Abstract
The Millennium Development Goal on Environmental Sustainability defines halving the proportion of the population without access to safe drinking water and basic sanitation by 2015. In addition to being an independent target that the international community is working towards, access to safe drinking water and basic sanitation is instrumental in achieving all other Millennium Development Goals. Ensuring safe drinking water and adequate sanitation will control the spread of disease, decrease mortality, increase productivity, reduce poverty and build gender equality. Currently, women and girls are disproportionately affected by lack of access to clean water and basic sanitation. The purpose of this report is to further explore the aforementioned issues and to discuss the importance and likelihood of reaching this Millennium Development Goal by 2015 based on existing realities and current trends.

Drinking Water, Sanitation, and Hygiene: The issues and their effects on health and gender

1. Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) illustrates that ill health is a main cause and consequence of poverty. Ill health contributes to poverty by destroying livelihoods, reducing worker productivity, lowering educational achievement and limiting opportunities. Because poverty leads to diminished access to medical care, increased exposure to environmental risks, and malnutrition...sick people are more likely to become poor and the poor are more vulnerable to disease and disability (2004, para. 3). Therefore, to decrease poverty one must focus on preventing ill health (among other causes of poverty). One of the causes of ill health is the lack of access to drinking water and adequate sanitation. “Almost 900 million people lack access to safe drinking water and 2.5 billion, 40% of the world's population, have no access to improved sanitation” stated the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) (as cited in Bozena, 2009, p. 1). According to UNESCO, it is a human right to have access to drinking water and adequate sanitation. The World Health Organization (WHO) defines access to water as varying “according to location, but [averaging] 20 litres per person per day within one kilometer’s walking distance from the household” (Inter-Agency Task Force on Gender and Water, 2004, p. 5). As part of the Millennium Development Goals (MDGs), the United Nations aims to halve the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015 (The Millennium, 2009, p. 45). In order to achieve this UNESCO outlines a system of availability, accessibility, and acceptability of drinking water and adequate sanitation. (2004, para. 4).

When drinking water is available, it is not always easily accessible, either because it is not affordable, or because there is a lack of information available on how to access the resource. Even when the population knows how to access the resource, it may be geographically difficult to get to or to transport. In addition, one faces the challenge of providing drinking water that is of good quality. The JMP describes the basic framework for these solutions in their report on the progress of improving access to drinking water and sanitation. Through its definition of acceptability, UNICEF also emphasizes that in providing solutions one should be respectful of medical ethics and cultural values (2004, para. 6).

This paper will assess where the developing world is at in providing adequate sanitation and safe drinking water for its populations using the sanitation and drinking water ladder laid out by the JMP. Then, the report will assess the diseases which are attributable to poor water and

sanitation facilities and the lack of education surrounding hygiene. From there, this report will analyze the effects that these issues have on women and children, particularly girls, in school.

2. Assessment of MDG regions sanitation targets

The JMP assesses the global, regional, and country-specific progress using the "sanitation ladder". There are four steps on the sanitation ladder:

- open defecation
- unimprove sanitation facilities
- shared sanitation facilities
- improved sanitation facilities (WHO/UNICEF, 2008, p. 6)

Open defecation

The first rung of the sanitation ladder describes open defecation as populations that practice:

- open defecation in open spaces
- disposal of human faeces with solid waste (WHO/UNICEF, 2008, p. 6)

According to the JMP, 18% of the world's population and 23% of developing countries practice open defecation. This practice is the highest in Southern Asia followed by Sub-Saharan Africa. The gap between Southern Asia and the rest of the regions that practice open defecation is quite significant as illustrated in Figure 1.

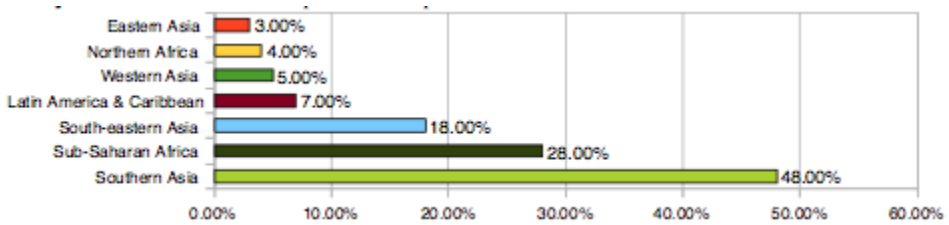

Figure 1 Graph of populations of MDG regions practising open defecation in 2006. Adapted from *Progress on drinking water And sanitation: Special focus on sanitation*, by WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 7.

Open defecation is practiced the most in rural populations as opposed to urban populations. The JMP estimates that "nearly one third of the world's rural population practices open defecation." Sixty-three per cent of Southern Asia's rural population and fifteen per cent of their urban population practice open defecation. Thirty nine percent of Sub-Saharan Africa's rural and eight percent of its urban population practices open defecation (as illustrated in Figure 2) (WHO/UNICEF, 2008, p. 18).

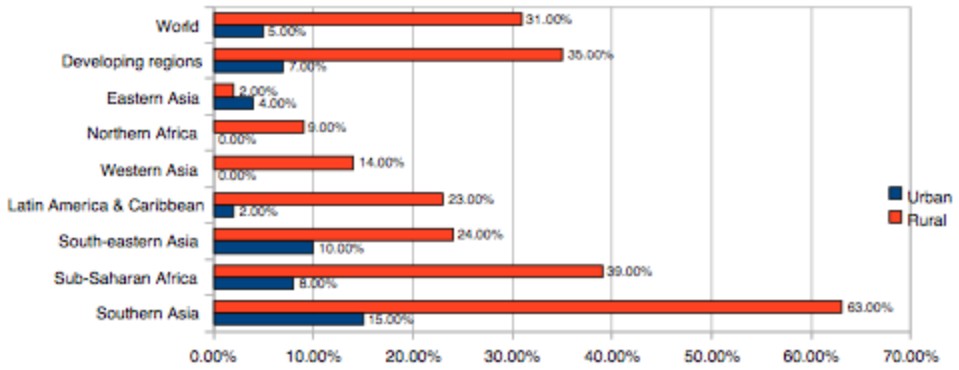

Figure 2 Proportion of urban and rural populations practising open defecation, by region in 2006**.** Adapted from *Progress on drinking water And sanitation: special focus on sanitation*, by WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 18. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

As illustrated in Figure 2 and Figure 3, statistics on open defecation show a large gap exists between the proportions of rural and urban dwellers practicing it (eastern Asia being the exception). Out of the 1.2 billion people still practicing open defecation, 13% of them are urban dwellers (as illustrated in Figure 3).

