



The sanitary situation and its health effects on women exposed to occupational heat in Chennai, India

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Abstract

The purpose of this study was to see how lack of toilets along with occupational heat affects health and prosperous. It is based on interviews made on women and men working in the surroundings of Chennai, India, with and without access to toilets, that all are affected by occupational heat. Questions about their perception of how their health is affected by working in heat are asked. There are also questions about how their work is affected by their toilet situation. Some of the interviewees have access to shadow and to toilets and some do not have any access to these facilities. Totally 72 people have been interviewed, 58 women and 14 men. 50 of them had access to toilets and 22 did not. All of the interviewees are affected by the heat and some of them have diseases that indicates on health problems caused by no or limited access to toilets. The workers with no access to toilets are the group that have most health problems and are also the group that go for urination and defecation least. The workers with access to toilets are the group that have least health problems and go to the toilet most. Men with no access to toilets go more often than women with no toilets and are more similar with the group with access to toilets. This report is a minor field study, funded by SIDA, and made in collaboration with Sri Ramachandra University, India.

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1. Introduction

Lack of toilet is a major problem in India where around 50% of the inhabitants do not have access to a toilet or similar for urination and defecation. This people relieve outside on fields or rivers, which contaminate the water that they are drinking. Especially for women this is a problem, as they have to go early in the morning and late in the evening under cover of darkness. Being abused or attacked by animals happens when the women go for relieving in the darkness. This also leads to health problems such as urinal tract infection, as they have to hold it for longer than convenient. The climate change makes this problem even bigger as the temperature will rise and droughts and floods become more average and the access to water will decrease

2 Overall aim

The aim is to assess the health situation of working women in Chennai and if it is affected by their sanitary situation. The aim is to see whether women are more affected by the sanitary situation. Both men and women will be interviewed to see if there are any differences between the genders. The significance of sanitation in this text does not include locations for laundry, showers or other things where focus is on keeping clean, but only toilets or other places for urination and defecation.

2.1 Research Questions

To gain information about how the heat affects the women at their work these questions will be answered:

- What is the perception of heat at work?
- Which health problems do they report; what causes, including heat, do they report?

To gain information about the sanitary situation in the working places these questions will be answered:

- What access do they have to sanitary equipment in their working places?
- How many times per day do the people in the studied working places, use the toilet, and where?

To gain information about the correlation between heat-related health issues and the sanitary situation these questions will be answered:

- Do the health problems get more severe because of the sanitary situation?
- Does reduced frequency of access to toilets change their drinking habits during work?

To see if there is a gender difference these questions will be answered:

- Does the working situation differ between the genders?
- Does the sanitary situation differ between the genders?

To gain information about a solution to the situation these questions will be answered:

- Do the interviewees perceive that there are too few toilets in their working area?

Is there a difference between the men and the women's perception?

3 Background

3.1 Climate Change

Carbon dioxide is one of the main gases around the earth. If the earth would not be surrounded by gas the temperature would be much lower. If the gases increase it will lead to a higher temperature. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005 because of an increase of industries and traffic. The concentration growth rate was larger during the last 10 years than it has been since the beginning of continuous direct atmospheric measurements (Alley et al.

2007). The atmospheric concentration of carbon dioxides has increased by more than 30% since pre-industrial times. Both the average temperature and the global average sea level have risen. 1850 was the average temperature -0.5°C (Alley et al. 2007). Now, 150 years later, the average temperature is around 0.5°C and it has been less frequent with cold days, cold nights and frost (Alley et al. 2007, NASA). The minimum daily temperature has tended to rise faster than maximum daily temperatures and the day-night difference has thus decreased remarkably in most places. This has resulted in an increase in frequency of very warm days and nights and a decrease in the frequency of very cold days and nights (Watson et al. 1997). Droughts have been observed and are now longer and more intense. It is likely that the temperature will rise and it will be fewer cold days and nights over most land areas and hot days and nights will be more frequent. Hot extremes, heat waves and heavy precipitation events are very likely to become more frequent. Beyond this the population that will be affected by these weather events, will also increase (Field et al. 2012). It is more liable that this is by anthropogenic forcing than not (Alley et al. 2007). The trends in Asia are consistent with global trends (Watson et al. 1997)

One cannot see differences between each year but it is clear that the temperature is rising during a long-term period. Since 1981, the 20 warmest years have happened and 10 of them all happened after 2000 (NCDC 2011). This includes an increased frequency of heat waves and hot days, which may lead to health effects of no preventive interventions (O'Neill 2003).

3.1.1 Impacts

The climate change is mainly caused by people from high-income countries, as they are using more of the earth's resources. They have higher energy consumption, which cause major environmental problems. Poor people consume less and does therefore effect the environment and cause the climate change less, but they are more vulnerable to negative impacts of climate change. Already lots of work has to be done to change the situation for poor people but in the context of climate change this will be an even major problem. Today 10 million children die each year, 800 million people go to bed hungry and 1500 million people do not have access to clean water (Costello et al. 2009). It is likely that this will rise even more, the more the climate change, as it will be more difficult to grow crops and the weather will be more doubtful with droughts and storms. It will also be easier for diseases to spread with a warmer climate as the climate change will cause more floods, heat waves and storms where coastal cities and towns will be most vulnerable. The frequency of extreme climate together with reduced water and food security will rise and this will affect the public health of billions of people (Costello et al. 2009, Parry et al. 2007, WHO 2012:2). Major health risks will remain unless the undeveloped world share in the growth and development experienced by the more developed parts of the world (Patty et al. 2007).

Global climate change has a major impact on the health. Heat-related illnesses and deaths such as hyperthermia (heat stress) might be more likely as the temperatures are likely to rise. Changes in climate may have implications for occupational health and safety and can lead to death or chronic ill health from after-effects of heatstroke. The work groups that are most at risk for heatstroke include constructors and agricultural workers and even if acclimatised the risk is not eliminated (Parry et al. 2007). It may also cause changing patterns of infectious diseases, which may cause health problems for many people. Because of the climate change there will be rising sea levels which increases the risk of coastal flooding and that can cause injury and death, and increases the risks for infections from water and vector-born diseases (WHO 2012:2). Therefore it is vital to keep the water clean (McMichael 2003). These effects are dependent on factors such as the effectiveness of a community's public health and safety systems. The temperature is normally higher in urban areas than rural areas and the climate change may raise the temperatures even more. For this air condition is to prefer but will be more difficult for poor people and increased use of electricity increases human CO_2 emissions (EPA 2012).

3.2 Heat stress

One of the most direct health effects occurring from global change is an increased rate of mortality and morbidity associated with exposure to high ambient temperatures and this is already a burden for many countries (Githeko et al. 2003, Hajat et al. 2010). Adapting to heat is difficult as it is dependent on the body's ability to act as a natural cooling system comparing to adapting to cold weather, where wearing warmer clothes solves the problem. Symptoms of heat illness are an indication that the physiological systems of the body may be struggling to meet the demands of thermoregulation. For the body to work properly it needs a constant core body temperature and must therefore continually lose heat to the surrounding environment at the same rate as heat is produced (Hunt 2011). The body eliminates heat through sweat production, increased cardiac output and redirection of blood flow to the skin. When the temperature is as high as the body temperature the body's primary way to cool down is to sweat. If the body is dehydrated the sweating is reduced. Dehydration also affects the blood flow to the skin during sweating. When acclimatised to the heat the body produces more sweat to keep the body cool which requires you to drink more (Hunt 2011). Drinking enough is vital to protect the vital organs in the body (Popkin et al. 2010). Heat can lead to heat strokes, which can lead to mortality if it is not helped (Hajat et al. 2010, EPA 2012). If this mainly is a problem for frail people is still investigated. The most commonly provided heat-protection advice to the general public is, among others, to wear light weight loose fitting clothing, seek out an air-conditioned or cool environment, avoid physical activities, avoid going out during the hottest part of the day and, one of the most important things, drink regularly (Hajat et al. 2010). Air condition also makes the indoor air less polluted (O'Neill 2003). This advice might be complicated for certain groups, especially in low-income countries where the access to air-condition is uncommon. It may also be difficult to reduce physical activities and avoid going out during the hottest part of the day as people with low income are forced to work long days to get the income that is needed. To drink regularly might be a major problem for people in low-income countries where the access to clean water may be reduced. In India only around 50% of the population have access to a toilet or private place to urinate or defecate. This can make people hold it during long periods and therefore avoid drinking even though they feel thirsty.

Most people are comfortable when the air temperature is between 20°C and 27°C and a relative humidity between 35 and 60%. If it is higher than this, people feel uncomfortable and the body has to adjust and manage the heat. If the climate is a lot higher than that, the body's coping mechanism can be overwhelmed and lead to serious and fatal conditions (CCOHS 2008). When the air temperature is higher than the body temperature, conduction and convection will act to transfer heat from the air to the body as the thermal gradient has been reversed (Hunt 2011). The body try to keep a constant body temperature by pumping more blood to the skin and increase the sweat production, in this way the heat burden and the heat loss is balanced. If the environment is very hot this balance does not work and the heat gain is bigger than the heat loss (CCOHS 2008).

The first effects of heat are subjective and relate to how one feel. If the exposure gains, physical problems can appear and make one less efficient and cause adverse health effects. It may also cause more incidents and disturbed water and electrolyte balance (CCOHS 2008). It requires more work for the body, to keep down the bodily temperature. The heart needs to pump more blood to keep the blood to the outer body parts and skin. This imposes additional demands on the body. This is worse for women as they are generally less heat tolerant than men (CCOHS 2008).

It is more difficult to adapt to heat if one is over-weighted or if one is older than 45 years old. It also worsens it, if the general health is poor and the level of fitness is low (EPA 2012, Hunt 2011). The major risk group are poor people as they more often have health problems and no access to facilities that will keep down the temperature (EPA 2012). Illnesses caused by heat exposure include heat cramps, which are sharp pains in the muscles; heat exhaustion that is

caused by loss of body water and salt through sweating and the symptoms includes weakness, nausea, fatigue and headache (CCOHS 2008, Hunt 2011). Heat stroke, where the body temperature is more than 40.6°C caused by environmental heat exposure, and hyperpyrexia, that is similar to heat stroke but with higher body temperature, are the most serious types of heat illnesses. For this immediate first aid and medical attention is needed (CCOHS 2008). In extreme cases this can even cause death. High body temperature cause damage cells in the liver, kidneys and skeletal muscles, and death is often a result from multiple organ system failure (COOHS 2008, Hunt 2011)

3.3 Heat-related diseases

A higher temperature may also increase the risk for water-borne diseases such as cholera and various diarrhoeal diseases as the water become warmer and food-borne diseases such as salmonella and other bacteria-related food poisoning as the bacteria's can grow more rapidly in warm environments (EPA 2012, Githeko 2003, Parry et al. 2007).

Reliable access to clean water and good sanitary conditions are essential for good health and public health infrastructure is the key to economic, social and industrial development. The access to water may decrease, caused by higher temperatures and unreliable weather. If the sanitation is bad the available water will be contaminated and the access will decrease even more (Costello et al. 2009). As droughts and flooding's will be more common due to the climate change the access to water will also be changed. The hydrological cycle will be intensified with more evaporation and more precipitation, but that will be unequally distributed around the globe and some parts of the world may see major reductions in precipitation, or major alternations in the timing of wet and dry seasons (Arnell 1999). The access to water may also be reduced as pollutions, that are well interconnected with climate change, may reduce useable drinking water. One third of the world is now living in countries that experience moderate to high water stress. With a growing population this may increase and year 2025 as much as two thirds of a much larger population can be under water stress (Arnell 1999).

3.4 Toilets

Basic sanitation is essential to prevent the spread of waterborne diseases and also essential for the respect, dignity and safety of individuals (Petersson et al. 2008). It is also a key to empower women (Hesselbarth 2005). Now, around 2,5 billion people in the world do not have access to basic sanitation (Berntell 2005, Colopy 2012, Peterson 2008, Prasad 2012, Rahman 2010, Scott 2003), which is around 35% of the world.

