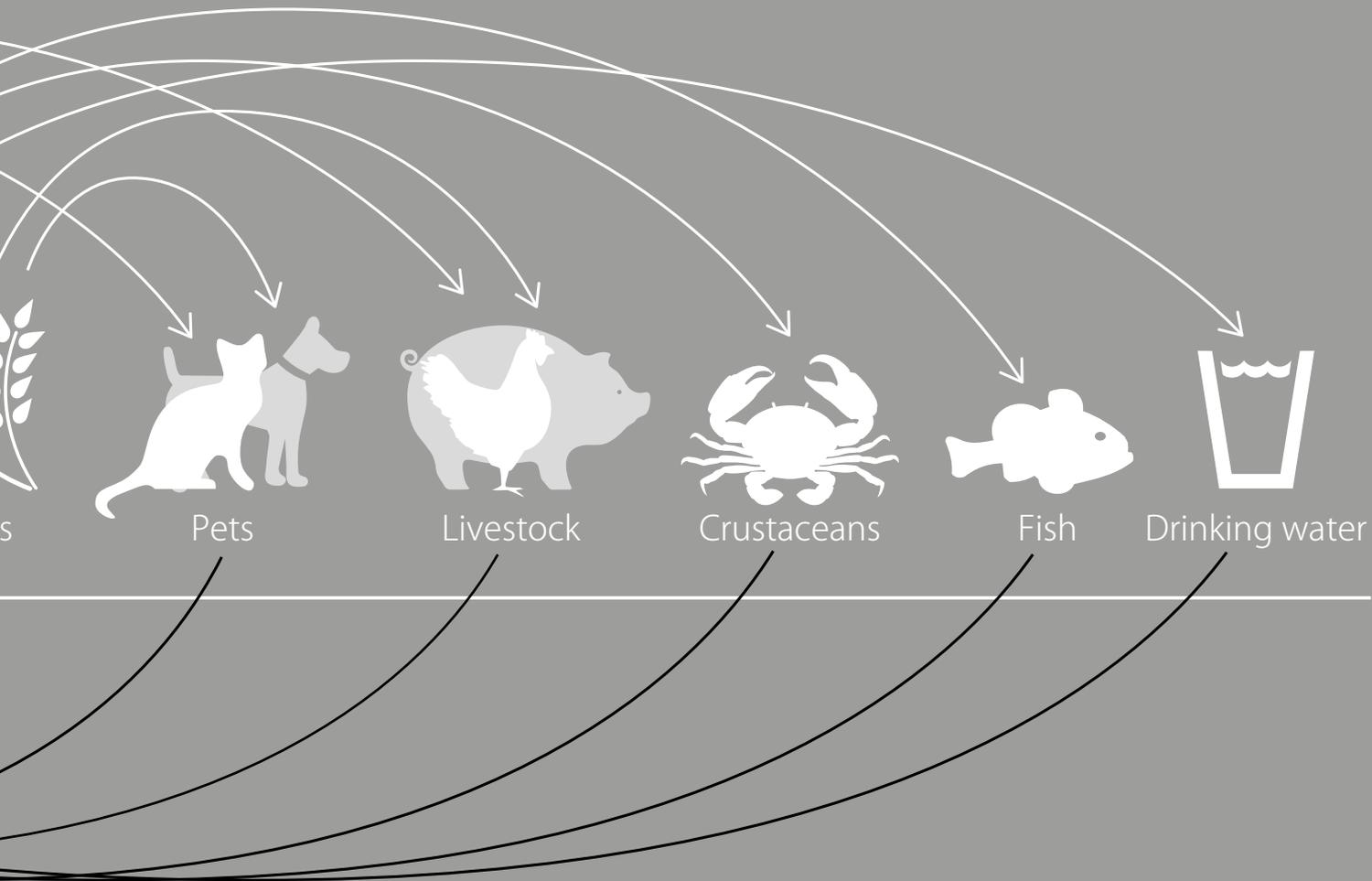
HOW DOES A TOILET HELP HEALTH?