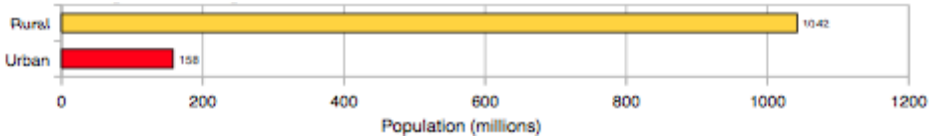

Figure 3 Number of people practising open defecation, by urban and rural areas in 2006. Adapted from *Progress on drinking water And sanitation: special focus on sanitation*, by WHO/ UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 19. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

Despite efforts to provide improved sanitation facilities in Southern Asia, the proportion of populations that practice open defecation as a whole has risen by 20 percent in the last 15 years because of significant growth in these populations (WHO/UNICEF, 2008, p. 18). Although Southern Asia has increased its practice of open defecation overall since 1990, there also are countries in Southern Asia which have experienced significant decreases. Between 1990 and 2006, Nepal's open defecation practice dropped by 34% to 50%. Within the same period, Lao People's Democratic Republic decreased its practice by 30% to 46%, and Thailand decreased its practice from 18% to 0% (WHO?UNICEF, 2008, p.19). These decreases are significant considering that 83% of the 1.2 billion people who practice open defecation live in 13 countries, with India having the highest number of people practicing it (as illustrated in Figure 4).

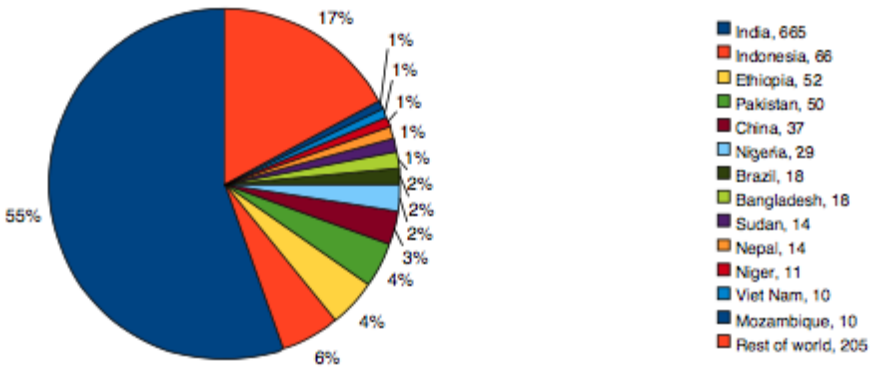

Figure 4 Population practising open defecation, by countries with highest prevalence in 2006 (millions). Adapted from *Progress on drinking water And sanitation: special focus on sanitation*, by WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 19.

Unimproved sanitation facilities

The JMP defines unimproved sanitation facilities as "facilities that do not ensure hygienic separation of human excreta from human contact" (WHO/UNICEF, 2008, p. 16). These facilities include:

- pit latrines without a slab or platform
- hanging and bucket latrines
- improved facilities that lack adequate disposal like pour-flush toilets that discharge directly into open drain, ditches or other bodies of water (WHO/UNICEF, 2008, p. 16).

The report by the WHO and UNICEF emphasizes that the users of unimproved sanitation facilities are a critical audience for health promotion activities because existing facilities can be upgraded to improve sanitation (WHO/UNICEF, 2008, p. 16). These facilities are most common in rural areas. According to WHO/UNICEF Joint Monitoring Program, "use of unimproved sanitation facilities is four times higher in rural than in urban areas" (WHO/UNICEF, 2008, p. 16)

2.3 Shared sanitation

The JMP report defines shared sanitation facilities as sanitation facilities that are acceptable (leaving out unimproved shared sanitation facilities) and are "shared between two or more households, including public toilets" (WHO/UNICEF, 2008, p. 14). The reason shared facilities are not defined as improved sanitation is because of the lack of research done on whether many of these facilities ensure hygienic separation of human excrement from human contact. The perception is that they, especially the public facilities, fail to ensure this separation. Also, there has been concern expressed about the public facilities' accessibility during the day and security at night.

The practice of shared sanitation facilities is most common among urban dwellers. In eastern Asia, 92% of the shared facility users were urban dwellers, and every third urban dweller in Sub-Saharan Africa used a shared sanitation facility. This could become a serious problem if

the urban populations continue to grow at the rate they are growing without an increase to the sanitation options available in these cities (WHO/UNICEF, 2008, p. 15).

2.4 Improved sanitation

The JMP defines improved sanitation facilities as facilities that ensure hygienic separation of human excreta from human contact. They include:

- Flush or pour-flush toilet/latrine to:
  - piped sewer system
  - septic tank
  - pit latrine
- Ventilated improved pit latrine
- Pit latrine with slab
- Composting toilet (UNICEF/WHO, 2008, p. 12).

Over 2.5 billion people don't have access to improved sanitation. As illustrated in Figure 2.4a, 22% live in sub-Saharan Africa and 70% live in Asia, with Southern Asia having the largest population without improved sanitation.