In India 626 million people do practice open defecation and has more than twice the number of the next 18 countries combined (WHO 2012:1). India stands for 90 per cent of the 692 million people in South Asia who practice open defecation, even though many of these countries have lower, per capita gross domestic product (Colopy 2012, Menon 2003, Saluja 2012, Water for all 2009). Because of lack of sanitation facilities people are forced to practice open defecation, which often is practiced in rivers or near areas where children are playing or food are prepared and that increases the risk of transmitting diseases, such as diarrhoea, worms, cholera, typhoid, hepatitis A and bladder infections that is some of the diseases that are transmitted through water contaminated by human waste (Ashbolt et al. 2012, Conant 2005, Sayre 2013, WHO 2011, WHO 2012:2) and

Table 1: Number of people doing open defecation in the 12 countries where open defecation is most common (WHO 2012:1)

	Country	Number of open defecation
1	India	626 million
2	Indonesia	63 million
3	Pakistan	40 million
4	Ethiopia	38 million
5	Nigeria	34 million
6	Sudan	19 million
7	Nepal	15 million
8	China	14 million
9	Niger	12 million
10	Burkina Faso	9,7 million
11	Mozambique	9,5 million
12	Cambodia	8,6 million

you can see a strong relationship between diarrhoeal death rates and lack of sustainable access to sanitation measures, mainly from a variety of dysentery-like ailments that result from ingesting human fecal, and it is very difficult to avoid ingesting human waste without

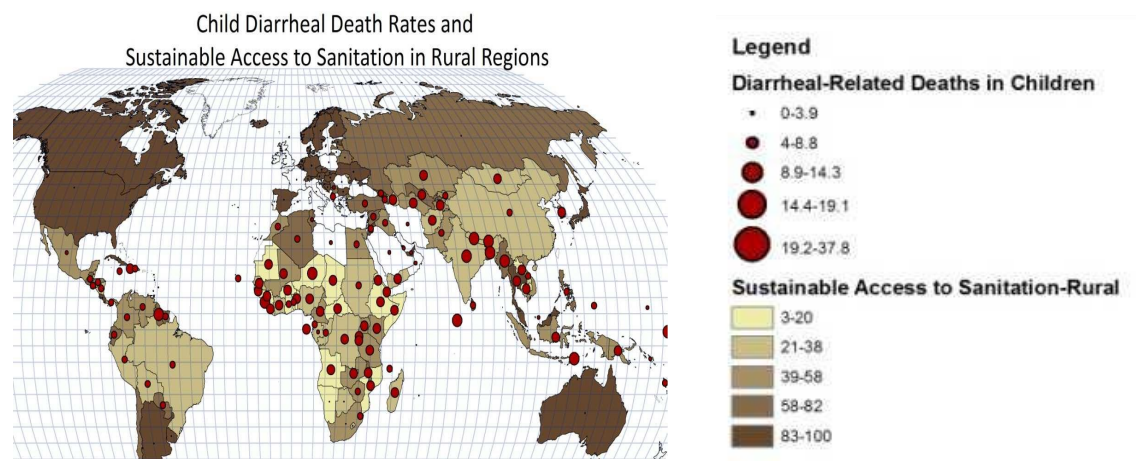


Figure 1. Diarrhoeal death rates among children and sustainable sanitation

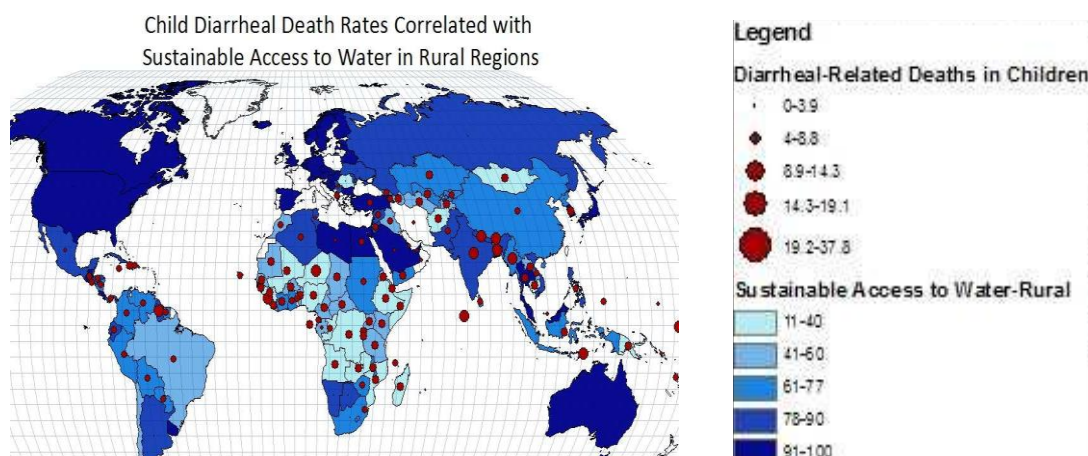


Figure 2. Child diarrhoeal death rates correlated with sustainable access to water

toilets as it either enters the food and water supplies or it spread by flies and dust (Berntell 2005, Mercola 2010). Open defecation is one of the major causes of disease anywhere in the world as feces proved a good breeding ground for lots of parasites and flies, and are because of that very easily spread (Wherever the need 2007). There is also a correlation between lack of access to proper drinking water and diarrhoeal diseases and you can see that most countries that do not have access to proper toilets, do not either have access to proper drinking water (Figure 1 & Figure 2) (Peterson et al. 2008). In India, though, more people have access to proper drinking water even though their toilet situation is not good. This may be because of the technology that is used to clean the water and make it more suitable for drinking (Prasad 2012). Only focusing on clean drinking water will therefore not change the complete sanitary situation (UNU-INWEH 2010). When defecated water causes diarrhoea it can lead to death within 48 hours after the initial symptoms. These are extreme cases but it happens, especially in countries with overcrowding and poor sanitary such as India (Ashbolt et al. 2012).

Only among children in the world, more than 2 million die each year from diarrhoea, which is more than all children that dies from AIDS and malaria together, mainly in poor and undeveloped countries. Children from sub-Saharan Africa are five hundred times more likely to die from diarrhoeal disease than a baby from the developed world (WHO 2005). Improving the sanitary situation is thus vital in undeveloped countries, as it will improve the health and well being for the most vulnerable groups (UNU-INWEH 2010). It is also far more people that suffer from poor sanitation and water supply than by war, terrorism and weapons (Bartram et al. 2005). If suffering from diarrhoea multiple episodes it has been shown results in malnutrition and in *“permanent shortfalls in physical and cognitive development, with decrements of up to 8 cm in growth, 10 intelligent quotient points, and 12 months of schooling”* (Berntell 2005, Peterson et al. 2008). In India around 100 000 tons of human excrement is left, every day, in the fields of food and river banks that are used for drinking and bathing (Gale 2009) and only in the Ganges river, India, 1,1 million litres of raw sewage is dumped into it every minute. One gram of faeces may contain 10 million viruses, one million bacteria, 1000 parasite cyst and 100 worm eggs. If the sanitation would be improved deaths caused by diarrhoea would be reduced by a third (Chaih et al. 2008, WHO 2011, WHO 2012:1). Therefore faecal pollution of water is one of the most important and difficult challenges, as so many people are involved (Ashbolt et al. 2012). The group that are most affected by bad sanitation are people living in the slums or in rural areas, and that is mainly poor people. If the sanitary situation would be better, these people would be able to contribute to overall economic and social development (Scott 2003). In these areas the income is very low and it does not seem natural to make a building for a toilet. Where there are toilets there are often unsanitary bucket latrines, which require scavengers to take care of, and at this moment 700 000 Indians make their living in this way. In rural areas where they have better access to toilets the excrements do still need to be developed as it is emptied without regard for the environment and health considerations (Water for all 2009). In slums the situation is one of the worst as they are living many people in small areas and the access to toilets are limited (Menon 2003). Few city governments in India have invested much in extending provision for sanitations to the slums (Burra et al. 2003). One reason for this may be the lack of funds but it is also common that money given for constructing toilets have not been spent for that (Burra et al. 2003). Even when toilets are built they are not used properly as the toilet blocks are in disrepair already after 3 months, and people thus use the surrounding area to defecate in the open and this gives a huge health burden, especially for infants and children (Burra et al. 2003).

Unsafe disposal of human excreta facilitates the transmission of oral-faecal diseases, including diarrhoea and lots of worm infections. Because of the poor sanitation, India is loosing billions of dollars each year, as illnesses are costly for families. It does also lead to an economy loss in terms of productivity losses and expenditures on medicines, health care and funerals. It also affects the welfare impacts such as reduced school attendance and lack of privacy and security for women. Using the excrements more efficient may, on the other hand, lead to significant economic benefits when it, for example, can be used as biogas as an energy source or as fertilizers after taking care of germs that can be harmful (Conant 2005, Water for all 2009). The Indian Government is well aware of these effects and has sanctioned projects in all of India's rural districts, building about 57 million individual household sanitary latrines. This is still far away from enough, as 119 million units are needed. Every US\$1 that is invested to improve the sanitation would give US\$9 back.

To improve the health clean drinking water, sanitation and a clean environment are vital (Government of India 2007). According to the country's Tenth Five-Year Plan, three-fourths of India's surface water resources are polluted, where 80% is due to sewage alone (Water for all 2009). At the moment girls and women spend hours to fetch clean water, which take time and should not need to be done. Of all water supplies, drinking water is only 1% and should be priority and not damaged. Clean drinking water and lack of toilets should therefore be treated together as complementary needs. India had a sanitation goal for 2012 and to

succeed, the country would have had to build 112,000 toilets per day for 3 years (Shah Singh 2009)

Defecating and urinating without toilets contaminate the water, which cause the spreading of diseases in the surroundings. It also reduces the water supply thus making it more difficult to find clean water for drinking and for hygienic purposes (Menon 2003). Not having access to a toilet or similar is a bigger problem for women than for men, as the stigma against women urinating or defecating in public makes doing so problematic. In Delhi there is only 132 public toilets for women, while there are 3192 public toilets for men (Anand 2012). To relieve, women must therefore go in the open as the access to toilets are limited or absent and that has to be done before sunrise and after sunset to avoid being seen (Shah Singh 2009). This increases the risk for overheating and heat strokes, sexual assault, kidnapping and animal attacks, in turn causing some women to eat and drink less, in order to avoid having to defecate or urinate, thus putting them at a higher risk for malnutrition (Anand 2012). It also increases the risk for urinal tract infections and kidney infections caused by holding it to long. This can also be caused by germs from faeces, often caused by open defecation, as the germs can spread more easily than if a toilet had been used (Conant 2005).

Tradition and lack of awareness about the importance of sanitation may compound a change even if access to toilets would be improved. Even though people care about their wellbeing they are unaware of the correlation between lack of sanitation and their health (Scott 2003). For this education is needed and this, mainly for women as they have the most influence in determining household hygiene practices and in forming habits for their children. Besides this, women are, as mentioned above, also the ones that suffer most from the lack of toilets (Water for all 2009). A study in south India has confirmed the importance of genital hygiene, to prevent infections. Cervical dysplasia can be reduced with health education, satisfactory living standards and the empowerment of women (Varghese et al. 1999).

3.5 Indian women and their health

In developing countries, gender inequality is a major determinant of women's health (Patel et al. 2006). Reasons for this are, among others, lack of support for daily activities (Patel et al. 2006) and in India only 40% of women aged 7 and over were literate in 1991, this has been improved during the last years though. Among the literate women only 41% has an education higher than primary education (Velkoff 1998). In the Indian society it is typical that the women take care of the household, such as washing of clothes and utensils, bathing their children and cooking and cleaning (Sheikh 2008). In poor families, where this is the biggest problem, the women do not have access to anything that would simplify their life but they have to wash by hands, cook over open fire etc. In India the tradition is that women eat last and least throughout their lives, this even when she is pregnant and breastfeeding which result in not only malnourished women but also malnourished children (Coonrod 1998). To be added teenage pregnancy are common and many girls are too young to carry a baby and it is therefore more likely that the baby is malnourished (Lahiri 2011). It is also more common that the women are uneducated than the men as they pull them out of school earlier because of either they are needed at home or because of lack of toilets, fear from violence or because they reach puberty and thus has to protect their honour and cannot stay in school (Coonrod 1998, Gale 2009, Rahman 2009, Velkoff 1998) It is also costly in India to put your children in school and thus more economically to only let the sons stay in school as they can get a good job and therefore help the family economically, whereas the daughters, in the poorest families only will do house work and thus cannot help the family economically. Women also work longer hours even though they often are working at home, as it is common that they are taking care of big families without any equipment that makes it easier for them, such as washing machines. Except this, women are exposed to atrocities such as rapes, assaults and dowry-related murders and sex-selective abortions are common, even though it is against the law (Coonrod 1998, Goldberg et al. 2011). In the end of the 1990's every 26 minutes a women was molested, every 34 minutes one woman was raped, every 42 minutes a women was

sexual harassed, every 43 minutes a woman was kidnapped and every 93 minutes a woman was burnt to death over dowry. On top of this are the unreported cases. A daughter is often viewed as a liability when the sons are idolized and celebrated (Coonrod 1998, Goldberg et al. 2011). It is therefore more common that sons are breastfed longer than daughters. It is also less likely that girls are taken to the doctor while they are sick comparing to the boys. That continues when they grow up and women tend to not admit that they are sick and wait until their sickness has progressed before they seek help. When women are working they are often at works where they are required to be in one position for long periods and that can affect their reproductive health. In one study made in Maharashtra it is found that 40% of all infant deaths occurred in the months of July to October and that the majority of all births were premature or stillbirths. The study attributes this to the squatting position that had to be assumed during July and August, which are the rice transplanting months. In a case study in the Indian Himalayans it was found that on a one-hectare farm, a man works 1212 hours and a woman 3485 hours in a year (Coonrod 1998).

Reproductive tract infections are common and cause physical illness among women. Anemia is also common, with from 58% in Andhra Pradesh up to 98% in Rajasthan, which is associated with heavy menstrual bleeding and poor nutrition. This may be caused by lack of safe drinking water and sanitation, as stomach infections caused by contaminated drinking water, that is often the result of poor hygiene and sanitation, hinder the uptake of nutrition (Waterdrops 2009). In a study made in Kerala, India, common mental disorders were higher among women who had experienced gender disadvantage and economic difficulties. It was also strongly associated with several gynaecological complaints (Patel et al. 2006). It is known that women are more vulnerable to urinary tract infections and reproductive tract infections than men, which will be even worse if they do not have possibility to relieve themselves when needed. Indian women are ranked as the most stressed women in the world, which may be caused by the facts above (Goldstein 2011).