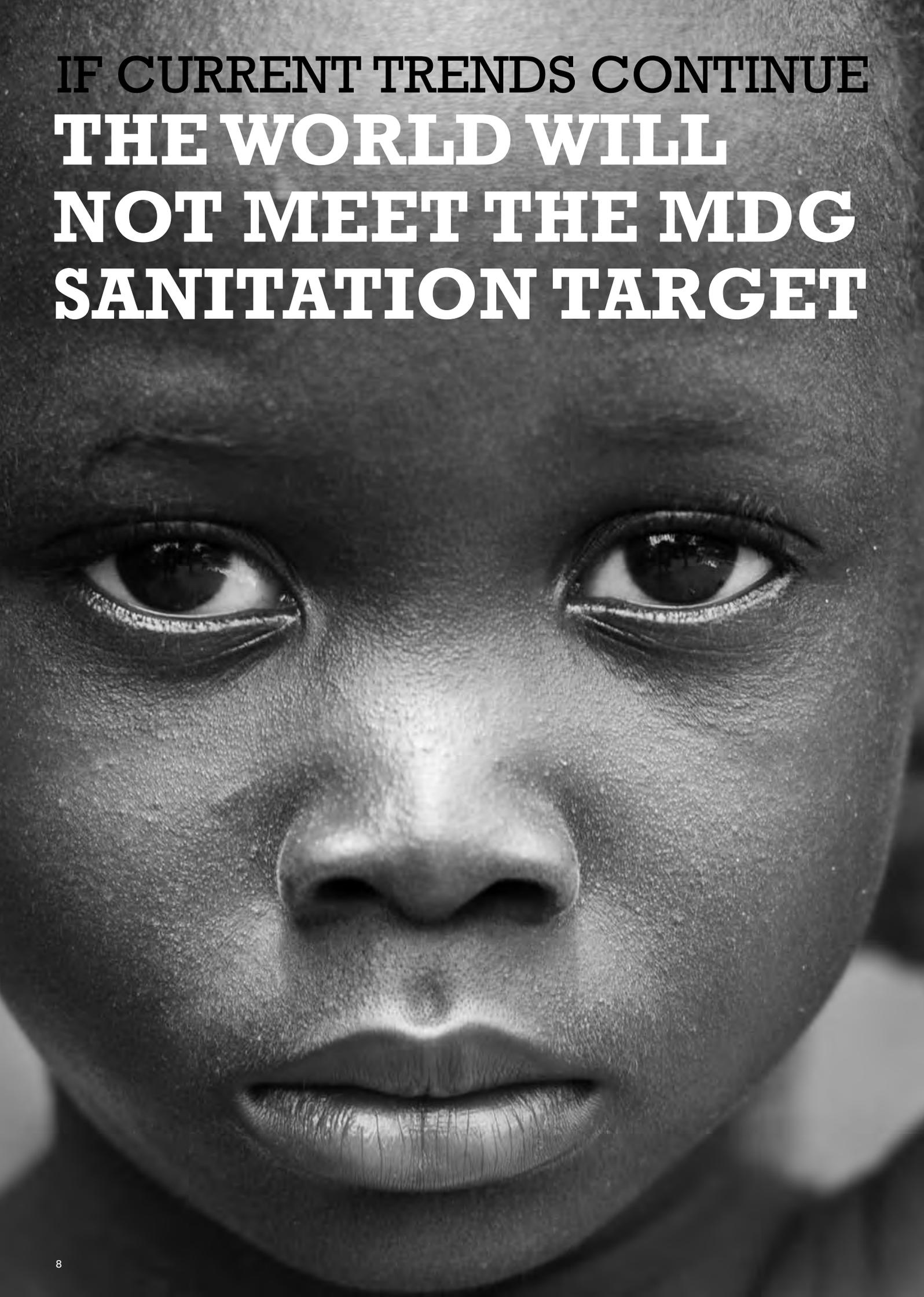


Source: Carolyn Jones, Global Hygiene Manager, Unilever, Domestos

Adapted from: Wagner and Lanoix (1958)

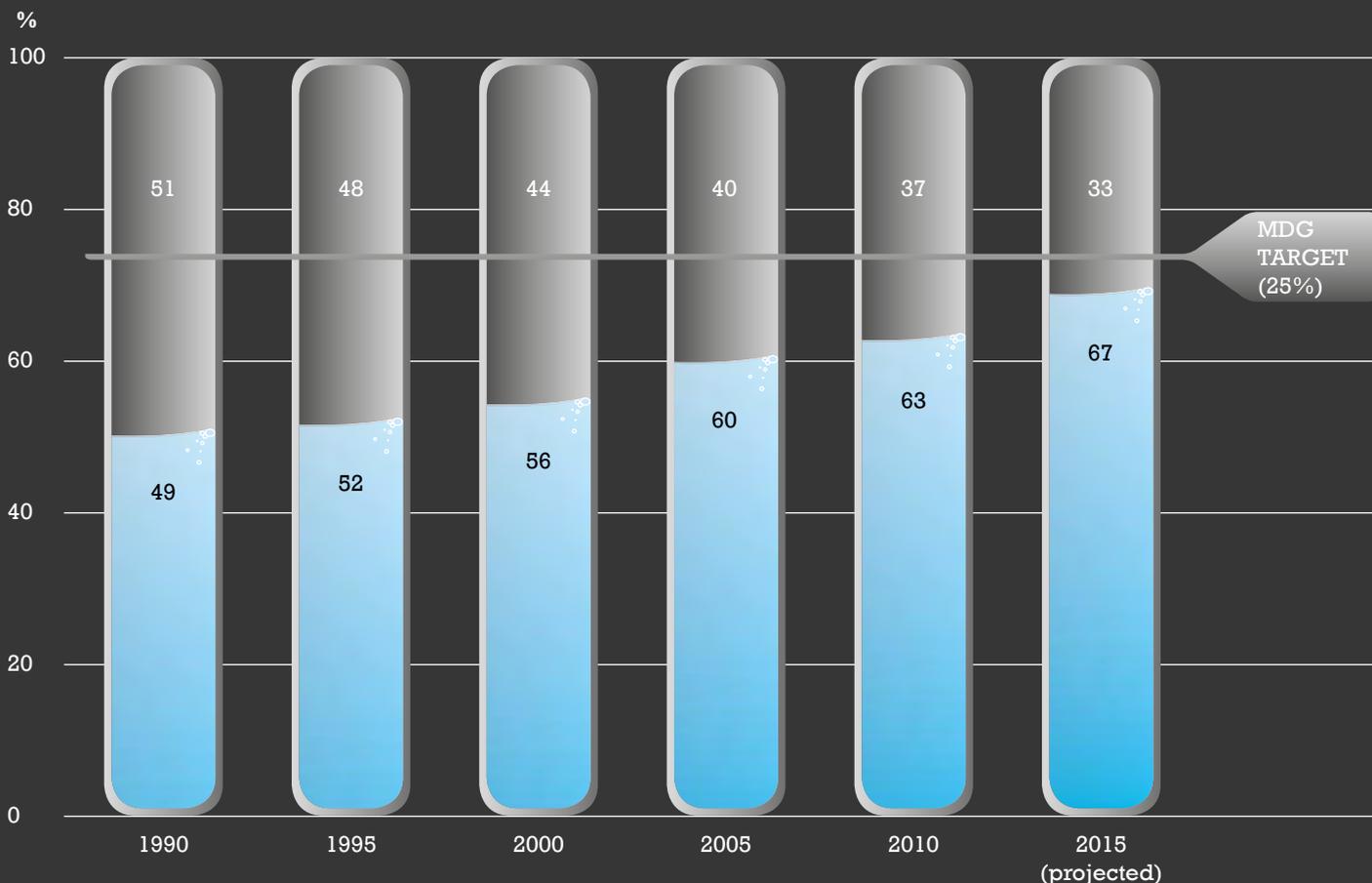
Ref. Wagner, E.G. and Lanoix, J.N. (1958). Excreta disposal for rural areas and small communities. Geneva:WHO.





IF CURRENT TRENDS CONTINUE
**THE WORLD WILL
NOT MEET THE MDG
SANITATION TARGET**

Figure 5: Global Sanitation coverage 1990-2010.



Source: Adapted from WHO/UNICEF, 2012

Although some progress has been made since the 1990s, 1 billion people still practice open defecation.⁸ Studies show the number of people relying on shared sanitation facilities has actually increased from 6% of the global population in 1990 to 11% at present, equating to approximately 762 million people, 60% of whom live in urban areas.⁹ Shared or communal sanitation facilities are often unclean, inaccessible, poorly managed,¹⁰ and pose a particular risk to women who often experience sexual harassment when using the facilities.¹¹

Compounding this poor progress, under the current population growth trends, predictions reveal that to reach the MDG 7c target on sanitation in 2015, more than 120 million people should gain access to improved sanitation every year.¹² More recently, however, academics have warned the scientific community that this projected progress towards the achievement of MDG 7c target, to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation, may be overestimated.¹³ This is due to the reduction of household sizesⁱⁱ (i.e. average number of people in a household), which in turn will increase the number of households, affecting governments' ability to provide water supply and sanitation operation and maintenance.