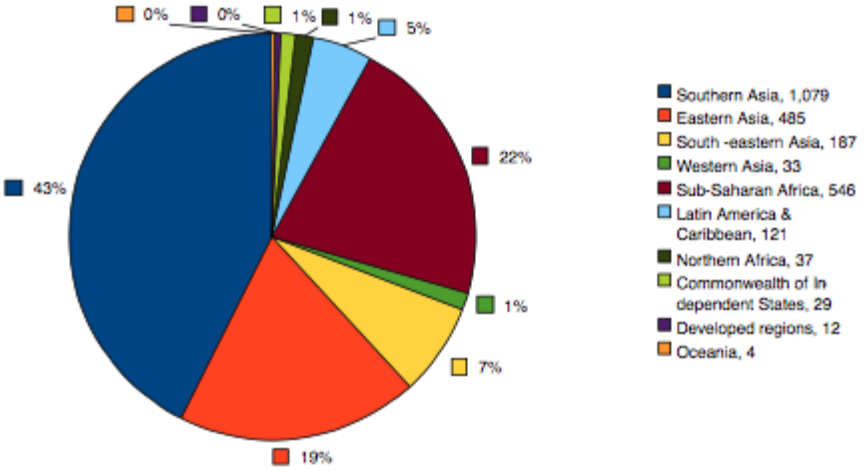

Figure 5 Population without improved sanitation, by region in 2006 (millions)**.** Adapted from *Progress on drinking water And sanitation: special focus on sanitation*, by WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 13.

This data may cause one to conclude that the greatest need for improved sanitation is in Southern Asia. However, upon taking a closer look at individual countries within these regions, it becomes apparent that countries which have the lowest access to improved sanitation are in Africa. As illustrated in Figure 6, the ten countries with the lowest improved sanitation are all in Africa with Eritrea being the lowest at 5% (WHO/UNICEF, 2008, p. 13).

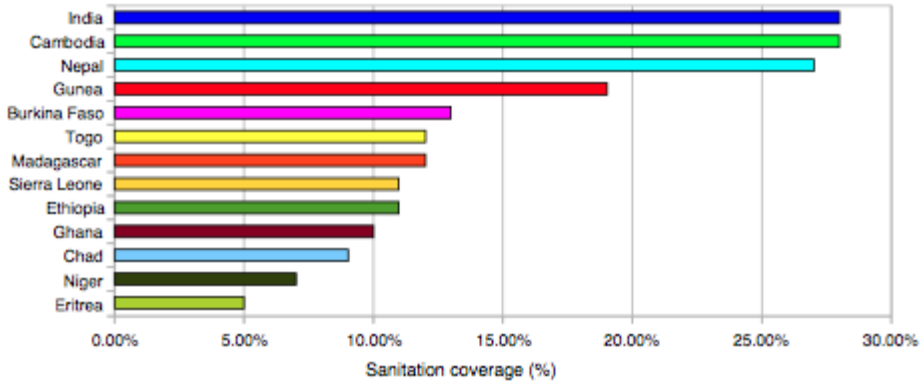

Figure 6 Proportion of population in countries that have improved sanitation. Adapted from *Progress on drinking water and sanitation: Special focus on sanitation*, by WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 13. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

2.5 Conclusion of sanitation assessment

"Overall between 1990 and 2006, the proportion of people without improved sanitation [decreased] by...8 percentage points" (WHO/UNICEF, 2008, p.8). As illustrated in Figure 7, the world will have to increase its progress significantly to reach the 2015 targets. On average, at least 173 million people per year will need to begin using improved sanitation facilities (WHO/ UNICEF, 2008, p.8).

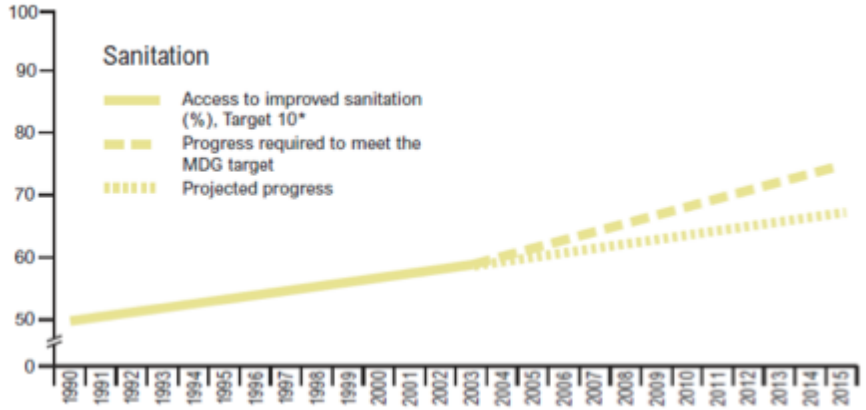

Figure 7 Missing the target: Global progress toward the MDGs. As adapted from, *In the public interest: Health, education, and water and sanitation for all* by Emmett, B., 2006, p. 21. Copyright 2008 by Oxfam International. Reprinted with permission.

3. Assessment of MDG regions' drinking water supply

JMP's (2008) three step drinking water ladder includes:

- unimproved drinking water sources
- improved drinking water sources, other than piped water
- improved drinking water sources (WHO/UNICEF, p. 22)

3.1 Unimproved drinking sources

Unimproved sources of drinking water include:

- unprotected dug wells
- unprotected springs
- cart with small tank/drum
- bottled water1
- tanker truck
- surface water (river, dam, lake, pond, stream, canal, irrigation channels)

The JMP estimated that, in 2006, 884 million (13%) of the global population was reliant on unimproved drinking water sources with Sub-Saharan Africa having the largest population reliance at 323 million (As illustrated in Figure 8).