Privacy for sanitation is important for women's safety, dignity and self-respect. If it is difficult to find these private areas women live in a constant state of anxiety as they try to meet their sanitation needs without losing their dignity. To relieve, this sometimes includes leaving her children unattended, and to get privacy, she sometimes needs to go into dense vegetation, which may cause insect and animal bites. Another option is to go early in the morning and then wait until nightfall to relieve under the cover of darkness (Burra et al. 2003, Rahman 2010, Roy 2011, Scott 2003, Waterdrops 2009). This option, on the other hand, is faced with the threat of possible sexual harassment (Desai et al. 2011, Ramesh 2012, UNU-INWEH 2010, Waterdrops 2009). To wait for so long also cause psychological stress and pain. It also leads to health complications such as urinary tract infection, chronic constipation and intestinal damage. Some women choose to eat and drink less to make it easier to hold it (Waterdrops 2009). In 1985, when women pavement dwellers in central Mumbai began to discuss their needs and priorities, access to water and toilets was one of the most common themes. These women did understand though, that it would be difficult to build toilets to every family as their house were only around 10 square metres. They also thought it would be difficult to keep the toilets clean as there access to water was limited and thus be unpleasant for the family as it had to be close to the area for cooking and washing (Burra et al. 2003). Access to a toilet nearby the workplace improves the ability to work, safety and mobility and might be an option if one does not have access to a toilet in the home (Roy 2011).

The campaign "No Toilet, No Bride" that started in northern India, women in India has started to demand basic right (Roy 2011, Shah Singh 2009). But as the lack of toilets mainly are among poor families many women have no education and has not been experienced household with good toilet facilities and may not think about demand for a husband with good toilet facilities. When a woman gets married she does not choose her own husband as her father and other men in the family make this for her. It may therefore be hard for her to come with requirements and because of the dowry it may be hard for the family to find a

family with these facilities as the husbands family may demand a higher dowry than they can afford.

Menstruation is still a taboo in India, which makes it difficult for women to keep themselves and sanitation pads clean during their menstruation period. Lots of girls are not able to stay in school due to their menstruation because of lack of adequate hygiene facilities (Waterdrops 2009). Even though some women have access to toilets during their menstruation lots of them do still not use it, as they are afraid of staining the toilet, non-availability of disposal facilities, and no space to keep used clothing to get dry again after cleaning (UNU-INWEH 2010). This cause serious health concerns and as some women do not have access to sanitary pads or likewise they have to use old clothing for a long time, which may lead to infections. Some women even stay in a cowshed during their period (Waterdrops 2009). It is suggested that poor menstrual hygiene, such as re-using unclean cloths or not being able to wash properly, may increase the risk for urinal and reproductive tract infections. This is not supported by sound medical analysis and can therefore not be proven (Mahon et al. 2010).

3.6 Composting toilets

Using flush toilets, large amount of water is used to transport a small amount of excreta. For one family at least 100 000 litres of water is used per year, only for flushing (Calvert 2002) If the flushing system is not very good the risk for human excreta ending up in the sea is big and may therefore cause both health and environmental problems (Andersson et al. 2002). If a country like India, with over a billion people, would get this kind of toilets, an huge amount of water would be needed. Only 30% of the wastewater was being treated 2003 which means that the rest, millions of litres each day, goes to local rivers or streams. India has not enough water to flush-out city effluents, not either enough money to set up sewage treatment plants (Water for all 2009). To reintegrating human waste with soil is a well-known method that has been used for years, and nowadays they are easy to keep clean and hygienic and do not smell (Calvert 2002). When using pit latrines and septic tanks, water will often be contaminated by human faeces (Banarjee 2009, Calvert 2002). This is common, especially in areas with high population densities, and this, as mentioned above, will increase the risk for diseases such as cholera, dysentery and diarrhoea, but also diseases such as polio and typhoid. Therefore, composting toilets can result in a significant reduction in the occurrence of these diseases (Calvert 2002). It is often built with two chambers where you use one of them until it is full and then change to the other chamber, and it will be time for the first one to process the faeces. Composting toilets that separate the urine from the faeces is less likely to smell but the ones that are combined is better but requires greater quantities of carbonaceous residues, such as sawdust and straw. It is possible to use the composting toilet both in rural and urban areas. It can be built beside the house or as a part of it. It is not recommended in open communities, as good knowledge about it is needed. The cost for a composting toilet is around £90 (1000 SEK, 8000 INR) (Calvert 2002, Menon 2003).

The benefits from composting toilets are that the sewage systems not need to be extended and the cost for infrastructure will be less than if water toilets would be used. It is also suitable for the saving of water, as no water is needed (Calvert 2002). You will also be able to use the faeces as fertilizers. In 3 to 6 months the faeces is well composted and can be used as soil nutrient (Banarjee 2009). But any kind of compost programme do require an education programme to assure that the toilets will be accepted in the group and used in a convenient way (Calvert 2002). Using composting toilets would change the situation for women, as they therefore would get a private place to relive themselves, any time of the day. Putting the toilets close to their homes they would not either have to walk long distances in the darkness to find a private place to urinate or defecate.

3.7 Millennium Development Goals

The millennium goals are used to focus on the need for long-term considerations for our common future. Among the goals are alleviation of poverty, hunger, and burden of disease, gender equality and reduction of environmental degradation (Berntell, 2005). For all this goals water is a key issue as lack of good water will affect all the goals (Berntell 2005) and the goal is, by 2015, to halve the proportion of people without sustainable access to safe drinking water and basic sanitation (Hesselbarth 2005).



MDG 1: Poverty and Hunger

Improving water supply and sanitation will have a positive impact on the individual income and poverty situation of the beneficiary household. It will also reduce the time and energy it takes to collect safe water and therefore give more time for other activities. Access to water of good quality will reduce the health risks and also reduce time used for treating ill family members. This will also lead to a positive impact on the household situation (Hesselbarth 2005).



MDG 3: Gender Equality

To change the water and sanitary situation, a change for women will be present, as ensuring the households water supply mainly falls under responsibility of the women. Both collecting water and take care of family members suffering from water-related illnesses has to be done by the women. It will not only give more time for the women to do other meaningful activities but will also reduce the risk for harassment as this is a risk when they go for collecting water or for urination or defecation (Hesselbarth 2005, Rahman 2010, WHO 2005,).



MDG 4: Child Mortality

As mentioned above, water-related diseases are the most common cause of death and illness among the poor population and their children. To change the sanitary situation and therefore improve the water situation, fewer children will be sick and die (Hesselbarth 2005).



MDG 7: Environmental Sustainability

Inadequate water supply and sanitation is associated with unsustainable exploitation of natural resources. To maintain the ecosystems integrity improved water management is a key factor. It will also reduce the flows of human excreta into waterways and reducing the respective health and environmental risks. It will also change the situation for poor people and mainly women as these people are the ones that suffer most from the lack of good sanitation (Hesselbarth 2005)

To reach the millennium development goals, to halve the number of people without sanitation by 2015, India will have to build more than 50 million toilets (Banerjee 2009).

3.8 Chennai and Sri Ramachandra University

Chennai is the capital city of the southernmost state in India, Tamil Nadu. It is one of the biggest cities in India with 8,7 million inhabitants. It is located on India's east coast and was, 2005 affected by the tsunami. Chennai has a tropical wet and dry climate and as it is a coast city there is extreme variation in seasonal temperature, but most of the year the weather is hot and humid with the hottest parts of the year in May to June. It is India's fastest growing city and is rated in the "Forbes-Top to Fastest Growing cities in the World". It generates 4,500 tonnes of garbage every day.

Sri Ramachandra University (SRU) located in Porur, Chennai, India and consists of eight constituent colleges with over 45 departments offering courses in health care and medical studies. A University hospital is also located at the campus area. The University was established 1985 as a private not-for-profit self-financing institution and dedicated to serve the society as a centre for medical education, research and health care. This study is made

together with the department for Environmental Health Engineering, Sri Ramachandra University. Together with universities in Sweden, the department for Environmental Health Engineering, SRU, does a SIDA-funded project about occupational heat among workers in Chennai. This study is in collaboration with that project. To be able to do this study in India Ethical Consent (EC) is needed and as this project is in collaboration with another project, this study took part of their EC.

4 Materials and methods

To answer the research questions interviews have been made with both men and women at their working places. They have been asked about both heat and their toilet situation to see if their health and social life is affected by their working situation. As this study has been done together with a study with main focus on occupational heat, the questionnaires have questions useful both for this study and for their study. The result for this study is based on answers from all questions except part 6 (Appendix 1). The groups are based on their assumed toilet access and the occupational groups were maintenance workers, that have good access to toilets, brick workers and agricultural workers that have no access to toilet, neither in their home or at their workplace, and research fellows from Sri Ramachandra University, that do not have access to toilets during field work but have access to toilets when they are doing work at the University. The interviews took around 15 minutes per person and in total 72 people were asked, 50 people with access to toilets and 22 with no access to toilets. 58 of the interviewees are women and 14 are men. 15 of the maintenance workers are working as gardeners at Sri Ramachandra University. Before the interviews, we thought that these people did not have access to toilets at their work, but during the interviews, we understood that they had access to toilets during work. Therefore the group of people with access to toilets are bigger than the group with no access to toilets even though they are mainly used as a control group, to see if there are any differences between people with access to toilet comparing with people with no access to toilets. All the other maintenance workers did work in a residential area in Chennai, around one hour from the University. Both the brick workers and the agricultural workers did work outside Chennai, also around one hour from the University. In both these group it were difficult to find people as they were not as many at their working place as the maintenance workers and it was also harder for them to get away from their work to answer the interviewee questions. The brick workers were interviewed when they were doing their work and the agricultural workers in one of the workers home. At both these places everyone that we could reach were interviewed. More people would have been preferable but were hard to find. No men were interviewed among the agricultural workers as the male interviewer forgot to ask them questions about toilets and only focused on heat. It was difficult to see the working area for the agricultural workers and none of the workers did want to show the place to me. Therefore, the knowledge about their working place is limited.

During the interviews, three men and two women were used for asking the questions. All these people are from Sri Ramachandra University and part of the SIDA-funded study on occupational heat. It was always a man asking the male workers and a woman asking the female workers. The questions are quantitative and the interviewees could mainly answer yes or no (Appendix 1). I was together with the female interviewer but did not participate, as my knowledge in Tamil is absent. When maintenance workers were interviewed it was difficult to do the interviews only with the interviewed, as there colleagues were waiting for their turn and were listening to when their colleagues were interviewed. When agricultural workers were interviewed we had access to a room where only the interviewer, the interviewee and me were during the interview. The brick workers, that were interviewed when they were working, were not alone during the interviews but their workplace is big and the distance to their colleagues were so large that they could talk undisturbed most of the time. When private questions were asked the interviewer could lower her voice to make it more private.

5 Results

Totally 72 people have been interviewed, 50 of them with access to toilets, 39 women and 11 men and 22 without access to toilets. 5 of them, all women, did have access to toilets sometimes, as they are both working at the university and outside doing field studies. 17 of the interviewees did never have access to toilets, not either in their homes, and were working as agricultural workers and brick workers (Figure 3 & 4). 3 men, all from the brick industry and, the rest women, 8 were working at the brick industry and 6 as agricultural workers. The result is divided into three parts, people with access to toilet, people with no access to toilets and people that have access to toilets sometime. Each group is also divided into subgroups according to their workplace. The last part of the result raises differences between the work groups. In this part there are also figures showing the differences. During the result it is referred to these figures, but there is also figures included in the other parts of the result to make it clearer. In the figures maintenance workers are abbreviated to MTW, agricultural workers to AW, brick workers to BW and research fellows to RF.

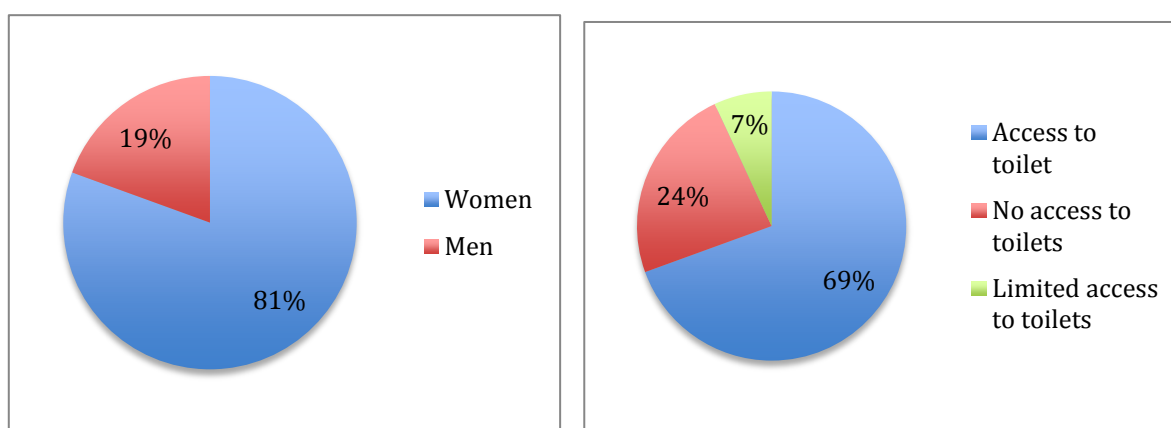


Figure 3. Proportion of women and men who have been interviewed

Figure 4. Proportion with access to toilets, no access to toilets and limited access to toilets

5.1 Workers with access to toilets

5.1.1 Maintenance workers

Among maintenance workers (MTW), there were 39 women and 11 men. All of them had good access to toilets in their working area. Everyone was working outside and was therefore exposed to outdoor heat and did not have access to a cooling area with air condition. The female maintenance workers were working as gardeners or did house work, such as washing or wiping the floor. The male maintenance workers were doing similar work but some of them were painting, or doing some smaller construction works in the area. This people did, though, have good access to shadowed areas as their working places had lots of trees and buildings that generated shadow. Everyone have good access to clean water from a tap or from a can. The access to toilets was good with more than 6 toilets in the area where around 30 people were working. They were also allowed to use the toilets when needed and were not interfered by their workload or by their boss. 27% of the men and the majority of the women are illiterate; none of the women have been to higher secondary school and only one of the men. More than half of the men have been to secondary school but

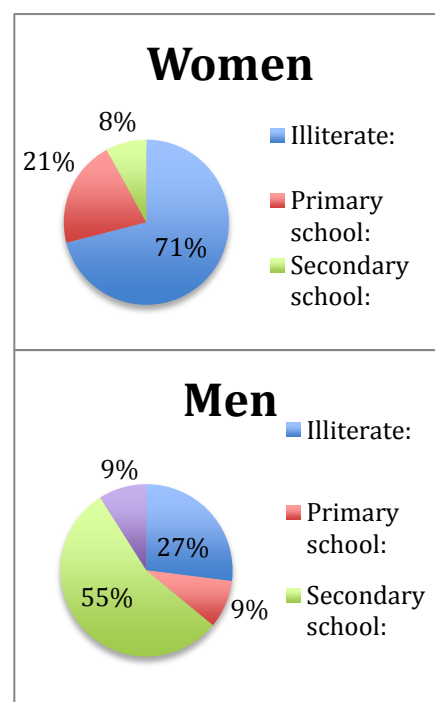


Figure 5 & 6. Female respectively male maintenance workers education level in %

only 3 of the women. 8 of the women and 1 of the men have been to primary school (Figure 5 & 6). 4 of the women and 7 of the men had some existing illnesses. Most workers had a moderate type of work and had been doing this kind of job for more than the last years and are therefore adapted to potential heat stress. Including breaks the interviewees are working between 5-8 hours per day and there are no additional breaks during summer time.