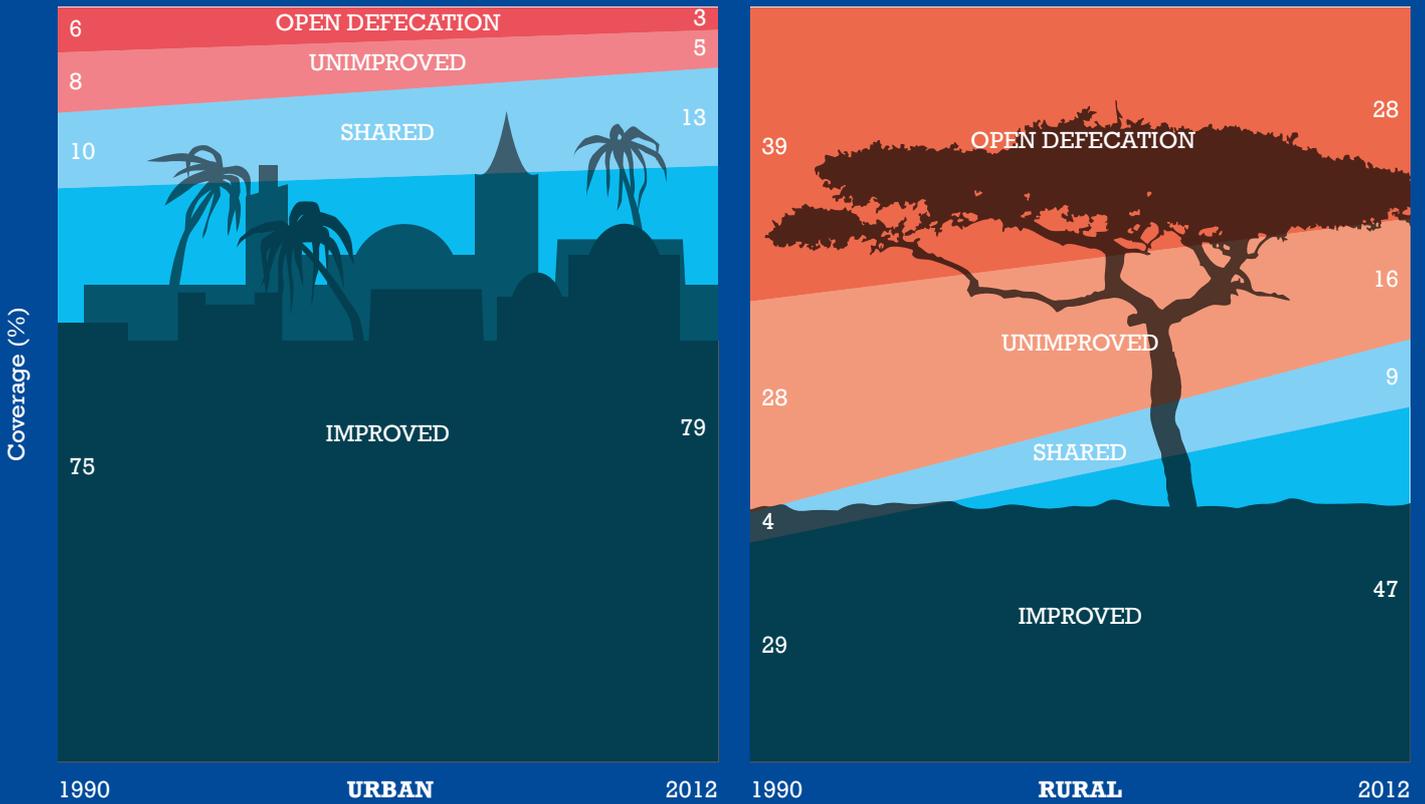
ⁱⁱ The decrease in household size is often attributed to a decrease of fertility rates.

GEOGRAPHICAL DISPARITIES

Improvements in access to adequate sanitation are marked by regional geographical disparities, with South Asia and Sub-Saharan Africa showing particularly low coverage rates (see Figure 3). The common characteristics of 'unimproved' sanitation facilities also differ according to geographical location; for example 45% of the population in Sub-Saharan Africa primarily use shared sanitation facilities and pit latrines, whilst in Southern Asia, 41% of the population practices open defecation.

There are also striking disparities in sanitation coverage between the urban and rural populations. At a global level, 27% of people living in urban areas, approximately 1.5 million, do not have access improved sanitation systems, due to the rapid population growth and migration patterns¹⁴, compared to 43% of the population living in rural areas, approximately 2.4 million people. Whilst the number of rural dwellers who use unimproved sanitation has decreased in rural areas of developing countries, the number of urban dwellers living without improved sanitation facilities has increased (between 1990 and 2012), (see Figure 6).

Figure 6: Sanitation coverage trends by urban and rural areas



Source: WHO/UNICEF, 2012



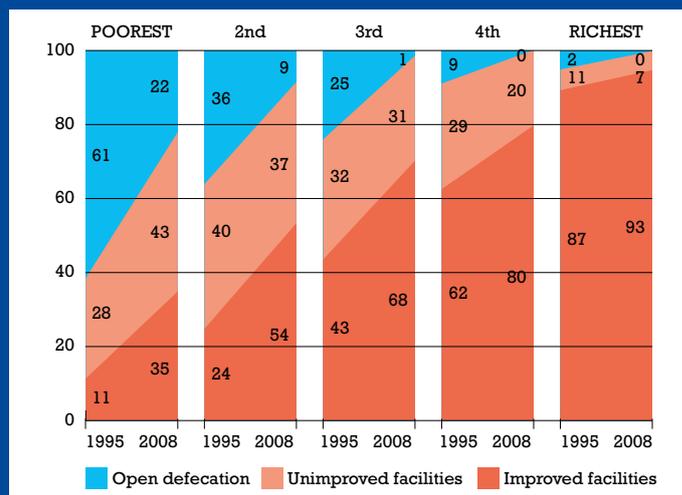
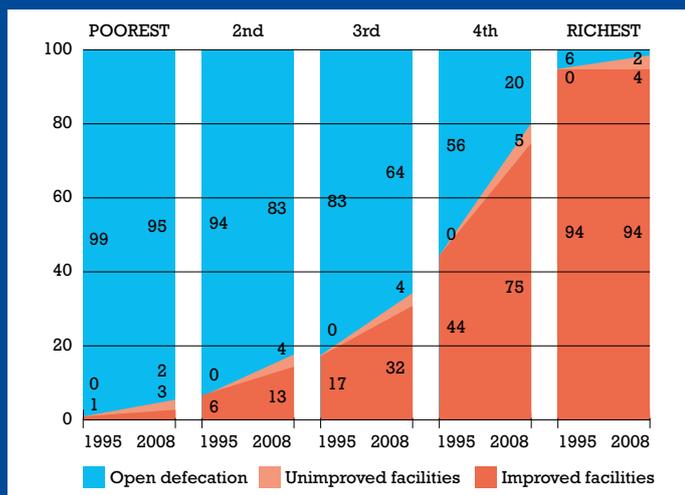
SOCIO-ECONOMIC INEQUITIES