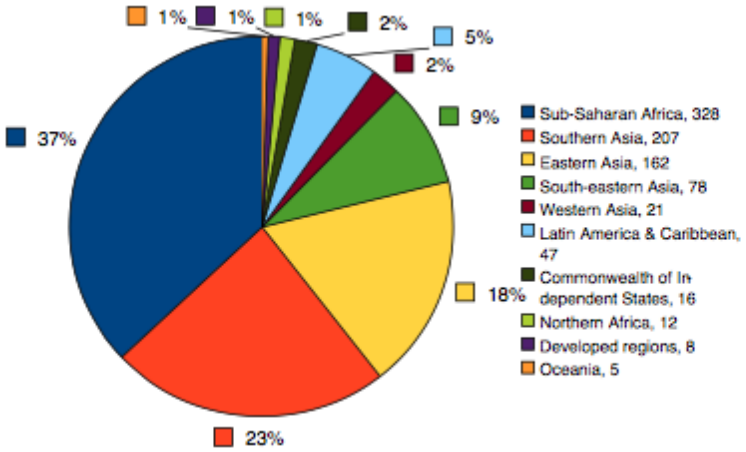

Figure 8 Population using an unimproved drinking water source by region in 2006 (millions). Adapted from *Progress on drinking water And sanitation: special focus on sanitation*, by WHO/ UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 30. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

When compared to all the other regions in Figure 8, Oceania may look like it is doing well but this figure represents 51% of Oceania's total population. Furthermore, between 1990 and 2006, Oceania was the only region that experienced an increase in reliance on unimproved drinking water sources, going from 50% to 51% (WHO/UNICEF, 2008, p. 24). It is the only developed region not on track in reaching its drinking water targets.

The majority of the populations represented in Figure 3.1a are comprised of rural inhabitants, 84% or 746 million, compared to 137 million urban residents. Although the urban residents have very little comparative reliance on unimproved drinking water sources, they may find it more challenging if populations continue to grow at the rates they have been. "The world's urban population has risen by 956 million people" since 1990 (WHO/UNICEF, 2008, pp. 23, 26). In some African and Asian countries, this has created difficulties in providing drinking water to

more residents.

3.2 Other improved sources of drinking water

According to JMP (2008), other improved sources include "sources of water likely to be protected from outside contamination, particularly faecal matter, but excluding piped connections into dwelling, plot or yard." (WHO/UNICEF, p. 29). These include:

- public taps or standpipes
- tube wells or boreholes
- protected dug wells
- protected springs
- rainwater collection (WHO/UNICEF, 2008, p. 29).
-

According to the JMP, the proportion of the world that relies on other improved drinking water sources is 33% with the highest reliance being Southern Asia, at 65%, followed by sub-Saharan Africa, at 42%. Although the difference between urban dwellers' reliance and rural dwellers' reliance on other unimproved sources is smaller compared to the difference in their reliance on the unimproved sources discussed in Section 3.1 of this report, "rural dwellers are more than twice as likely to rely on other improved sources of drinking water" with the largest gap existing in southern Asia and the smallest in Eastern Asia (WHO/UNICEF, 2008, pp. 23, 29).

3.3 Improved drinking water sources

Improved drinking water sources include:

- Piped connections into a dwelling, plot or yard (piped water on premises) (WHO/UNICEF, 2008, p. 28)

Worldwide, 54% use piped drinking water. However, more than twice as many urban dwellers, 2.5 billion, have access to piped drinking water compared to the number of rural inhabitants, 1.1 billion. These disparities are highest in Latin America and Sub-Saharan Africa (WHO/UNICEF, 2008, p. 27).

3.4 Conclusion of drinking water assessment

Even with these disparities, the JMP predicts that with the current trends "more than 90 per cent of the global population will use improved drinking water sources by 2015" (WHO/UNICEF, 2008, p. 24). Global population use of improved drinking water sources rose from 77% in 1990 to 87% in 2006. All regions reported gains except for Oceania who slipped back from 51% in 1990 to 50%. Sub-Saharan Africa is progressing the slowest, and critical attention must be given to this region's targets because a third of those using unimproved drinking water sources live there. Progress toward meeting targets has been the highest in Eastern Asia, which increased its coverage by 20%, and as illustrated in Figure 9, shows high improved drinking source use in most areas (WHO/UNICEF, 2008, p. 24).

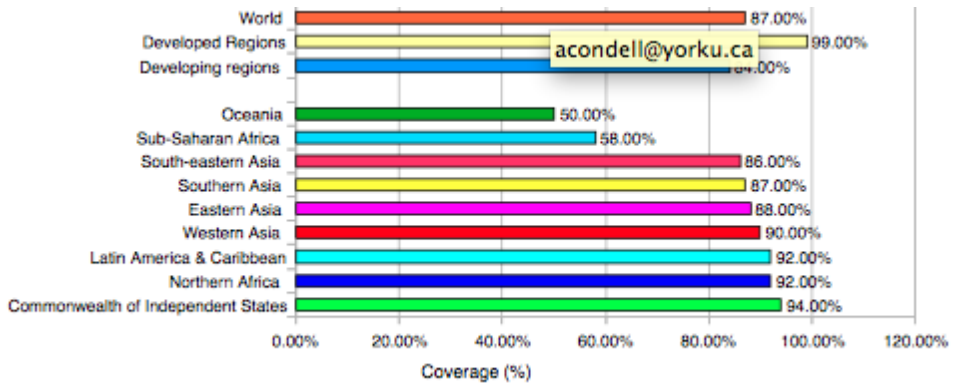

Figure 9 Improved drinking water coverage, by region in 2006. Adapted from *Progress on drinking water And sanitation: special focus on sanitation, by* WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2008, p. 24. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

Every region but Sub-Saharan Africa and Oceania is on track to meet its MDG water targets (WHO/UNICEF, 2008, p. 25). The JMP has reported that, overall, the world is on track to meet its drinking water targets (WHO/UNICEF, 2008, p. 24). However, to stay on track in the future the world will have to increase its coverage, particularly in Sub-Saharan Africa and Oceania (as illustrated in Figure 10).

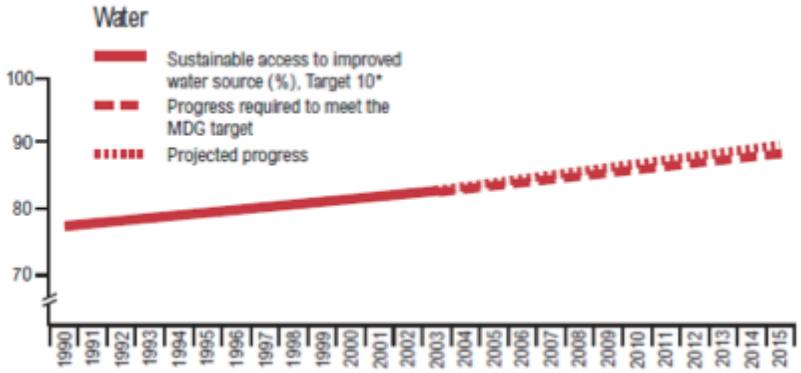

Figure 10 Missing the target: global progress toward the MDGs. Adapted from, *In the public interest: Health, education, and water and sanitation for all* by Emmett, B., 2006, p.21. Copyright 2008 by Oxfam International. Reprinted with permission.