5.1.1.1 Heat situation

Most of the workers feel comfortable with their working temperature and find it manageable during the summer. But even though they do not find heat as a problem almost every one of the maintenance workers are feeling excessive sweating and thirst (Figure 10). A third of the women do feel exhaustion due to heat and 6 of them feel that they want to go to a comfort zone, none of the men. 3 of the men and the majority of the women feel heavy sweating, a third of the women do have muscle cramps, also a third of both the women and the men feel tired or weak and suffer from headache, 9 women feel dizziness. 5 women and 1 man feel nausea or vomiting and 4 women and 4 men have fainting spells. 7 women and 2 men suffer from prickly heat and 5 women respectively 1 man suffer from other heat related illnesses such as heat stroke, heat cramps or heat exhaustion (Figure 10 & 11). When they were asked if they have ever taken sick 2 of the women and 3 of the men said yes. Most of them had been away for around 2 days. Only one of the maintenance workers, a woman, has been advised to take off due to heat and none of them have been admitted to hospital due to heat. All interviewees have been asked if they feel absenteeism. In this study it means that they feel like they are somewhere else rather than being somewhere else, absent-minded or abstracted. One of the maintenance workers says that heat effect her by absenteeism. 2 women and 1 man thinks it leads to less productivity, 3 of the women and 2 of the men says it leads to irritation and as many says that the heat makes the work take longer time than normally. 5 women, none of the men, have to work extra hours (Figure 12). To limit heat exposure almost all the women, but only one man get away for a while and the majority says that they drink water to limit heat exposure. The majority of the women and almost half of the men take rest, 7 women take cool shower and 1 of the women move to a cooler environment and switch to light weight clothing to cope with heat. One of the interviewees, a man, goes to the doctor to cope with heat (Figure 13). All the maintenance workers drink water during work and most of them drink around 2 litres per day. Some drink 1 to 1,5 litres and a third of the workers drink 3-5 litres per day (Figure 14). Many of the interviewees say that they drink buttermilk to make the heat more manageable. 2 women, says that they spend more time to cope with heat during summer season but only 1 of the women thinks that it has moderate impacts on their social life, among men, 3 find that the heat has a moderate impact on their social life.

5.1.1.2 Sanitary situation

All of the maintenance workers are using the toilets more than 6 times per day and it does not make them uncomfortable to talk about it in the open. Out of all women 14 of them answered that they still had their menstrual cycle and only one of the female workers have an irregular menstrual cycle. 10 of these women could work during their period but 2 of them found it very difficult and 2 of them answered that they could not work, mainly because of stomach pain (Figure 22). These women had access to sanitary pads and did not find any problems to change them and keep clean during their period. 7 of the women and 3 of the men feel burning sensation while urinating and all men and the majority of the women do only feel it during summer (Figure 17). 2 women and 1 man find it difficult to hold it sometime. One of the male workers both feel burning sensations and difficulties to urinate even if needed, except him, non of the interviewees find it difficult to urinate (Figure 17). 7 of the interviewees have noticed a change in urine volume, one man and the rest women, but this mainly during summer time (Figure 20). 1 of the interviewees, a woman, feels excessive tiredness and skin itching and none of them feel numbness or have swollen legs or hands. Among the interviewees 5 women respectively 36 men, had dark yellow urine, and most of them answered that it was mainly during summer. One of the men has been treated for kidney problems, and 2 of the men did feel back pain (Figure 20). 4 women respectively 2

men did feel dehydration and one of the women did feel nausea or fainting spells. None of them had been admitted to hospital caused by dehydration (Figure 19).

For the questions if they had any other health problem a third of the women said yes, none of the men. Mainly they felt body pain, such as back pain or leg pain and it was also common with headache.

5.2 Workers without access to toilets

5.2.1 Brick workers

All the brick workers (BW) were working outside and were exposed to heat from the sun. They did not have any areas where they could get shadow but did work early in the morning, before sunlight, to be able to stay away from the sun during its strongest hours. Two of the workers, only male workers, are also exposed to heat from where the bricks are burned. Most of the interviewees were between 20 and 40 years old and they worked at the brick industry 6 months per year and worked the rest of the year as agricultural workers or similar, closer to their hometowns. While working in the brick industry they stayed in small barracks in their working area. 8 of the interviewees were women and 3 were men. Among the women 3 had a secondary education, 3 had a primary education and 2 were illiterate. Among the men 2 had primary education and one was illiterate (Figure 7 & 8).

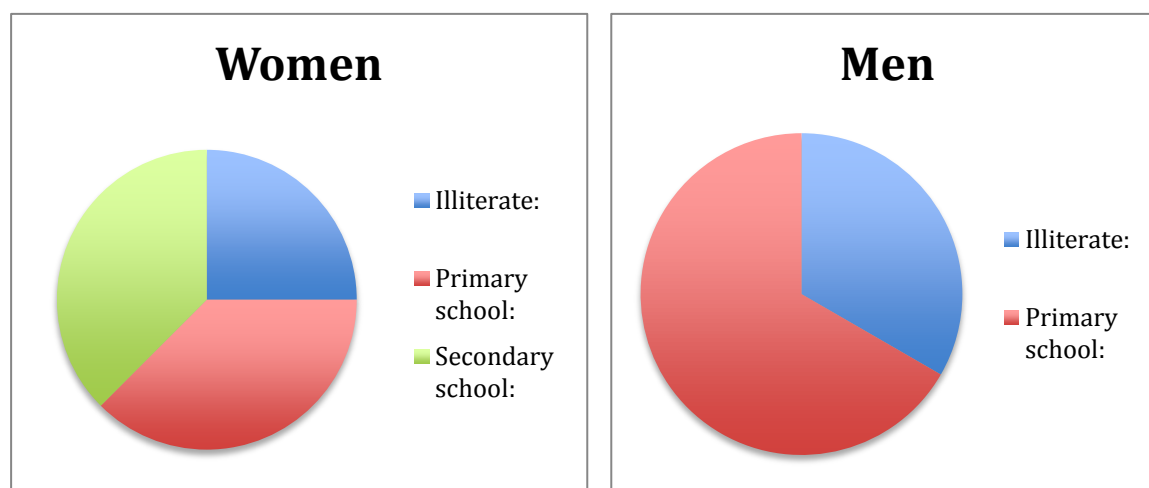


Figure 7 & 8: Female respectively male brick workers education level in %

One of the men suffers from gastro intestinal problem and the rest of the interviewees do not have any existing illnesses. The workers are working from 5 hours per day to 8 hours per day and start 3 o'clock in the morning. The area is well ventilated as all of them are working outside.

5.2.1.1 Heat situation

5 of the interviewees, 4 of them women, are uncomfortable with the temperature and 6 are comfortable. 8 of them find heat as a problem, one of them working with the brick firing. 7 of the workers, 4 of them women and all the men, find the heat problematic 1-3 months per year and 4 of them, only women, find it problematic 3-6 months per year but most of them find it manageable (Figure 9). Among the interviewees, 7, 4 women and 3 men, feel excessive sweating, all of them feel thirst and one of the men wants to go to a comfort zone during the summer months. The majority feel heavy sweating, most of the women, none of the men, feel muscle cramp, All of the interviewees, except one of the men, feel tiredness or weakness, 4 of the women feel dizziness and have headache. One of the women feels nausea and there is also one of the women that are fainting. 6 of the interviewees, 5 of them women, have been affected by prickly heat and 3 of them, only women, by heat syncope. 8 out of 11 have taken sick during work, mainly for a few hours up to a few days, among this 2 of the men and 6 of

the women (Figure 10 & 11). Three of them have lost wages during that times as they get daily wages. Their production target is 30'000 bricks per day all together and they are around 50 workers totally in the area. The target is completed every day and they do not need to work extra hours.

To cope with heat exposure all of the interviewees drink water and two of them also get away for a while. This are the men that are working close to the firing of the bricks and they move away from the fire to cool down a little bit. All of the workers also say that they can take a rest when it is too hot and they all have access to drinking water and drink while they feel thirsty (Figure 13). Most of them drink around 3 litres per day but among the men it was common to drink up to 8 litres per day (Figure 14). Except drinking water, four of the interviewees drink coconut water and buttermilk to cope with the heat. But only one of them spends extra money due to the hot season and do spend around 50 rupees (around 6 SEK) totally during the hot season. The heat does not affect their daily life.

5.2.1.2 Sanitary situation

There are no toilets in the area and as the workers are living in the area they do not have access to toilets, either during their working hours or when they are home. But as they have their homes in the area they can go there, during their menstruation, if they need to change sanitary pads or clean themselves during the day, which all of them do regularly. Half of the interviewees do, however, feel itching around genitals, but they do not think that would be better if they had better access to toilets (Figure 23). All of the interviewed women are using old clothing as sanitary pads. For urinating or defecating both men and women go to areas close to the working areas. The men are mainly going on the fields and the women in areas that are more hidden such as a small forest (Figure 16). The women go between 1-4 times per day and the men go slightly more often, around 5-6 times per day, one of the men are going more than 6 times per day (Figure 15). All the men and most of the women go alone. 2 of the women go together with friends. All of the interviewees are comfortable with this option. None of the interviewees mention that something has happened to them while they are going to relieve themselves. 2 of the women feel that they have to hold it for around 3-4 hours longer than convenient. These women also say that they sometimes have to stay home from work because of the toilet situation. None of the interviewees think their working situation would be better if they had better access to toilets.

All workers have access to drinking water. The women use water from a water tank and the men say that they get their water from the ground water. This difference might be caused by the fact that different people interviewed the men and women and therefore got the question formulated different. All of the interviewees drink when they feel thirsty. None of the women would drink more even if they had better access to toilets but all of the men would.

Three of the women feel burning sensation while urinating during summer. Two of them feel it once a week while one of them feels it everyday. This woman also feels difficulties to hold it and two of the women feel difficulties to urinate even if needed. They have also noticed a change in the urine volume. Both of them have been admitted to hospital because of this and stayed there for 3 days. One of the other women also feels difficulties to urinate while needed. None of them think this would be better if they had access to toilets. All of the interviewees have noticed a change in the colour of the urine and for 3 of the women the urine is dark yellow and for the rest yellow. None of them have had any kidney problem. 3 of the women and 1 of the men feel back pain, which might be caused by hard work rather than kidney problems (Figure 20). Among the interviewees 4 of the women feel dehydrated but do not feel any further problems caused by this, such as nausea or skin problems (Figure 19). 5 of the women feel constant hunger even if they are eating but none of them have problems with diarrhoea (Figure 21).

5.2.2 Agricultural workers

Among the agricultural workers (AW) it were totally 6 women interviewed, no men. 3 of them were at the age 30-40 years old and 3 of them were at the age of 40-50 years old. All of them were living close to their workplace. All of them are illiterate and have been doing this kind of work for their whole lives. Most of the interviewees said that they are working for around 4-5 hours per day but two of them said that they are working 6-8 hours per day. During the summer period they have additional breaks, for around one hour, because of the heat.