Poor access to sanitation disproportionately affects the poorest people in society. Data from the 2012 report by WHO / UNICEF shows how progress in achieving the MDGs for sanitation has been highly inequitable. Figures 7 and 8 show the progress for India and Bangladesh from 1995 to 2008. For instance, since 1995, India has provided access to more than 150 million people, however progress was highly inequitable as the poorest quintile made hardly any progress.

Conversely, progress in Bangladesh has been more equitable, with the use of improved sanitation tripled amongst the poorest quintile.

Figure 7: Progress in access to sanitation in India per wealth quintile (1995-2008)

Figure 8: Progress in access to sanitation in Bangladesh per wealth quintile (1995-2008)



Source: WHO/UNICEF, 2012

Further evidence shows the health implications of poor sanitation fall disproportionately on the poorest households and particularly on children under the age of five living in those households.¹⁵ Studies disaggregating access to sanitation by wealth quintiles have shown a link with disparities in health risks between the poorest and richest quintiles of the population in developing countries (Rheingans etc.).¹⁶

VULNERABLE POPULATIONS

Beyond economic inequalities, the burden of inadequate sanitation often falls disproportionately on the most vulnerable people living in developing countries, such as children.¹⁷ Every year 0.85 million children under the age of five die from diarrhoea, with an estimated 88% of these deaths caused by poor sanitation and unimproved water, according to a 2008 report by the World Health Organisation.

Furthermore, the burden of inadequate sanitation falls disproportionately on people with disabilities, who, according to the most recent estimates represent 10% of the world's population. It can be assumed that this proportion is reflected also in the population statistics of developing countries. Access to sanitation for people with disabilities in developing countries is characterised by technical (infrastructural and design) barriers, as well as social barriers (stigma and discrimination) which must also be addressed if the MDG 7c target is to be achieved.¹⁸

WHY TOILETS MATTER

Few interventions have the potential to contribute to such a wide range of development goals as access to improved sanitation facilities.¹⁹ Figure 9 provides an example of the positive influence that increased access to improved sanitation can have on the achievement of other Millennium Development Goals.

Figure 9: Impacts of sanitation on achievement of MDGs





Urban Slum in Mumbai Source: Roma, 2011



Pit latrine in Durban informal settlement Source: Roma, 2011

TOILETS AGAINST POVERTY AND HUNGER (MDG 1)

Increased investments in sanitation would contribute to a country's economic productivity. Furthermore, appropriate management practices would enhance agricultural production, providing economic revenues from the sale of produce and securing food provision to face increasing global food prices. Economists argue that investment in water and sanitation could have immediate as well as long-term pay offs. The World Health Organization estimates a rate of return of \$5 for each \$1 invested in water and sanitation, depending on the context and system adopted.²⁰

Advances in sanitation can also reduce the economic burden on health systems in developing countries. People affected by infectious diarrhoeal diseases often require health care and/or hospital support, which incur costs to both patients (transport, medicine, time-loss) and to the national governments (medical consultation, treatment, medication).²¹ Last but not least, inadequate sanitation imposes an economic burden on tourism.²²

TOILETS AND EDUCATION (MDG 2)

Sanitation impacts on the educational advancement of children in developing countries. It is estimated that 443 million school days are lost every year due to WASH related diseases.²³ Improved school sanitation facilities have an impact on attendance and retention, increasing employment rates and quality of life. Improved sanitation and handwashing facilities have a particularly positive impact on the education opportunities of young girls, who are disproportionately affected by lack of privacy and cleanliness during their period. There is some anecdotal evidence that lack of toilets in schools may affect the concentration of learners, due to them having to wait for longer periods before being able to relieve themselves.

TOILETS AND GENDER EQUALITY (MDG 3)

Lack of access to sanitation facilities affects women more than men. Studies have demonstrated that women who have to travel to use the toilet or to defecate in the open are more susceptible to sexual harassment and violence.²⁴ Often, in densely populated areas, it is challenging for women to find privacy. This can lead them to refrain from urinating and defecating for many hours,²⁵ which it has been suggested may cause urinary tract infections.²⁶

TOILETS AND THE REDUCTION OF CHILD MORTALITY (MDG4)

During the first years of life, children need appropriate nutrition to support their immune system and to be protected against disease.²⁷ Diarrhoeal diseases caused by inadequate sanitation and unhygienic conditions put children at multiple risks leading to vitamin and mineral deficiencies, high morbidity, malnutrition, stunting and death. The impacts of diarrhoeal diseases on children's nutritional status and growth limitation (height and weight) have also been documented. Further evidence suggests that sustained exposure to excreta-related pathogens – including helminths referred to above – in early life limits cognitive development and lowers immunity.²⁸

Improving sanitation can reduce diarrhoeal disease,²⁹ although more research is needed to understand how we can scale-up these impacts.³⁰

TOILETS AND THE ENVIRONMENT (MDG 7)

From an environmental perspective, improving sanitation would contribute to the mitigation of urgent climatic changes such as water stress, unexpected natural disasters, environmental degradation and excessive resource depletion.³¹

The lack of appropriate sanitation (and related water and hygiene) is both a cause and effect of the vicious poverty cycle in which millions of people are trapped.³² Figure 10 synthesises the contribution of unimproved sanitation to poverty.

Figure 10: Contribution of unimproved sanitation to the poverty vicious circle





UNIMPROVED SANITATION

THE BURDEN

OF DISEASE

The WHO has developed the concept of Global Burden of Disease (GBD), which provides a comprehensive and comparable assessment of mortality and loss of health due to diseases, injuries and risk factors for all regions of the world. The GBD estimates the burden of more than 100 major diseases and risk factors at global and regional level. Among the most important risk factors, water sanitation and hygiene play a fundamental role. It is important to stress that although this document focuses on the burden of inadequate or lack of sanitation, it is difficult to disaggregate benefits and/or negative impacts from water and hygiene interventions, due to the complementary nature of such activities.