4. Effects of inadequate sanitation facilities, unimproved sources of drinking water and poor hygiene

All of the information that has been described provides a basic overview of how well each MDG region is providing improved sanitation and clean drinking water. In evaluating where need is most urgent, one has to examine why it is so important to come up with solutions.

Diseases

"Almost one tenth of the global disease burden, mainly in developing countries, could be prevented by water, sanitation and hygiene interventions" (Prüss- Üstün et al., 2008,

p. 56). Out of the global disease burden attributed to poor drinking water, sanitation, hygiene (WSH), diarrhea makes up the largest percentage (as illustrated in Figure 11).

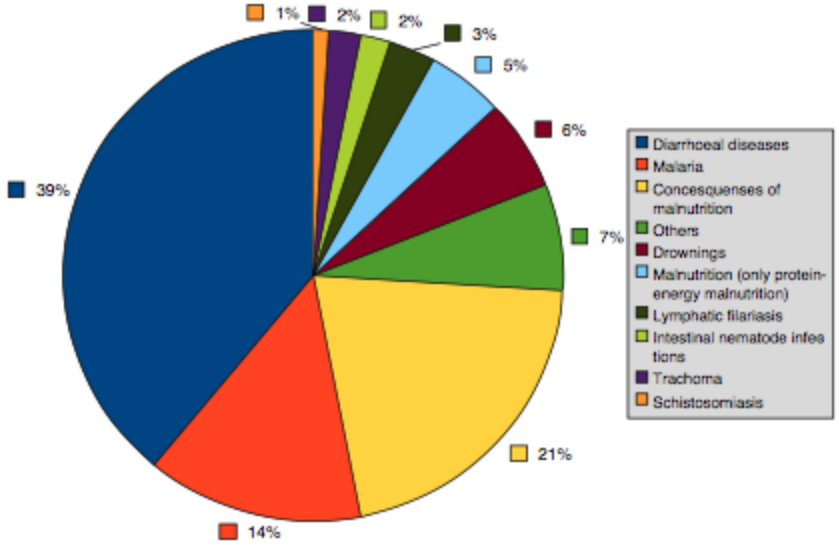

Figure 11 Diseases Contributing to to Unsafe WSH Related Disease Burden in DALYs (2008). Malaria, Lymphatic filariasis, and drownings are beyond the scope of this paper. Adapted from *Safer water, better health-Costs, benefits and sustainability of interventions to protect and promote health,* by Prüss-Üstün, A., Bos, R., Gore, F. & Bartram, J., 2008, p. 11. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

The burden of disease is caused by a risk factor. According to MedTerms medical dictionary, a risk factor is, “something that increases a person's chances of developing a disease” (Risk factor, 2009). In this case, the risk factor would be poor WSH. In estimating the burden of disease, a counterfactual (or baseline) is first determined. The counterfactual of unsanitary WSH is contrary to existing realities or facts. It is defined in Prüss-Üstün et al.'s (2007) report as an “ideally regulated and best practice treatment of water supply; full treatment or isolation of excreta/sewage; and optimal personal hygiene practices” (p. 3). This means a water supply and environment devoid of pathogens, complete prevention of the transmission of faecal-oral pathogens, and elimination of contact with harmful levels of water-born chemicals through these pathways (Prüss-Üstün et al. 2007, p.3). If this was a true scenario then there would be no burden of disease from WSH. In other words, the burden of disease “is the burden that would be avoided if the risk factors were reduced to the counterfactual exposure” (Prüss-Üstün et al., 2007, p. 3). The burden of disease is measured in Disability-Adjusted Life Years (DALY) which can be thought of as lost years of “healthy” life. The sum of these DALYs are a “measurement of the gap between current health status and an ideal health situation” (Global Burden, 2009), the ideal health situation being the counterfactual of poor WSH.

WSH include some guidelines laid out by Prüss-Üstün et al. (2008) in their report for the WHO. They include:

- a *medium* that can serve to transmit pathogens and toxic chemicals (drinking-water);
- *services* (drinking-water, sanitation, [and] solid waste management...) that contribute to disease

- prevention, and conversely, the lack of which increases the risk of several diseases
- *behaviours* such as, for example, personal and domestic hygiene (p. 15)

These guidelines outline what makes poor WSH a risk factor. The diseases that are associated with this risk factor are:

- Infectious diarrhea
- Malnutrition and consequences of malnutrition on most infectious diseases
- Intestinal nematode infections (ascariasis trichuriasis, hookworm disease, other)
- Schistosomiais
- Trachoma (Prüss-Üstün, 2007, p. 3)

Diarrhea

"Eighty-eight per cent of cases of [diarrhea] worldwide are attributable to unsafe water, inadequate sanitation or insufficient hygiene" (Prüss-Üstün et al., 2008, p. 7). These cases are most prevalent in children, with an estimated 2.5 billion cases appearing among children under five years of age and 1.5 million of these cases leading to death each year (UNICEF/WHO, 2009, p. 5). Africa and South Asia, which have more than half of the 2.5 billion cases, are most likely to experience the worst bouts resulting in death or other severe outcomes (UNICEF/WHO, 2009, p. 5).

The UNICEF and WHO report on diarrhea (2009) explains that this disease is caused by pathogens, and the way most of these pathogens are transmitted is from the stool of one person to the mouth of another (p. 9). Diarrhea, along with many other faecal-oral diseases, can be transmitted through many different routes (as illustrated in Figure 12).