5.2.2.1 Heat situation

Only one of the interviewees are uncomfortable with the temperature during summer but many of the interviewees mention that the winter season is hard for them as they are freezing and thus less comfortable with that temperature, which they think is because they are used to higher temperatures most of the time and therefore react badly to lower temperatures. They also find the raining season difficult, as their work is harder when the fields are wet. The workers also find their surroundings too dirty during this time, as the rain is moving up dirt and faeces from the dykes. Despite this, all of them still feel excessive sweating, exhaustion and thirst during the summer months. All of them also feel heavy sweating and muscle cramps during this period. Half of the workers feel tiredness or weakness. One of them feels dizziness. It is also half of the interviewees that have headache during the summer season. None of them feel nausea or vomiting and one of them feel fainting. Two of the workers do also suffer from heat cramps and heat exhaustion. Everyone, except one, suffers from prickly heat. 4 of the workers have been taken sick from work because of the weather and have been away for between 2 days to one week per month (Figure 10 & 11). Even here they mention that the cold season is more of a problem for them and that they stay home from work more often because of the cold weather. For that they have lost between 200 rupees to 900 rupees. None of them have been advised to hospital because of the heat. 4 of the interviewees think the heat lead to absenteeism during work and 4 of them thinks it lead to less productivity (Figure 12). Only one of the interviewees did not think the heat affected their work. To cope with heat while needed all of the interviewees get away for a while. 3 of them also drink water. They also take rest to cope with the heat (Figure 13). They do not have access to water on their working area but all of the interviewees do drink when they feel thirst. 3 of them drink 2 litres per day and 3 drink 3 litres per day (Figure 14). 2 of them also use buttermilk when it feels too hot. 3 of the workers use more money during the summer and spend around 50 rupees more totally. All of the interviewees think they would drink more if they had better access to toilets.

5.2.2.2 Sanitary situation

There are no toilets close to the agricultural fields and none of the workers have access to a toilet for defecation in their homes, only for urination. 4 of the interviewees go for urination or defecation 3-4 times per day, one only 1-2 times per day and one 5-6 times per day (Figure 15). All of them go in a hidden area and everyone, except one go alone (Figure 16). They all feel comfortable with that. It has never happened anything inconvenient, such as being attacked by an animal or abused by a person, to any of the interviewees, while they have relieving themselves. One of the interviewees mentioned that they are so used to that option so they do not know about anything else and are therefore comfortable. This interviewee also said that no one would tell anyone if something happened to her while relieving and that they do not care if any one is looking at them during urination or defecation, as they are so used to it. None of the interviewees feel that they have to hold it for longer than convenient but they think that their working situation would be better if they had better access to toilets on the fields.

Two of the workers have reached menopause and rest of the interviewees work during their menstruation (Figure 22). They use old clothing as sanitary pads. One of the workers wait the whole day to change sanitary pads while the rest is going to another place for changing. Two of them wash regularly and two of them do not but none of them feel itching around genitals, which normally can happen if you do not wash regularly (Figure 23).

Four of the workers think that the toilet situation impacts their social life. Two of them because it makes them stay at home more than if they would have had access to a toilet. One because she feels tired. One did not answer this question.

Four of the interviewees feel burning sensation while urinating but only during summer season. But none of them have difficulties to hold it or to urinate when needed (Figure 17). They do not think these problems would be better if they had better access to toilets. None of them have been admitted to hospital because of urination problems. They have not noticed a change in urine volume and not either excessive tiredness or numbness which is indicators of kidney problems. None of them have back pain or have been treated for any kidney problems. They do not feel dehydrated or any health problem that can be linked with dehydration. To the questions about health problem caused by drinking defecated water such as diarrhoea, they did not feel any problems.

None of them have any other health problems.

5.3 Workers with limited access to toilets

5.3.1 Research fellows during fieldwork

Five research fellows (RF) were interviewed about their working situation during fieldwork; all women and they were all between 20-40 years old. They have all a degree from the University. None of them have any existing illnesses. 4 of the interviewees have been doing this kind of job for more than one year and one of them for 2 months. They work 6-8 hours per day, 6 days a week, and are exposed to outdoor heat. They do not have any additional breaks during summer.

5.3.1.1 Heat situation

Two of the interviewees are comfortable with the temperature and three of them are not. Three of them do also find the heat as a problem but it is not the same people that are uncomfortable with the temperature. One of the interviewees find the temperature problematic 1-3 months per year, one find it problematic 4-6 month per year and one find the temperature problematic 7-9 months per year. The rest never find the temperature problematic (Figure 9). Two of the interviewees find the temperature extremely bad during hot season, one find it bad and two do not find the temperature as a problem at all.

During the summer season two of the interviewees feel excessive sweating, one feel exhaustion, two feel thirst and two wants to go to a comfort zone. Two of the interviewees feel heavy sweating during the hot season, one feels muscle cramps, two feel tiredness, one feels dizziness, two feel headache, and one feel nausea or vomiting. None of them feel like fainting. One of the interviewees felt all these symptoms. She was also affected by prickly heat and heat cramps (Figure 10 & 11). The other interviewees felt one or two of the symptoms mentioned above, and one of them was also affected by heat exhaustion. One of the interviewees has taken sick during the summer season and stay at home totally one day per month. She was affected by heat exhaustion and headache. She is also the only one that has been advised to take off due to heat. Two of the interviewees' find that the heat lead to more irritation or interpersonal issues at work during hot season and three of them feel that it takes more time to complete the same task (Figure 12). Three of the interviewees do not complete their daily target and around 25% to 40% is not completed each day. One of the interviewees says that she has to work 5 hour extra each day to complete her target. The rest of the interviewees do not work extra hours.

To limit heat exposure when needed two of the interviewees get away for a while, four of them drink water and one get shadow with help from an umbrella. Two of the interviewees do also take rest to cope with the heat and three of them move to a cooler environment. One

of the interviewees does nothing to limit heat exposure. None of the interviewees remove any clothing to feel more comfortable (Figure 13).

All of the interviewees have access to drinking water during their work, from water bottles, and all of them are drinking when they feel thirst. But all of the interviewees think they would drink more if they had better access to toilets. One is drinking 1-2 litres per day while the rest are drinking 3 litres per day (Figure 14). Except water, two of the interviewees also drink buttermilk and fruit juices and eat curd rice. These interviewees also spend more money during the summer. One of them feels that she spend more time to cope with the heat during hot season. Another interviewee thinks that the heat affects her social life moderately.

5.3.1.2 Sanitary situation

During fieldwork none of the interviewees have access to toilets. On this part of the questionnaire (Part 8-19, appendix 1) lots of questions are left out and not answered by the interviewees. Two of them go to relieve themselves 3-4 times and one of them wait for the whole day (Figure 15). One of the interviewees does not feel comfortable with the toilet situation. She does also feel that she has to hold it, for 3-4 hours longer than convenient. This person also says that she has to stay home from work sometimes because of the lack of toilets. Two of the interviewees think their working situation would be better if they had better access to toilets, the rest did not answer this question. All of the interviewees have access to toilets in their home and they do also have access to toilets in their working area when they do not do field works. Two of the interviewees think the toilet situation impact their social life as it makes them feel more tired, one did not answer this question and two does not think it has any impact.

All of the interviewees do still have their period and all of them can work during that time (Figure 22). 3 out of 4 have access to sanitary pads but only one out of four have access to a place to change during their fieldwork. One of them goes somewhere else to change and the rest wait for the whole day. All of the interviewees can wash themselves regularly during their period but one of them feels itching around genitals (Figure 23).

To questions concerning urinal tract infections, none of the interviewees feel burning sensations or difficulties to urinate while needed. One of the interviewees feels difficulties to hold it sometimes (Figure 17). This person also thinks it would be better if she had better access to toilets while she was working. On questions concerning kidney problem none of the interviewees mentioned any problem that indicate kidney problems. One of the interviewees has felt back pain for longer than six months (Figure 20). One of the interviewees feel dehydrated and does also have problems with pressure ulcers, other skin conditions and nausea or fainting. She thinks it would be better if she had better access to toilet. None of the other interviewees had any problems with dehydration. On questions concerning defecated water none of the interviewees had any problems that indicates that their drinking water is defecated.

None of the interviewees have any other health problems but one of them still think her health would be better if the access to toilets were better.

5.4 Differences and similarities

Most of the interviewees, from all groups are uncomfortable with the temperature around 3 months per year (Figure 9), which probably is around the summer months. All diseases (Figure 10) are affecting the interviewees except wanting to go to a comfort zone. Exhaustion is mainly a problem for agricultural workers. Agricultural workers are on top on all the disease and seem to be very affected by all of them, except the feeling of wanting to go to a comfort zone. Sweating seems to be a major problem for the female maintenance workers. Thirst is something that affects most of the interviewees, but mainly brick workers and agricultural workers, which might be because this people are most exposed to the heat. They

do also have a harder work and may therefore need to drink more than the other groups. Only male brick workers and the research fellows want to go to a comfort zone. Muscle cramps are very common among female brick- and agricultural workers, which might be because of their type of work; they have to work hard and be in postures improper for the body to be in for longer periods, and it may not have any correlations with the heat. Female brick workers are the group where most people feel tired or weak but also many men from the brick industry do feel tired or weak. This is the group with the hardest work, which might be the reason for their weakness. Working early hours and close to the sun, many hours per day may also be a reason for their weakness. It is also the group that are most affected by prickly heat. A small proportion of the interviewed feel fainting, nausea or vomiting. Around half of the agricultural workers are affected by most of the diseases (Figure 11). Among the research workers are 2 people (40%) suffering from headache, feeling tired or weak and have had a heatstroke, heat cramps or heat exhaustion. This group do not have as hard work as the agricultural or brick workers but are still very affected by the heat (Figure 11).

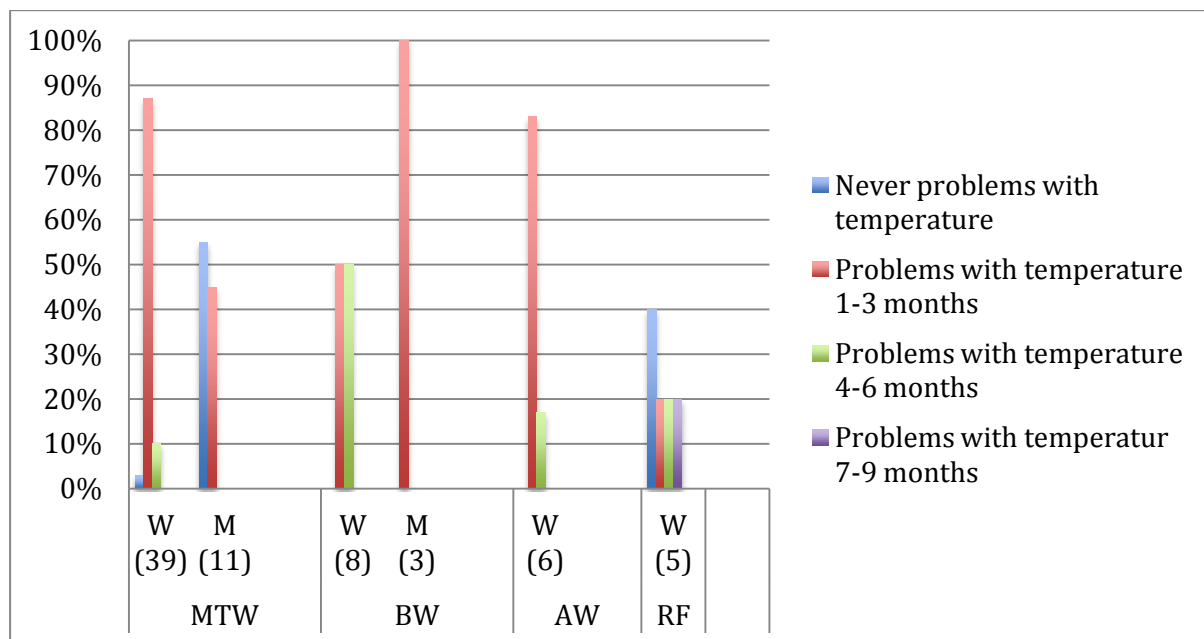


Figure 9. Proportion of persons having problems with heat.

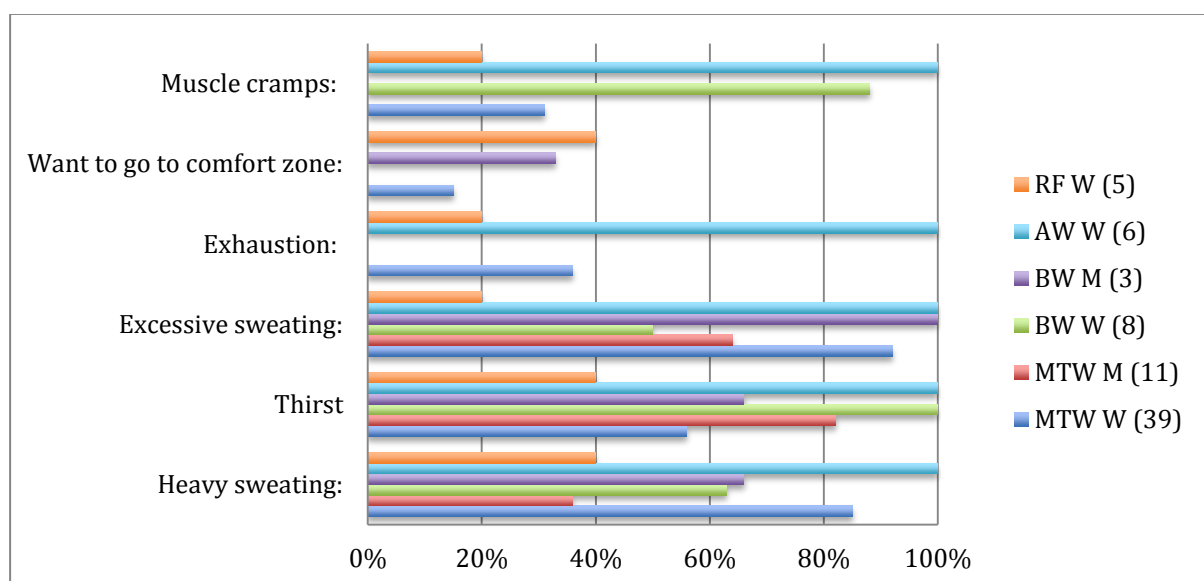


Figure 10. Symptoms caused by the heat and how many of the interviewees, in %, that is feeling them