The disease burden caused by poor water, sanitation and hygiene is significant. Inadequate sanitation is mostly responsible for diseases which are transmitted via the faecal-oral route. The box below illustrates the classification of water-related infections.

THE BRADLEY CLASSIFICATION OF WASH DISEASES

Waterborne: The pathogen is in water that is ingested.

Water-washed: Person to person transmission because of lack of water for hygiene.

Water-based: Transmission via an aquatic intermediate host.

Water-related insect vector: Transmission by insects that breed in water or bite near water.

Source: Adapted by Cairncross and Valdarnis, 2006 from Bradley, 1977

A study by the World Health Organization in 2010 reported the improvement of water, sanitation and hygiene can prevent 9.1% of the WASH-related disease burden,ⁱⁱⁱ or 6.3% of deaths. A very large share of the disease burden falls on children under the age of five.

ⁱⁱⁱExpressed in disability-adjusted life years (DALYs), which are the number of years of potential life lost due to premature mortality and the years of productive life lost due to disability.



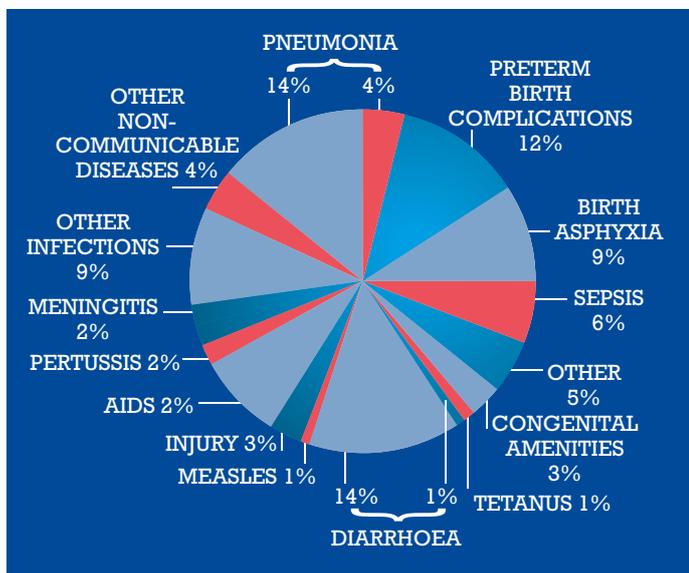
An eye-seeking fly. Source: International Centre for Eye Health, 2009

DIARRHOEAL DISEASES

The World Health Organization (WHO) defines diarrhoea as “the passage of three or more loose or liquid stools per day, or more frequent passage than is normal for the individual.” Diarrhoeal diseases are one of the most common causes of death in low-income countries, contributing to 15% of an estimated 8.795 million deaths in children under the age of five globally (See Figure 11).³³

Figure 11: Global causes of child's death

Source: Murray McGavin, International Centre for Eye Health, 1998



Source: WHO, 2011

Infectious diarrhoeal diseases include other severe diseases such as cholera, typhoid and amoebic dysentery (Table 1). Diarrhoea can be caused by bacterial (e.g. *Vibrio cholerae*), viral (e.g. Rotavirus) and protozoa (eg. *Giardia*) organisms most of which are found in water or food contaminated by faecal material. Diarrhoea is transmitted by the faecal-oral pathway illustrated in Figure 2.

children under the age of five, estimated at 1.5 million child deaths every year. Severe diarrhoea may be life threatening due to fluid loss, particularly in infants, young children, the malnourished and people with impaired immunity such as those living with HIV/AIDS.

Diarrhoeal diseases represent the most significant health impact of unimproved sanitation, and disproportionately impact upon children. WHO estimates that 88% of cases of diarrhoea can be attributed to unimproved water and sanitation.³⁴ Furthermore, diarrhoeal diseases are the second leading cause of death in

Since human faeces are the primary source of pathogens causing diarrhoea, poor sanitation, lack of adequate water supply and hygiene are all contributing factors to high instances of diarrhoeal disease.³⁵ Rigorous reviews of existing studies have estimated that improved sanitation can contribute to an approximate one third reduction in diarrhoea.³⁶

INTESTINAL NEMATODE INFECTIONS

Nematode parasitic infections continue to represent a major public health threat, particularly in developing countries. Nematode infections are transmitted by eggs or larvae, which can enter human hosts by either penetrating the skin (Hookworm), being ingested from uncooked/unwashed vegetables (whipworm and roundworm) or by not washing hands contaminated with soil.

ASCARIASIS is caused by the roundworm *Ascaris lumbricoides*. Eggs are passed in the infected faeces, which in poor sanitation conditions may contaminate water and soil. The infection is transmitted via ingestion of infective eggs, from contaminated soil or from uncooked products contaminated with soil or wastewater containing infective eggs. *Ascaris* eggs can survive for months or years in favourable conditions. Children are most at risk of being infected while playing in soil contaminated with human faeces. Similarly to ascariasis, trichuriasis is caused by ingestion of infectious eggs of the whipworm *Trichuris trichuria*.

HOOKWORM infections result from the ingestion or skin penetration of the hookworm larvae (*Ancylostoma duodenale* or *Necator americanus*), which are found in soil.

The larvae develop in soil through the deposit of faeces containing eggs from infected persons. The ingested larvae are carried in the bloodstream from the lungs to the small intestine where they attach to the intestinal wall. As they mature into adult worms, they digest quantities of blood and cause further losses

by lacerating the mucosa. Hookworm is a particular issue in countries where appropriate footwear is not commonly worn or available. This exposes the feet to untreated faecal matter as well as to the parasites which can enter via this route. The resulting infections can cause severe pain which leads to mobility problems and significant impact on the lives of those who remain untreated. Research on disease transmission suggests that intestinal nematode infections can be prevented by adequate water, sanitation and hygiene.³⁷ For example, a study of over 1800 children in Brazil found that sewerage and drainage infrastructure could significantly reduce transmission and re-infection.³⁸ This suggests that long-term strategies incorporating education on personal hygiene, provision of improved sanitation and access to safe water are fundamental strategies to tackle the disease. A recent systematic review, also found the use of sanitation is associated with significant protection against hookworm infection.³⁹ Similarly, other studies have shown an increased risk of ascariasis is associated with being exposed to untreated wastewater,⁴⁰ open defecation⁴¹ and no hand-washing with soap.⁴² For instance, in their review of the literature, Esrey et al. (1991) found that water supply and sanitation improvements can reduce the prevalence of ascariasis by a median of 28% and hookworm infection by a median of 4%.