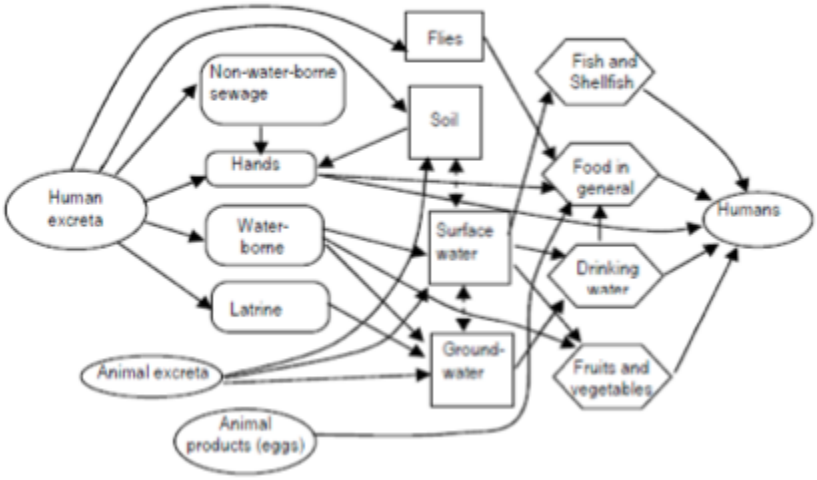

Figure 12 Transmission pathways of faecal-oral diseases. Adapted from *Water, sanitation and hygiene: Quantifying the health impact at national and local levels in countries with incomplete water supply and sanitation coverage* by Prüss-Üstün, A., Bos, R., Gore, F., Bartram, J., & Fewtrell, L., 2007, p. 9. Copyright © WHO and UNICEF Joint Monitoring Programme. All rights reserved.

The most common cause of diarrhea is ingestion of the pathogens through unsafe drinking-water, contaminated food and from unclean hands (Prüss-Üstün et al, 2007, p.7).

To prevent the transmission of diarrhea, it is important to create sanitation facilities where there is no contact between humans and faecal matter. According to Jamison (2006), "[i] mproving sanitation facilities has been associated with an estimated median reduction in diarrhea incidence of 36 per cent across reviewed studies" (as cited in UNICEF/WHO, 2009, p. 11). However, to reduce the spread of diarrhea significantly, the use of improved sanitation must be provided to all community members, otherwise, the disease still has human excreta as an access point to all the different paths outlined in Figure 12 (UNICEF/WHO, 2009, p. 11). Fewtrell, et al. reported that another important barrier to transmission is the washing of one's hands with soap, which reduces by 40% the incidences of diarrheal disease (as cited in UNICEF/WHO, 2009, p. 12). According to Jamison, washing one's hands is one of the most cost-effective barriers to transmission, but Curtis and Cairncross reported that it is restricted by the amount of water that the community has access to and the type of water source in the community (as cited in UNICEF/WHO, 2009, p. 12). It has also been shown that lack of improved drinking water sources results in a reduction of personal hygiene practice (UNICEF/ WHO, 2009, p. 20). Even if the community has access to an improved water source, many must still travel long distances to fetch water which decreases the amount collected (UNICEF/WHO, 2009, p. 12).

Diarrhea is the second highest cause of death among children, with pneumonia being the first (UNICEF/WHO, 2009, p. 5). Diarrhea not only leads to higher mortality rates, but in a community where there is no access to treatment, it can lead to malnutrition as well. Malnutrition can make the victim more susceptible to other diseases and can decrease chances of recovery from the diarrheal disease (Prüss-Üstün et al, 2009, 7).

Malnutrition

As illustrated in Figure 13, poor WSH causes intestinal infections which, in turn, cause malnutrition and make the body more susceptible to a variety of other infectious and respiratory diseases.

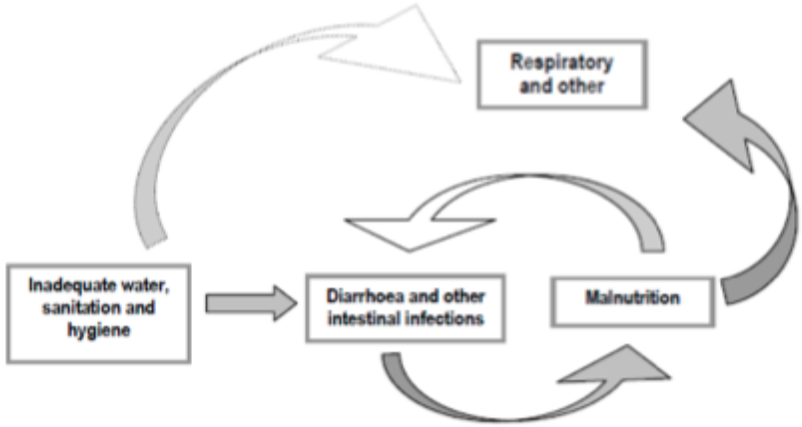

Figure 13 Main pathways linking WSH to malnutrition (2007). Adapted from *Water, sanitation*

and hygiene: Quantifying the health impact at national and local levels in countries with incomplete water supply and sanitation coverage, by Prüss-Üstün, A., Bos, R., Gore, F., Bartram, J., & Fewtrell, L., 2007, p. 21.

Children of every age are at risk for malnutrition, but underweight malnutrition is the most prevalent in children under five years of age. As illustrated in Figure 13, malnutrition is both a risk factor and a health outcome for infections, and it leads to a cycle that creates more severe malnutrition. It can lead to diarrhea, malaria and measles which have the most severe consequences in children (Prüss-Üstün et al., 2007, pp. 21, 22). Prüss-Üstün et al. (2008) estimate that "50% of...underweight…malnutrition is associated with repeated diarrhea or intestinal nematode infections as a result of unsafe [and inadequate WSH]" (p. 7). Children who are underweight are more susceptible to all infectious diseases and have a lower chance of full recovery. These indirect effects and the direct effects of malnutrition resulting from poor WSH are responsible for 860 000 deaths per year in children under five years of age (Prüss-Üstün et al., 2008, p. 7).