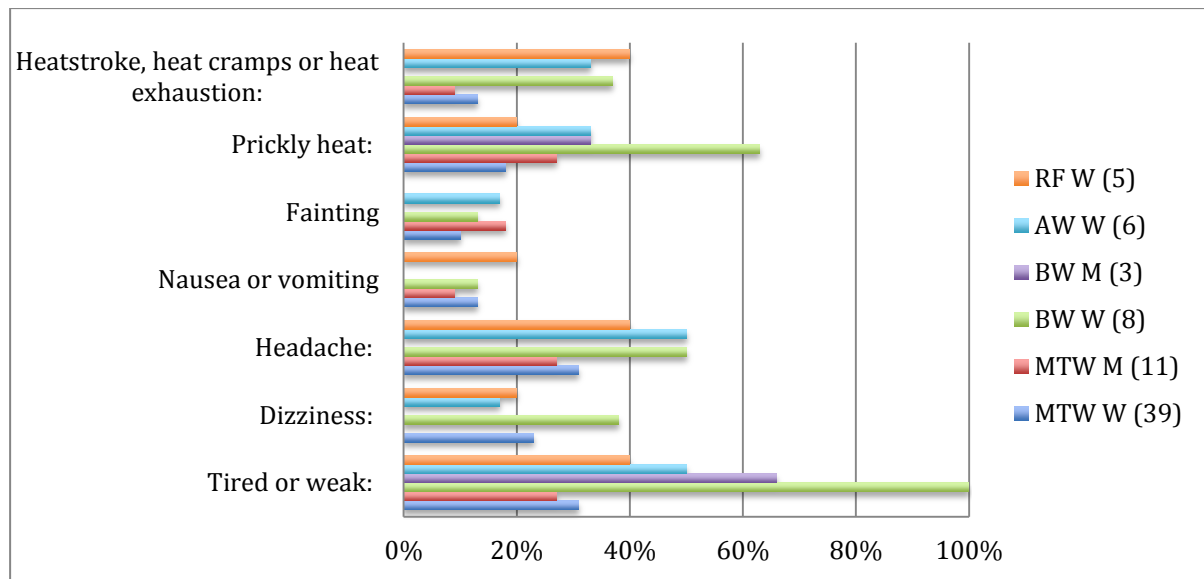


Figure 11. Symptoms caused by the heat and how many of the interviewees, in %, that is feeling them

How the heat affect the interviewees work (Figure 12) differs between the groups. Among the research fellows the main affect is that their work takes longer time as it for the agricultural workers leads to absenteeism and less productivity, which is the same affect as for the female brick workers. Male brick workers find it taking longer time and less productivity. The agricultural workers do seem to have more freedom at their work and that they can work whenever and however they want as long as they finish their target somehow. Among the research fellows and the brick workers it is more important to finish work in time and there is someone that controls their work. The agricultural workers do not have to work extra hours because of the heat and this might be the reason for that. One can see a clear trend when it comes to the maintenance workers as their job is not very affected by the heat (Figure 12). All the other groups do, more or less, have to work extra hours, feel irritated and have less productivity. Lots of people do also feel absenteeism. None of the women on the brick industry or the agriculture do feel irritation, such as all the other groups, even though they have same kind of work, or harder as the other (Figure 12).

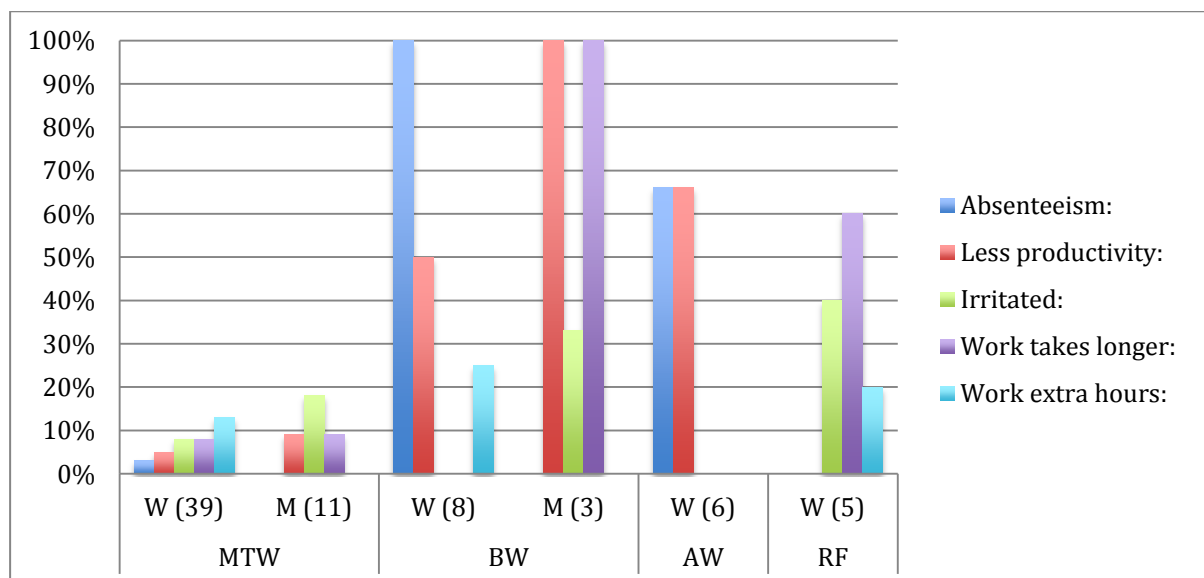


Figure 12. How the heat affects the interviewee's work

To cope with heat (Figure 13) most of the interviewees take rest. Male maintenance workers and research fellows does it less than the other groups though, which might be because of

there workloads or because of better possibilities to get away from there work. All the groups drink water, even the agricultural workers that do not have access to water at their working area. Only the research fellows move to a cooler environment. All of the groups, except the male maintenance workers and the female brick workers get away to cope with the heat. The reason for the maintenance worker is probably as they are working in an area that is well ventilated and with good access to shadows. The brick workers though, do not have that possibility and the reason why they not get away might be because they do not have time or because they do not have access to a good place to cool down. The male brick workers are working closer to a heat source and it is therefore important for them to get away when it is too hot and they do also have places that are less hot than their working place, as their working place are hotter than the surroundings (Figure 13). The body do also get used to the heat and as the brick workers are exposed to the sunlight everyday they might not find it as hard as other people would think in the same situation. During this study, no physiological tests have been made but one might find different values among these people if physiological tests had been made. Almost none of the workers use cool showers to cool down except a small amount of the female maintenance workers and the female brick workers.

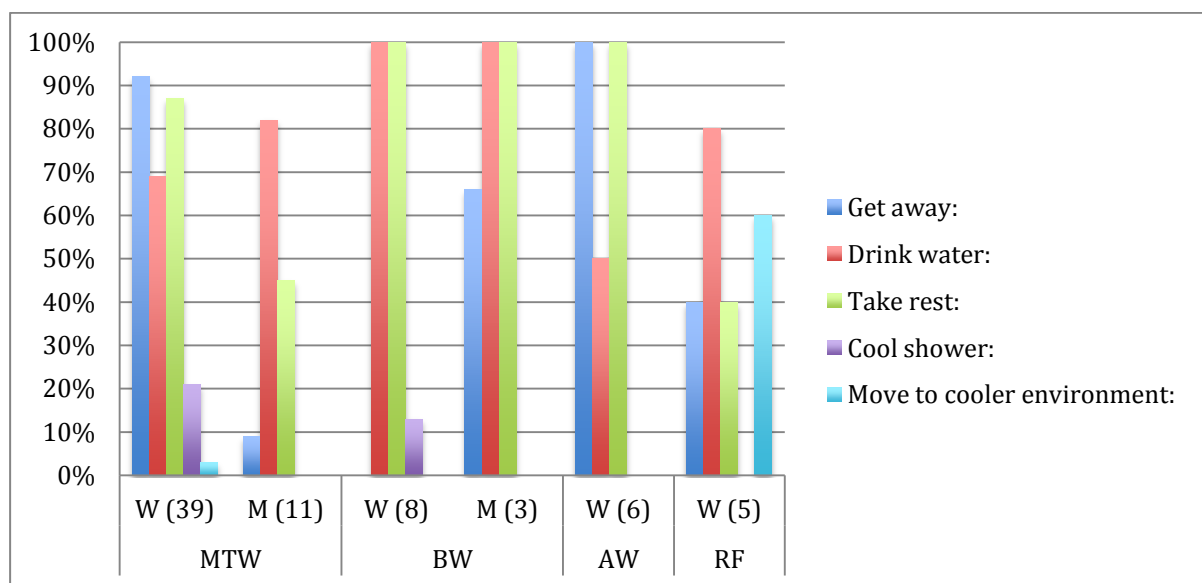


Figure 13. Methods that are used to cope with heat, % of the interviewees.

The maintenance workers are the group that drink least and the brick workers are the group that drink most (Figure 14), with almost 70% of the men drinking 6 litres or more per day. Among the other groups there is a majority of people drinking 3-5 litres per day. This, in correlation with their workload, make sense as the brick workers has the hardest work and are also exposed to most sunlight, together with the agricultural workers. 50% of the agricultural workers, that are also working exposed to strong sunlight drinks only 1-2 litres per day. Over 60% of the agricultural workers go to the toilet 3-4 times per day (Figure 15). How many times they go in their home, where they have access to a place for urination is not given. All of the agricultural women go to a hidden area to relieve themselves (Figure 16) and this might be hard during their work on the fields. The male brick workers go to the toilet more often than the other groups without access to toilets. They relieve themselves on the fields (Figure 16) and can go as many times as they want as there are no problems for them while they relieve themselves as the Indian culture are open minded about seeing men relieving themselves. The female brick workers go, on the other hand, to the forests, except one woman that also uses the fields for her urination or defecation. The female brick workers goes between 1-4 times per day which may be because its hard to find time during the day when they can find a spot to relieve themselves without anyone watching them. For the research fellows only one answered that the lack of toilets were an issue and she holds it for the whole day as she find it hard to find a good place for her urination or defecation, and are

therefore uncomfortable with the toilet situation during her field work. All of the other workers feel comfortable with relieving themselves in the open, whether they go alone or together with someone. Some of the research fellows relieve themselves during field works but did not answer where, it might be before they leave for work and when they come back as they said that they only do urination or defecation 1-2 times per day. They did not either answer if they were comfortable with that option. The maintenance workers, that have access to toilets do all go more than 6 times per day, even though they drink less then everyone else.

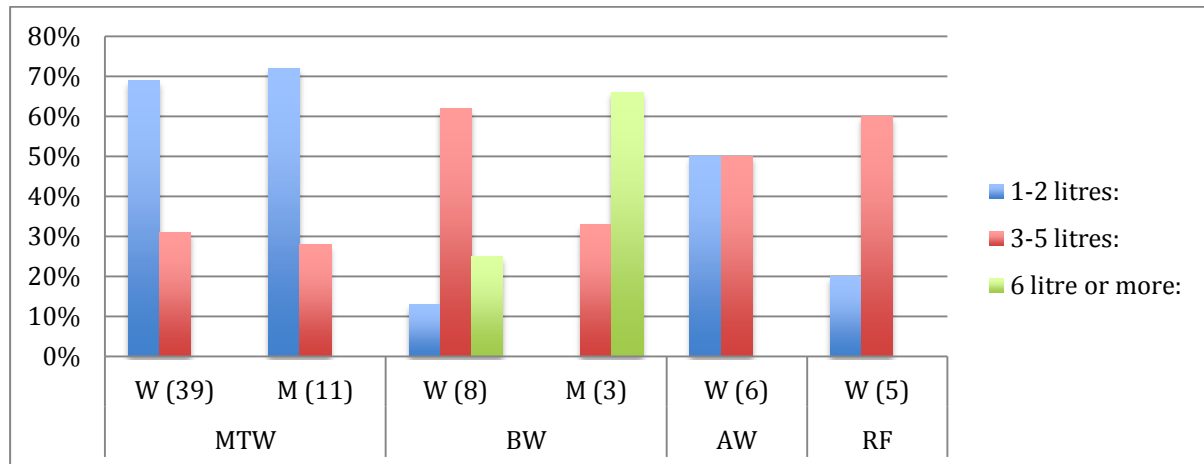


Figure 14. Number of litres of water per day for drinking.

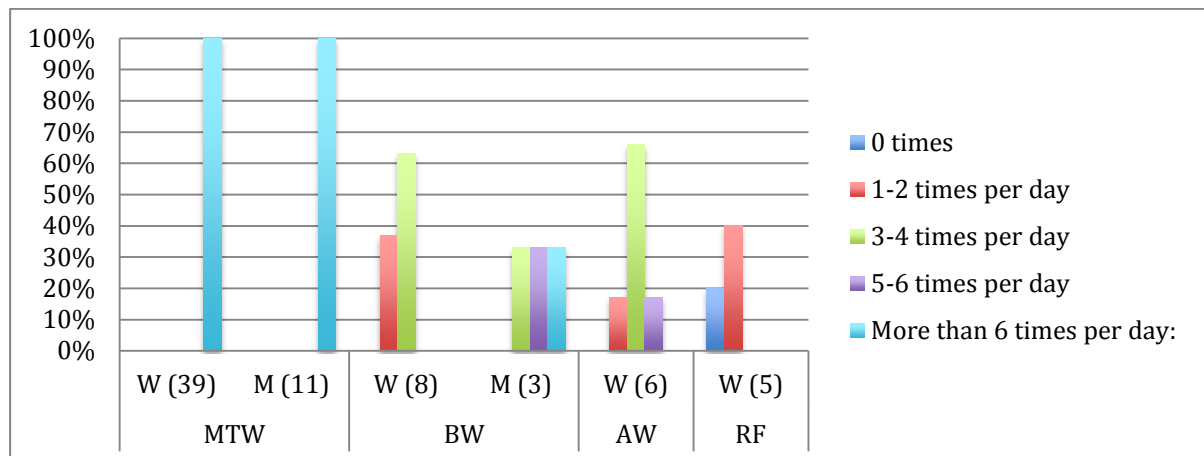


Figure 15. Number of times the interviewees go for urination or defecation.