SCHISTOSOMIASIS

Schistosomiasis is a chronic disease caused by nematode worms of the genus *Schistosoma*. The disease transmission occurs when the larval form of the parasite, which is released by freshwater snails, penetrates people's skin while they are in infected water.

In the human body, the larvae develop into adult schistosomes, which live in the blood vessels where the females release eggs. Some of the eggs are passed out of the body in the faeces or urine to continue the parasite life-cycle. Others become trapped in body tissues, causing immune reactions and progressive damage to organs.⁴³

In children, schistosomiasis can cause anaemia, physical weakness and consequently reduce their ability to learn, although these negative impacts can be reversed with appropriate treatment. Chronic schistosomiasis may result in death. In sub-Saharan Africa, more than 200,000 deaths per year are caused by the disease.⁴⁴ Access to

improved sanitation plays a fundamental role in preventing schistosomiasis. This is reinforced by appropriate hygiene behaviour, which discourages bad hygiene habits, urinating and defecating in the open and contact with contaminated water. A study in 1991 by academics Esrey et al. also found that decreases in infection rates related to improved access to water and sanitation varied between 59% and 87%.



TRACHOMA

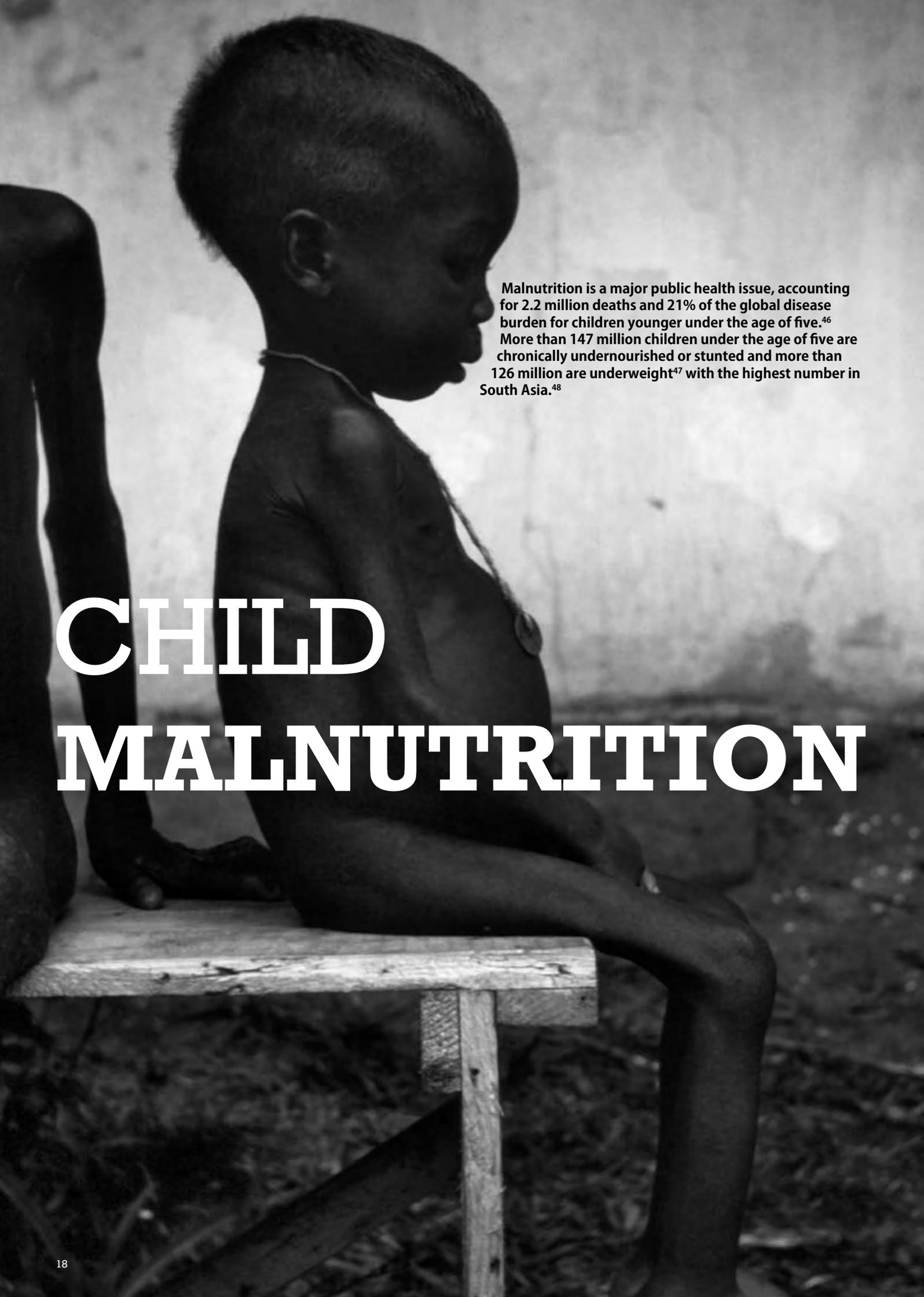
Trachoma is a chronic conjunctivitis caused by the bacterium *Chlamydia trachomatis*. It is one of the world's leading causes of preventable blindness, having affected an estimated 6 million people.⁴⁵

Infection usually occurs in childhood, with children showing prevalence rates of 60-90%. The disease takes years to progress as repeated infections cause scarring on the inside of the eyelid. The scarring eventually causes the eyelashes to turn in, causing rubbing on the cornea at the front of the eye. As a result, the cornea becomes scarred

leading to severe vision loss and eventually blindness.

A trial conducted by Emerson et al. in 2004 demonstrated that simple sanitation intervention, such as of provision of pit latrines, is effective in preventing trachoma infection, as it prevents open defecation and scattered faeces, which is the main breeding site of the trachoma fly vector *Musca sorbens*. Other recommended interventions include increased face washing among children at risk of disease, and improved environmental hygiene through disposal of waste.