C. Intestinal nematode infections

Intestinal nematode infections include ascariasis, trichuriasis and hookworm. These infections affect 2 billion or one third of the world's population. They are contracted through soil contamination from faeces. There are treatments for these infections, but Prüss-Üstün et al. (2007) report studies of the treatments indicate rates of reinfection are relatively high (p. 20). Instead, Prüss-Üstün et al. (2007) identify long term prevention strategies for WSH as the most effective means to sustainably reduce the disease because "the burden [of disease] caused by intestinal nematode infections is...entirely attributable to inadequate sanitation facilities and related lack of hygiene" (Prüss-Üstün et al., 2008, p. 8). Therefore, 100% of intestinal nematode infections can be completely prevented through hygienic practices and adequate sanitation (Prüss-Üstün et al., 2007, p. 20).

D. Schistosomiasis

Schistosomiasis is a parasite that is transmitted through water. The parasite's eggs come into the environment through an infected human's faeces or urine. These eggs will hatch in water, but water isn't the right environment for them to continue their life cycle (Prüss-Üstün, et al., 2007, p 8). Therefore, the parasites penetrate a snail host in which they can then multiply. Each day, parasites reproduce and emerge into the water in search of a human or animal host (Kogulan, & Lucey, 2007). Humans that come into contact with the contaminated water become infected. Therefore, unsafe water, inadequate sanitation and insufficient hygiene are responsible for these infections. Prüss-Üstün, et al. (2008) estimate that 200 million people have this infection which could be decreased significantly through, not only snail population control, but most importantly, through safe water and adequate sanitation facilities (p. 8).

E. Trachoma

Trachoma is a bacterial infection of the eye which is contagious and can result in blindness (Prüss-Üstün, et al., 2007, p. 24; Trachoma, 2009). This disease has exclusively hygiene-related risk factors which include a large population of flies, deficient supply of latrines, poor facial cleanliness, and insufficient access to water (Prüss-Üstün, et al., 2007, p. 24). Five million people's visual impairments from trachoma could have been prevented by addressing these risk factors. This disease is almost fully preventable just by providing safe WSH (Prüss-Üstün, et al., 2008, p. 8).

When providing clean drinking water, it is important one takes into consideration the entire population that is affected by it. One needs to cover all individuals when providing these services; otherwise, the diseases will still have a pathway of transmission. With an increase in people contracting these diseases, there is more of a demand for care for these victims and the task of providing care goes to the women of these communities. This isn't the only way that women are disproportionately affected by poor WSH compared to men; in fact, women are the sole transporters of water and proponents of hygiene for the household which means that they are the most affected by WSH practices.

5. Gender roles in water and sanitation

Until 1977, many organizations overlooked the unequal effects that poor WSH had on women compared to men. This became globally recognized at the United Nations Water Conference in 1977 (Interagency Task Force on Gender and Water, 2004, p. 4). Since then, it has become a greater issue as western society has recognized women's roles and responsibilities in managing and collecting water for the household. Therefore, availability, accessibility, and acceptability of WSH should be focused mostly on the women and girls in these communities.

Water sources are usually miles away in many rural communities so the person who has the responsibility of fetching water has to walk for a couple of hours each day performing this duty. In this case, it is the women and girls who do this. Not only do the women and girls have the responsibility of fetching water, but they are also responsible for the household water supply, sanitation, and health management. This water that is carried back is used for "food production and preparation, care of domestic animals, personal hygiene, care of the sick, cleaning, washing and waste disposal" (Interagency Task Force on Gender and Water, 2006, p. 1). Because these responsibilities demand so much time, women have little to no time to pursue an education and higher income generation. It is also harder for them to find time to create and maintain a sanitation facility within the household.

When looking at the data on women's responsibilities related to WSH, one can understand why they are the most affected and therefore the most important contributors to furthering these MDG goals. The results from the Johannesburg Summit Fact Sheet (2002) estimate that in the developing world, women walked an average of six kilometres a day to collect water, carrying up to 15 to 20 litres (as cited in International Child Development Programme, 2002, p. 2). Carrying this heavy of a load back to the household consumes a lot of energy, and the WHO reported that physical damage to the back and neck can occur as well (AquaFed, 2007, p. 2; as cited in WaterAid, 2006, p. 1). According to the National Wildlife Association, to carry out the task of getting water, one third of women in Egypt walk more than one hour a day, and in other parts of Africa, women walk up to eight hours a day (as cited in International Child Development Programme, 2002, p. 2). When faced with poor quality water and water shortages, these responsibilities put an unfair burden on women and their children. When the main source of water in a rural community is contaminated or scarce, it is the women and girls that have to spend more time and energy locating and carrying water that they regard as safe. Being the primary caretakers, Women give their time to care for those who become ill because of contamination (International Child Development Programme, 2002, p. 2).

Safety is another problem for women. In many cultures, like some in Ethiopia, community members would defecate in the woods if they didn't have a latrine. Women were particularly discouraged from "defecating or urinating where they could be seen during the day, and they

would usually have to wait until night to relieve themselves" (Emerson & Rotondo, 2009, p. 24). Not only are women in danger of gastric disorder from waiting until dark, but they are risking their safety because of increased likelihood of sexual harassment and assault (this can lead to an increase in STIs) (Interagency Task Force on Gender and Water, 2004, p. 8;UNICEF, 2008, para, 8; Emerson & Rotondo, 2009, p. 24).

Because women bear most of the burden of poor WSH, providing physically accessible clean water will give women and girls the time and opportunity to pursue an education or a job and to participate in projects that improve WSH services. Creating equitable access to water will empower women while addressing the causes of gender inequality and poverty. However, less than 2% of the world's private land is owned by women. In many countries, and particularly those in Latin America, land ownership often entitles an individual access to water. This makes it important to "accord to women recognition as land holders and contributors to the development process." (Interagency of Task Force on Gender and Water, 2006, p. 4).

Including women in creating and implementing projects that address WSH will not only benefit women and girls in these communities but will also benefit the WSH-focused projects themselves. A 1993 International Water and Sanitation Center (IRC) study on 121 World Bank financed projects showed that those projects which had the full participation of women were more sustainable and effective than projects which did not (Wijk-Sijbesma, 1998, p. 85). These results can be attributed to the focus being on women, who play a central role in household management, but also, to the contributions of women's knowledge.