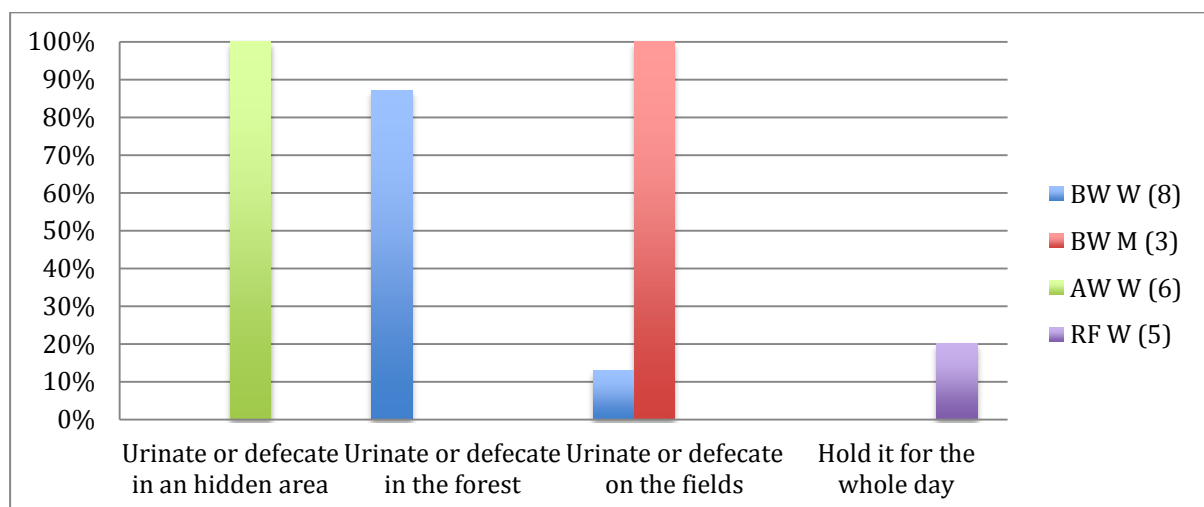


Figure 16. Where the interviewees go for urination or defecation.

A common effect of not relieving yourself when needed is urinal tract infection. Symptoms for urinal tract infection are burning sensation while urinating and difficulties to hold it. It is also common to need to urinate more often than normally. None of the interviewees had any feelings of needing to urinate more often, and had not had that feeling for a long time. Feeling burning sensation was something that many of the interviewees felt, both the group with access to toilet and the groups without access (Figure 17). For most of them were the burning sensations clearly connected with the heat (Figure 18). Most of the interviewees had only burning sensations during summer. Among the brick workers almost 40% of the women had both burning sensations and difficulties to hold it, which is an indicator that they might have problems with urinal tract infections, but no physical examinations were made so it is not possible to say for certain.

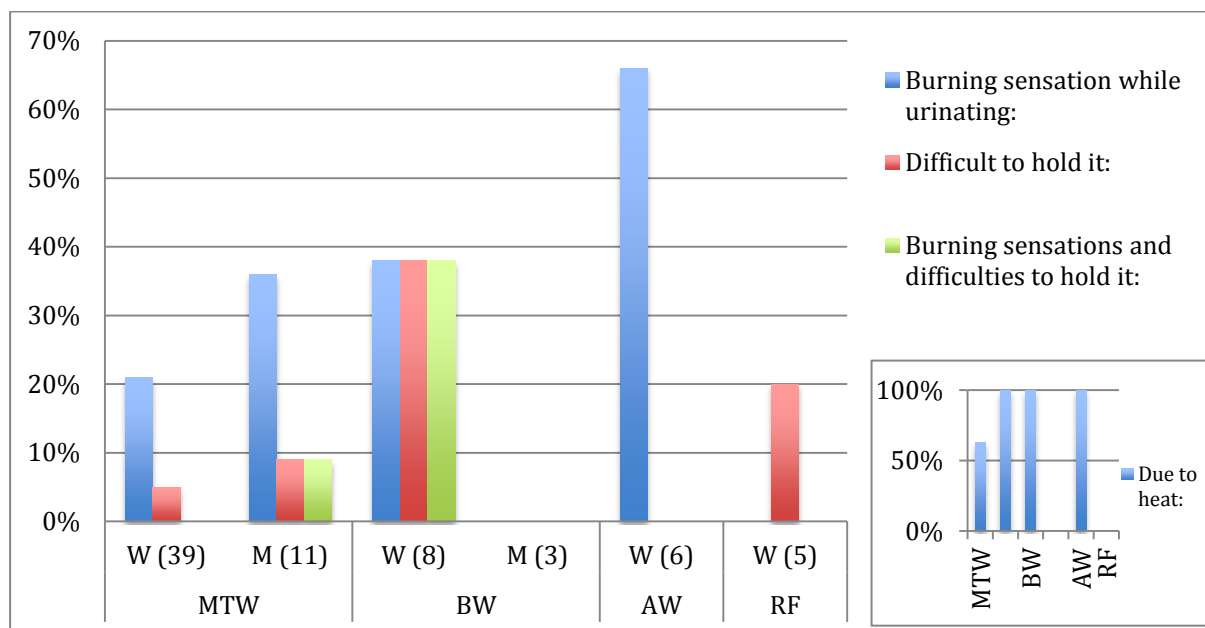


Figure 17. Symptoms that might be caused by urinal tract infection.

Figure 18 (inset). How many of the interviewees that feel the symptoms due to heat

It was common to feel dehydrated among the interviewees, especially among the female brick workers (Figure 19). This people did drink moderately but are working under hard conditions which may be the reason for them feeling dehydrated. It was not common to have any other dehydration symptoms. None of them have been admitted to hospital for it.

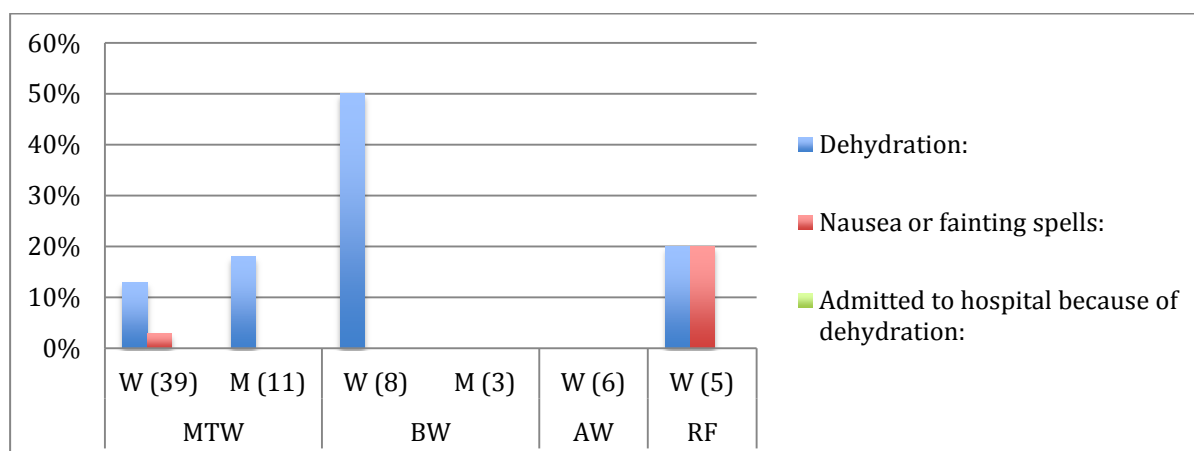


Figure 19. Number of interviewees that feel dehydrated (blue bars) and number of interviewees with symptoms caused by dehydration (red and green bars).

Among the maintenance workers and the female brick workers could the interviewee's notice that their urine were dark yellow, mainly during summer months that may be caused by not drinking enough and having too concentrated urine (Figure 20). Back pain that is an indicator for kidney problems, which in turn are an indicator for urinal tract problems, are common among the brick workers, male maintenance workers and the research fellows. As they did not show any other symptoms that may be caused by kidney problems the back pain can also be caused by their work. Brick workers are working in positions not proper for you to be in for longer periods and the male maintenance workers do hard work, such as painting, which may also cause back pain. This can therefore not be used as indicator for kidney problems. It is also none of the agricultural workers that feel back pain and none of them have been treated for kidney problems, which otherwise should be the group with the most kidney problems as they are the ones who has to hold it for longest. Only one has been treated for kidney problems (Figure 20).

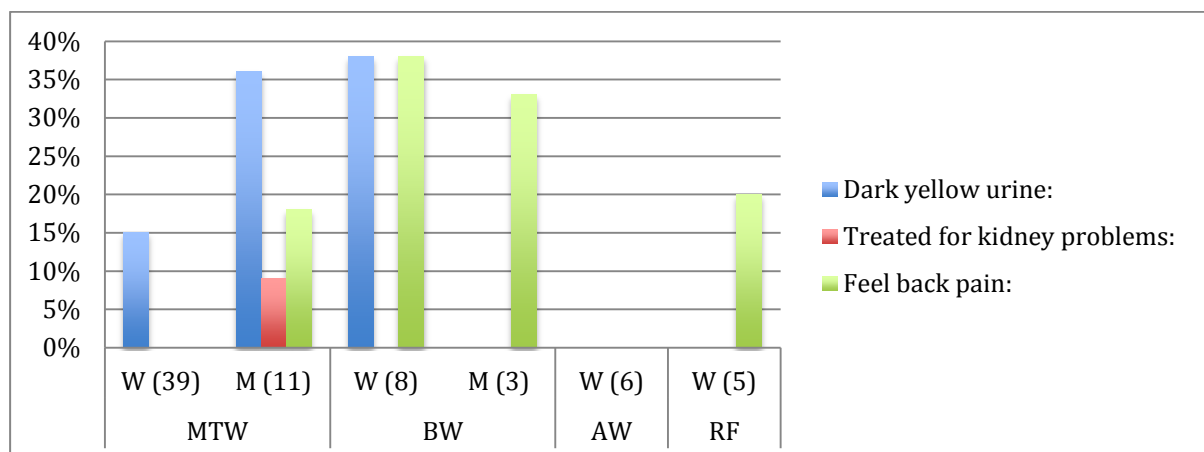


Figure 20. Symptoms indicating kidney dysfunction

As you can see in figure 21, none of the interviewees seems to have any symptoms caused by defecated drinking water. Most of them get their water from bottles or tanks, which is purified and therefore has fewer substances that infect the drinker. Only among the female brick workers, we can see that they only have one of the symptoms common when you have been drinking defecated water, feeling constant hunger even while eating. This symptom may therefore be caused by something else, such as not eating enough food, or because they eat fast carbohydrates and therefore becomes hungry quickly again. As they do not have any of the other symptoms for drinking defecated water it is hard to say if that is the reason for this symptoms. As the interviewees are used to drink this kind of water they may also be immune to some of the bacteria's and thus not have symptoms such as diarrhoea.

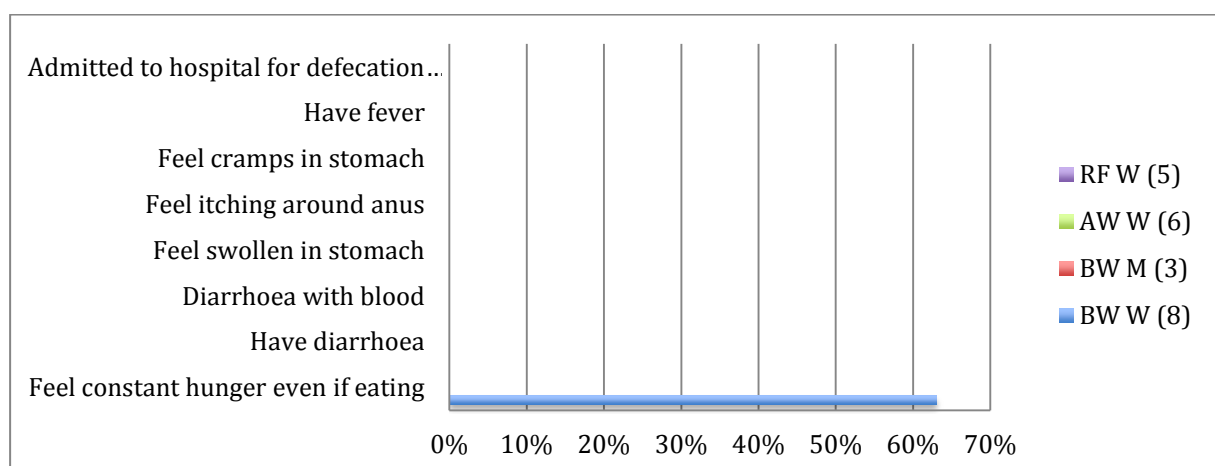


Figure 21. Health problems caused by drinking defecated water and, in %, how many of the interviewees that are affected

Most of the women are working during menstruation (Figure 22) and do not seem to find a problem with that. Only among the maintenance workers did some of the women feel that it was hard to work during menstruation. These women did also stay home from work during their menstruation, mainly because it caused them pain. Among the other workers menstruation did not seem to be a problem.