Malnutrition is a major public health issue, accounting for 2.2 million deaths and 21% of the global disease burden for children younger under the age of five.⁴⁶ More than 147 million children under the age of five are chronically undernourished or stunted and more than 126 million are underweight⁴⁷ with the highest number in South Asia.⁴⁸

CHILD MALNUTRITION



Many factors are reported to contribute to child malnutrition, most of which relate to poor dietary intake and severe and repeated bouts of diarrhoea. These factors, in turns, are closely associated with poor water, sanitation and hygiene conditions.⁴⁹ Several studies have demonstrated that diarrhoeal infections have a negative impact on children's nutritional status, decreasing food and direct nutrient intake, which in turn have implications for tissue synthesis and growth.⁵⁰ Several studies on child development have also demonstrated that those affected by diarrhoea during early childhood tend to be shorter than children who never had diarrhoea, and that improvements in sanitation are linked to height increases among children.⁵¹ Similarly, early childhood helminthic infections have been associated with a further height reduction of 4.6 cm by the age of 7.⁵² More recently, a 2009 study advanced the hypothesis of an association between child undernutrition and tropical enteropathy, a disease of the small intestine caused by sustained ingestion of faecal bacteria by young children.⁵³

As diarrhoea causes undernutrition, it also reduces a child's resistance to subsequent infections creating a vicious circle (See Figure 12).

Figure 12: The malnutrition-infection vicious circle



Source: Brown, 2003

Poor nutritional status may increase the frequency and severity of infections, such as diarrhoea and acute lower respiratory infection.⁵⁴ A child's susceptibility to infection is heightened by undernutrition because of its negative impact on the barrier protection afforded by the skin and mucous membranes, and by reducing the child's immunity.⁵⁵ Among malnourished children, diarrhoea has been reported to cause severe dehydration due to loss of water and minerals. Malnutrition also impacts the duration and recovery time of many infections.⁵⁶

CONCLUSION AND WAY FORWARD

This overview of the sanitation crisis and the related burden of disease in developing countries shows that interventions in the water, sanitation and hygiene sector are the most effective ways to address morbidity and mortality, however its importance in developing countries is overseen.

Tackling the sanitation crisis involves an equitable distribution of the interventions to various geographical areas and to segments of the population who are most in need. In addition, progressive sanitation interventions must take into account issues of sustainability and ownership of the systems implemented. The long-term effects of poor sanitation on the development opportunities of populations living in developing countries should also be clearly assessed to design appropriate intervention and advocacy strategies. These are daunting tasks, which require a great deal of support not only from the recipients of the interventions, but also from local and national governments and the international community overall.

A concerted effort to tackle sanitation and to make it a priority in the political agendas of both developing and developed countries is necessary. Particularly, the following recommendations are provided for relevant parties:

ALL:

- Recognise the importance of sanitation in improving human health and prioritise sanitation in development strategies.
- Through public private partnerships, business, governments and NGOs can maximize collective efforts and resources to improve access to basic sanitation

NATIONAL GOVERNMENTS:

- Prioritise the achievement of sustainable sanitation access.
- Ensure equitable allocation of resources to reach the poorest of the poor and the most vulnerable segment of the population.

INTERNATIONAL DONORS:

- Prioritise and financially support collaborative efforts to achieve universal improved sanitation. Increase equitable investments to high need areas and population segments.
- Adapt sector targeting approaches based on rigorous scientific research on sanitation and hygiene.

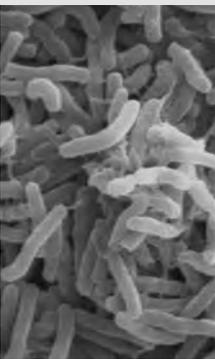
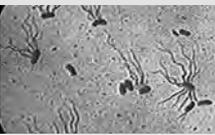
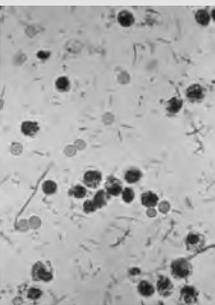
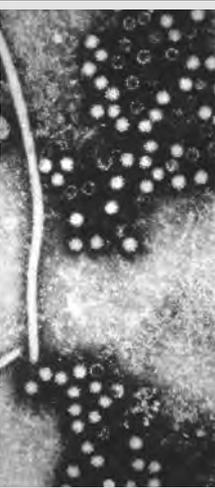
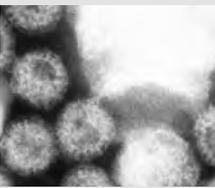
PRIVATE SECTOR:

- Alternative advocacy channels should be leveraged to increase awareness of the sanitation crisis.
- Businesses with the scale, resource and vested interest should address a global crisis of this nature. By doing so they will create and meet new demand for products that protect communities from disease causing germs.
- Rigorous research should be used to justify and develop sustainable sanitation business models, which use local resources ethically.

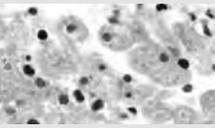


SANITATION BURDEN OF DISEASE LIST*

This table presents an overview of the main diseases linked to unimproved water sanitation and hygiene.

Disease	Category	Transmission mechanism	Pathogens	
	Cholera	Faecal – oral disease	Waterborne	Bacterium <i>Vibrio cholerae</i>
	Typhoid	Faecal – oral Disease	Ingestion of food or drink contaminated by the faeces or urine of infected people.	Bacterium <i>Salmonella typhi</i>
	Bacillary dysentery / Shigellosis	Faecal – oral Disease	<ul style="list-style-type: none"> • Ingestion of contaminated water and food. • Person-to-person contact. • Transmission via house flies. 	Bacterium <i>Shigella</i>
	E. coli diarrhoea	Faecal Oral	Ingestion of contaminated water	Bacterium <i>E. coli</i>
	Hepatitis A and E	Faecal – oral Disease	<p>The hepatitis A virus:</p> <ul style="list-style-type: none"> • Ingestion of contaminated food and water, • Direct contact with an infectious person. <p>The hepatitis E virus:</p> <ul style="list-style-type: none"> • Ingestion of contaminated drinking water • Ingestion of products derived from infected animals • Transfusion of infected blood products; • Vertical transmission from a pregnant woman to foetus 	Viruses
	Rotavirus	Faecal oral	<ul style="list-style-type: none"> • Person-to-person contact • Airborne droplets • Contact with contaminated toys 	Virus