Women are very knowledgeable about the location, quality, and storage methods of water resources because of their responsibilities. This helps them contribute to these projects in ways that others in the community can't. The end result will be more efficient and culturally applicable projects in terms of assessments and proposed solutions to a community's contaminated resources. Also, these projects will be more efficient at creating more reliable WSH sources that are closer to, or a part of, each household. Creating adequate WSH sources can result in changes to the gender divisions in labour because women have more time to devote to income-generating activities, better food preparation, and participation in community decision making. It will also release many girls from domestic tasks and enable them to go to school. By positioning WSH sources closer to households, women and girls benefit from greater self-esteem, better school attendance and less harrassment (Interagency Task Force on Gender and Water, 2004, p. 4).

6. The situations in schools

According to UN-Water (2008), if sanitation goals were met, 200 million days of school attendance would be gained annually (p. 1). The Center for Global Development (CGD) reported that education gives people the skills to improve their health because they are "better prepared to prevent disease and to use health services effectively" (Center for Global Development, 2006, p. 1). Education also has been shown to increase wages and economic growth, and it supports the growth of democracy and political stability (Center for Global Development, 2006, p. 1). Having a basic education, one also has more of an opportunity to achieve a higher education. The Task Force on Higher Education and Society states that higher education is important to development because it promotes income growth, enlightened leaders, expanding choices, and increasingly relevant skills (Task Force, 2000, p. 92). Education is a major force in creating a developed nation; therefore, those who are not able to attend and achieve this education will find it increasingly difficult to push out of the

cycle of poverty. Unfortunately, in communities with poor WSH, many community members are not able to attend school. Especially for girls, the quality of education is affected because of diseases attributable to poor WSH.

Because of the unequal burden girls face when they live in areas with poor WSH, 1 in 4 girls compared to 1 in 7 boys do not complete primary school (UN-Water, 2008, p. 1). As discussed earlier, diseases attributed to poor WSH contribute to preventing children from attending school, the largest contributor being diarrheal diseases. In fact, the WHO reported that if "everyone in the world had access to a regulated piped water supply and sewage connection in their houses, 1863 million days of school attendance would be gained due to less diarrhoeal illness" (Adams, 2009, p. 2). The fact that girls have to shoulder most of the burden when living in poor WSH communities leads to decreased enrolment by girls who are taking care of the sick.

When creating a project to provide sanitation facilities for schools, it is imperative to thoughtfully consider the needs of both genders. Plan Togo, an international organization, learned this the hard way. They created and implemented a project with the goal of increasing access to water and sanitation facilities in schools in the region of Est-Mono. Unfortunately, they failed to take the gender perspective into account and the facilities eventually stopped being used. One of the most serious oversights in this project was that they didn't include separate latrines for girls (Alouka, in press, p. 1). According to the World Bank, lack of school sanitation facilities designated exclusively for girls will often discourage parents from letting their daughters attend school out of concern for their privacy and modesty (Interagency Task Force on Gender and Water, 2004, p. 6).

This becomes more of an issue when girls are menstruating. Knowing that there are no appropriate sanitary facilities, water, or sanitary towels can make it very awkward and difficult for girls to attend school. According to Irura (2008), "students and female teachers may feign sickness during their menses to avoid going to school altogether" (p. 5). Irura reports that the average girl would miss about 52 days in a year (almost 2 months) due to her menstrual cycle. This creates a great need for separate and improved sanitation facilities for the genders. Also, according to a study done in Bangladesh, without adequate toilet facilities, girls have no privacy to change or dispose of their cloths (cheaper alternative to tampons); therefore, most girls return home during the day to change them (Seymour, n.d., p. 3). This creates disruptions in the school day which add up to many hours of school missed each month. The lack of private facilities to change the cloths along with lack of clean water to wash these cloths in school makes girls more susceptible to infections that affect their sexual and reproductive health (Icura, 2008, p. 5). According to the Division for the Advancement of Women, "one in ten school-age African girls [does] not attend school during menstruation, or [drops] out at puberty because of the lack of clean and private sanitation facilities" (2005, p. 12).

Many organizations have recognized these problems and are implementing gender and privacy oriented facilities in schools. This has been shown to increase school attendance. Another school sanitation study done in Bangladesh showed that a project helped boost girls' school attendance on average by 11% per year from 1992 to 1999 because it installed separate facilities for boys and girls (as cited in Interagency Task Force on Gender and Water, 2004, p. 9). The results of a similar project in Mozambique were that participation in schools increased for girls, "child-to-child sanitation clubs" were formed, hygiene promotion spread to the larger community, and more children, particularly girls, remained in school past puberty (Mozambique, DRINKING WATER, SANITATION, AND HYGIENE n.d.). These positive results are being

shown by more studies as projects engage communities in creating gender oriented solutions that address needs more equitably.

7. Conclusion

So much work has and is being done by governments, the civil sector, the academic sector, corporations and multilateral organizations in cutting in half the proportion of the population without sustainable access to safe drinking water and basic sanitation by 2015 as laid out in the MDG goals. In 1999, in India, the Total Sanitation Campaign was started. In the Lao People's Democratic Republic, a policy was adopted requiring latrines and a clean water supply be put in all newly constructed schools. The national policy for the development of basic hygiene education was adopted by the Burkina Faso government in 2004. The Mozambique government now has a program addressing water, sanitation and hygiene promotion issues (Water, sanitation, 2005, p. 32.) There are many more programmes, policies, and projects addressing these issues. The effects of poor WSH span over many of the issues addressed in the MDG goals. As outlined in this report, creating and maintaining adequate WSH will decrease prevalence of diseases (including HIV and AIDS), ensure environmental stability (through disposal of feces), decrease child mortality, promote gender equality, empower women, and increase education levels including quality of education of communities. Also, creating and maintaining adequate WSH will improve maternal health. As the end result, it will significantly lower poverty and contribute to reaching the MDG by 2015.