Symptoms	Morbidity / Mortality	Subjects at risk
<ul style="list-style-type: none"> • Profuse watery diarrhoea and vomiting. • Severe dehydration. <p>About 75% of people infected with V. cholerae do not develop any symptoms, although the bacteria are present in their faeces for 7–14 days after infection and are shed back into the environment, potentially infecting other people. However, in other cases it can kill within hours.</p>	<p>3–5 million cholera cases and 100,000–120,000 deaths every year.</p>	<ul style="list-style-type: none"> • People living peri-urban slums, where basic infrastructures are not available. • Displaced people or refugees living in camps where minimum requirements of clean water and sanitation are not met. • People with low immunity – such as malnourished children or people living with HIV. <p>Epidemics have never arisen from dead bodies.</p>
<ul style="list-style-type: none"> • Fever, headache, insomnia, constipation, diarrhoea, abdominal pain and tenderness. 	<p>Morbidity: 17 million cases worldwide</p>	
<p>Watery diarrhoea with intestinal cramps and general malaise, soon followed by permanent emission of bloody, mucoid stools.</p>	<p>Morbidity: 120 million cases of dysentery with blood and mucus in the stools.</p> <p>Mortality: About 1.1 million people estimated to die from Shigella infection each year, with 60% of the deaths occurring in children under 5 years of age.</p>	<ul style="list-style-type: none"> • Poor populations living in crowded settings where hygiene is poor and sanitation non-existent • Children under the age of 5.
<p>Acute watery diarrhoea with or without blood</p>		
<p>Although infection is frequent in children, the disease is mostly asymptomatic or causes a very mild illness.</p> <p>Symptomatic infections most common in adults aged 15–40 years. Typical symptoms include:</p> <ul style="list-style-type: none"> • Jaundice (yellow discoloration of the skin and sclera of the eyes, dark urine and pale stools) • Anorexia (loss of appetite) • Enlarged, tender liver • Abdominal pain and tenderness • Nausea and vomiting • Fever 	<p>Hep. A Morbidity: 1.4 million cases of hepatitis A every year.</p> <p>Hep. E: Morbidity: 20 million cases of hepatitis E infections yearly. Mortality: 70 000 hepatitis E-related deaths.</p>	<ul style="list-style-type: none"> • Children with very poor sanitary conditions and hygienic practices, most children (90%) have been infected with the hepatitis A virus before the age of 10 years childhood.
<ul style="list-style-type: none"> • Diarrhoea without blood • Nausea • Vomiting • Abdominal pain • Dehydration 	<p>Mortality: 453,000 child deaths occurred during 2008 due to rotavirus infection</p>	<p>Virtually all children are infected by the time they reach 2 to 3 years of age. Poor children and low birth weight infants have an increased risk.</p>

	Disease	Category	Transmission mechanism	Pathogens
	Amoebic dysentery (Amoebiasis)	Faecal oral	Contact with contaminated hands or objects	Protozoa
	Giardiasis	Faecal oral	Ingestion of contaminated consumables Zoonotic (transmitted from animal to animal)	Protozoa <i>Giardia lamblia</i>
	Roundworms / Ascariasis	Soil transmitted helminths	Transmitted by eggs present in human faeces, which contaminate the soil in areas where sanitation is poor.	Helminths
	Whipworms Trichuriasis	Soil transmitted helminths	Faecal-oral • Eggs located on vegetables are ingested when the vegetables are not carefully cooked, washed or peeled. • Eggs are ingested from contaminated water sources. • Eggs are ingested by children, who play in soil.	Nematode worm <i>Trichuris trichiura</i>
	Hookworms	Soil transmitted helminths	Skin penetration (or larvae ingestion)	Parasitic worms <i>Ancylostoma duodenale</i> and <i>Necator americanus</i>
	Schistosomiasis	Water-based helminths	Water contamination	Parasitic worms
	Guinea worm	Water-based worm	Drinking contaminated water containing water fleas carrying the guinea worm larvae	Parasitic worm <i>Dracunculus medinensis</i> or "Guinea-worm"
	Filariasis	Faeces-related insect vector	Poor sanitation (insect breed or feed in sites of poor sanitation)	Filarial worms, <i>Wuchereria bancrofti</i> , <i>Brugia malayi</i> or <i>B. timori</i> .
	Trachoma	Strictly water washed	Transmitted through contact with eye discharge from the infected person (on towels, handkerchiefs, fingers, etc.) and by eye-seeking flies.	Bacterium <i>Chlamydia trachomatis</i>

Symptoms	Morbidity / Mortality	Subjects at risk
<ul style="list-style-type: none"> • Diarrhoea with blood and mucus • Abdominal pain • Fever 	Mortality: 40,000 - 100,000 people annually	
<ul style="list-style-type: none"> • Nausea • Flatulence • Epigastric pain • Abdominal cramps • Diarrhoea • Large stools 		<ul style="list-style-type: none"> • Health care workers. • People eating improperly treated food or drink. • People who have contact with individuals already infected.
<p>People with light infections usually have no symptoms.</p> <p>Heavier infections can cause:</p> <ul style="list-style-type: none"> • Diarrhoea and abdominal pain • General malaise and weakness • Impaired cognitive and physical development 	More than 1.5 billion people are infected with soil-transmitted helminth infections worldwide	
<ul style="list-style-type: none"> • Diarrhoea and abdominal pain • Anaemia in most severe cases 	Morbidity: 500 million people yearly. Children aged 5 to 14 years are particularly vulnerable.	Children aged 5 to 14 years are particularly vulnerable.
<ul style="list-style-type: none"> • Abdominal pain • Anaemia which becomes severe in the absence of treatment 	900 million people worldwide are infected Mortality: 50,000 deaths annually	Anyone walking bare feet in a contaminated ground.
<ul style="list-style-type: none"> • Abdominal pain • Diarrhoea • Blood in stools or urine • Liver enlargement in advanced cases • Kidney damage in advanced cases 	Morbidity: 200 million people yearly worldwide Mortality: 10,000 deaths every year, mainly in sub-Saharan Africa.	<ul style="list-style-type: none"> • Fishing and farming populations in areas where there are poor water and sanitation conditions. • Women doing domestic chores in infested water. • Children playing in the fields or with soil.
<p>Emergence of the worm is accompanied by:</p> <ul style="list-style-type: none"> • Swelling • Burning sensation • Blistering • Ulceration of the area from which the worm emerges 	Total morbidity in 2011: 1058 case Guinea-worm disease is rarely fatal.	People working in the field and children are the most at risk.
<p>Elephantiasis (painful, disfiguring swelling of the legs and genital organs) is a classic sign of late-stage disease.</p>	120 million people are currently infected	
<ul style="list-style-type: none"> • Chronic inflammation • Scarring • Visual impairment • Blindness 	Trachoma affects about 21.4 million people of whom about 2.2 million are visually impaired and 1.2 million are blind.	<ul style="list-style-type: none"> • Children are the main reservoir of infection. • It also strikes women, who generally spend a greater time in close contact with small children.

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