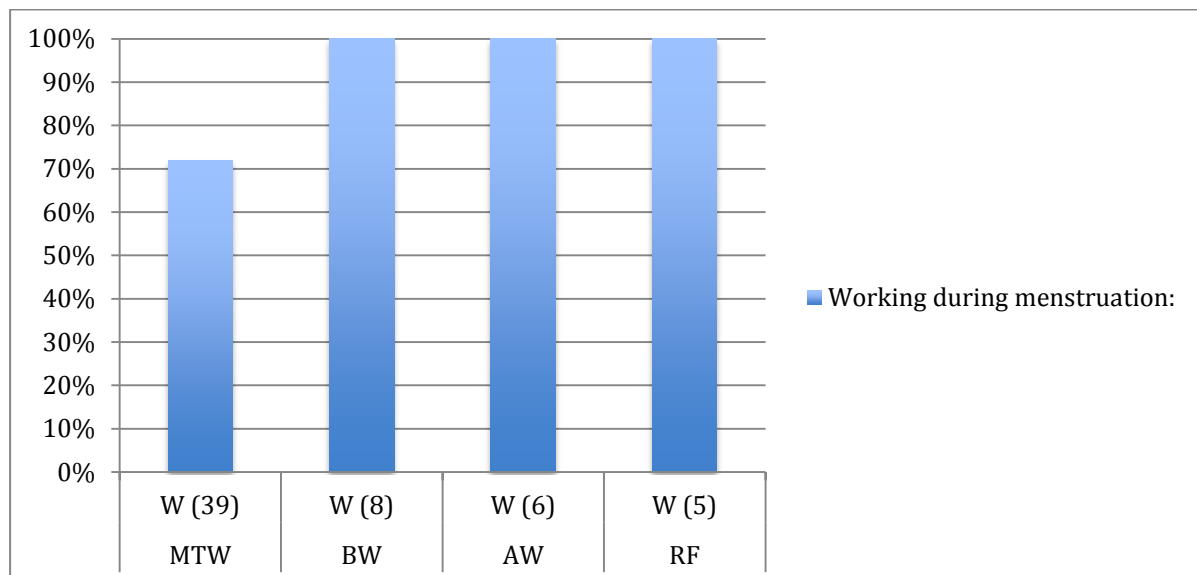


Figure 22. Proportion of women working during menstruation

All of the interviewees have access to a place to change sanitary pads during menstruation except the agricultural workers (Figure 23). Most of the interviewees can also wash regularly during their period, except most of the agricultural workers. Most of them do also have access to sanitary pads but the agricultural workers and the brick workers do use old clothing as pads.

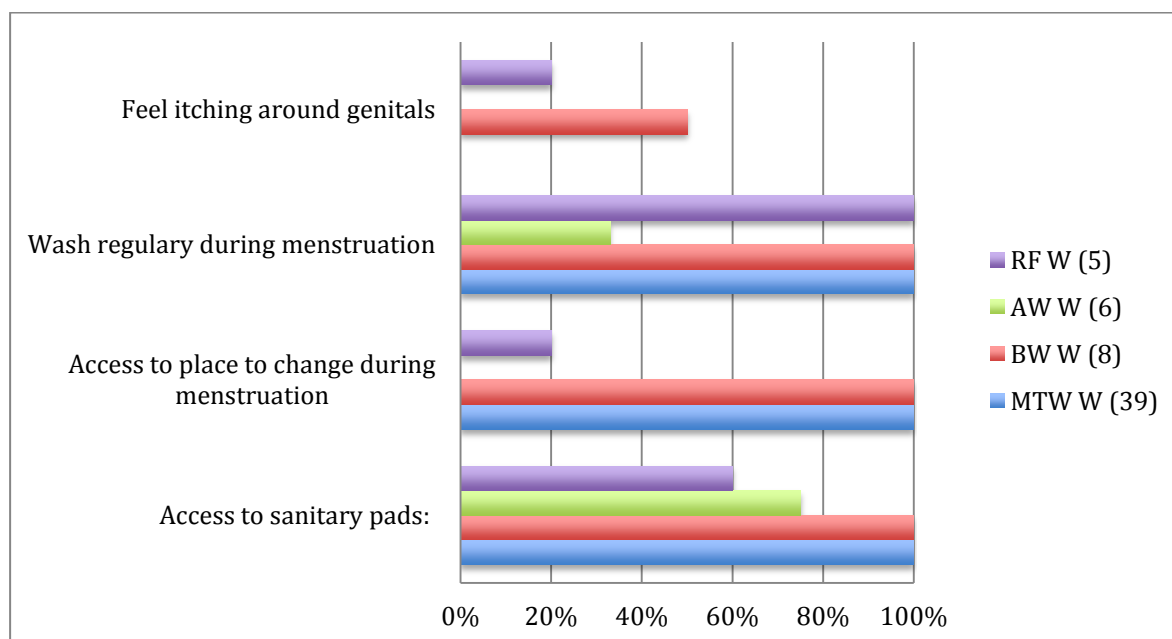


Figure 23. Habits and symptoms during menstruation

6 Discussion

Totally 72 people were interviewed. Among these 50 had access to toilets, 27 did not have access to toilets at all, either at home or at work. 5 of the interviewees did not have access to toilets during their field works, that was part of their work some days per week, the rest of their working time did they have access to toilets. Most of the workers were affected by the temperature and did feel uncomfortable a few months per year. The temperature also affected them by sensing symptoms caused by heat. The heat did affect their working time in different ways, such as work takes longer, feeling irritated or absenteeism. The maintenance workers did not feel that their working time was very affected by the heat.

Toilet habits also differs between the working group and maintenance workers relieve themselves most and the research fellows least. Where they go for urination or defecation is different in each group where female brick workers goes to the forest mainly, male brick workers to the fields, agricultural workers to a hidden area and the research fellow, where only one person answered this question, said she had to hold it for the whole day.

Among the symptoms caused by not drinking and relieving, most of the interviewees did not have many symptoms. Some of them had burning sensations while urinate, mainly due to heat. Many of them felt dehydrated but did not have other symptoms that are common while feeling dehydrated. Many of the interviewees did feel back pain that might be because of kidney problems, but did not have other problems that are common when there are problems with the kidneys. Problems during menstruation were not mentioned and everyone was comfortable during their period and did find solutions for changing sanitary pads and cleaning themselves.

6.1 Differences between the interviewee groups

The result differs sometimes between the interview groups. The heat is mainly affecting the brick- and agricultural workers, which make sense as they are most exposed to the sunlight while working. Many of the agricultural workers do mention that the temperature are most inconvenient during the cold season though, which might be because their bodies are more used to higher temperatures, and thus make it uncomfortable with the colder season, as it for, them are many degrees colder than most of the time. But the other groups do also find the temperature inconvenient even though they have better access to shadow. But as the temperature, during the summer, can be up to 40°C and the body can be overwhelmed already when the temperature is above 27°C, all the interviewees are exposed to a temperature that is not suitable to work in. Despite this, only male brick workers and the research fellows wanted to go to a comfort zone when the heat was overwhelming. This might be as none of the other workers did find a good comfort zone. The research fellows did sometime have access to the University where the rooms were equipped with air condition, and did therefore have access to a comfort zone sometimes during their work and could connect to this even during their fieldwork when they did not have access to any comfort zone. The male brick workers were working close to the heating of the brick, thus a more comfortable zone for them would be to leave the heating area and only be affected by the sunlight.

The agricultural workers are affected by most of the diseases in figure 10 which may be because they are working exposed to the heat the whole day. They do not have access to either toilets or water during their working times. This may be the reason why they are affected by most of the health effects caused by heat (Figure 10 & 11) as they are largely exposed to the heat and sunlight and have difficulties to drink and relieve themselves during their work. It may also be caused by their age as 50% of the interviewees are the age group 40-50 and heat affects people that are older than 45 more than others (EPA 2012, Hunt 2011). The research workers were also very affected by the heat even though their work is lighter than the agricultural workers. They do also have access to cooler areas and toilets more often than the brick- and agricultural workers. Why the research workers are more

uncomfortable with the temperature, comparing with agricultural- and brick workers, might be as they are not as used to this kind of working situation and thus are less adapted to the temperature. They also have an education in environment and health and can thus make clutches between their health and their working situation.

All groups felt that their working time were affected by the heat and felt that they had to work for longer hours or felt absenteeism (Figure 10, 11 & 12). All working groups did feel irritation except the agricultural workers and the female brick workers. Why they did not feel any irritation is not clear as their work is as hard as the other groups, sometimes harder, and they are exposed to the heat as much as the other interviewees. What links these two groups are that all are women, have a hard, low-income work and none or a primary education. This together may lead to little expectations of life and therefore less irritation. To feel irritated might be something you are not proud of and something that is not accepted among women, and therefore nothing you tell someone from a different social status and someone you do not know very well, or something you do not even show or tell anyone, as the answers are not socially acceptable.

The brick workers are the group that are drinking the most, at least among the men. Agricultural workers that have same kind of work does drink a lot less. The main reason for this may be, as they have no access to water during their work. This people do also have least access to a place to relieve and may thus wait until after work with drinking, as it can be complicated to hold it for as long as needed. They did not feel any health problems caused by dehydration though, which might be because their bodies are adapted to drinking less and therefore not show any symptoms even though the body might be dehydrated. It can also be that they have become accustomed to their health status and thus do not notice any symptoms. With physiological tests the health status might have been different.

Only one research fellow answered the questions about how she felt about the toilet situation during her fieldwork and did not feel comfortable. She had to hold it for longer than convenient and found it hard to find a good place to relieving herself. Why it was more difficult for her than the other interviewees to find a place for urination or defecation might be because she is used to more privacy while relieving and thus felt uncomfortable doing it outside where the risk of being seen is bigger than she is used to. As one of the agricultural workers mention, they (the agricultural workers) are used to being seen and does therefore not care anymore. This might be the case for the brick workers as well, as they also do open urination and defecation.

Only the interviewees with access to toilets did relieve themselves more than 6 times per day even though they were not the group that were drinking the most. This may be an indicator that relieving 1-4 times per day might be too little. But as there are only small interview groups and people from different kind of works you cannot be sure about the result, you also have to have in mind that people are different and some people need to relieve themselves more often than others. But the correlation between access to toilets and times per day for urination or defecation shows clearly that people with access to toilets relieve themselves more often than people without access.

Agricultural workers are the group where it is most common with burning sensations and it might be linked with the fact that they were the group that drank least and also had least access to a place for urination or defecation. That can also be connected with that men do not have any symptoms common for urinary tract infections as they have good possibilities to relieve themselves whether they have access to a toilet or not. Women are also more vulnerable to urinary tract infections and that may be a reason why the symptoms are more common among women in these study than men (Goldstein 2011). Why the interviewees feel burning sensation mainly during summer time might be as they drink more during this time but does still not urinate more than during colder times. This is something that needs further studies though.

According to previous studies it is not common for women to visit the doctors when they have health problems (Conrood 1998). Almost none of the women in this study have visited the doctor for any health problem caused by heat, dehydration or symptoms caused by lack of toilets, such as kidney-, liver- heart- or digestive problems (CCOHS 2008). Only two women have visited the doctor for kidney problems. This does therefore not show anything as they might have health problem that they are taught to ignore and not seek help for. Asking women for health symptoms may thus not give any answers as they might be used to ignore the symptoms and are not used to analyse their health status. The groups that are feeling nausea or fainting spells (symptoms for dehydration) are mainly the research fellows and the maintenance workers. Both these groups have a better situation at their work and the research fellows are well educated. They might therefore be able to analyse their health problems and link them with their situation. These people might also find it problematic earlier than the other groups as they might accept problems in life less than the other groups.

Some of the interviewees found that the urine is darker during summer than other. To be completely sure about the colour, test would have been needed. Even though they can see that their urine is darker than cold seasons they can only compare with themselves. Comparing with other people they might find that their urine is darker or lighter than other people all over the year, which means that their answer cannot give a complete picture of their urine colour.

Maintenance workers are the group that was most affected by their menstruation. None of the other interviewees did feel any problem while having their period but some of the maintenance workers found it hard to work because of pain. Their situation are still the best as they have good access to toilets, to sanitary pads and to a place to clean themselves, comparing with the brick- and agricultural workers that did not have access to a toilet and were using old clothing as sanitary pads. For the brick workers it would be costly to stay home from work during their menstruation as they get paid for each day they work. As mentioned above, you can also be more or less used to feel pain and if you never have been able to stay home because of pain you may not even think about that as an option. As menstruation is taboo in India it may also be hard to call in sick as the employer might figure out the cause and that, in turn can be embarrassing and more uncomfortable than work even though feeling pain.

The question if they wash regularly is diffuse as that for some people that means many times per day and for some only one time per day or less. That may be the explanation for why almost 50% of the brick workers feel itching around genitals even though they wash regular. The old clothing's may also be the reason for that because, as previous studies mention, it is hard to clean them and let them dry properly as that is something you cannot show men in your surroundings. None of the agricultural workers do feel itching even though they cannot change properly and not clean very often. But as they work only around 5 hours per day some days, they may have time to change in their home, before and after their work. Some of them might have been embarrassed to talk about their genitals with us and thus not told about if it is itching around genitals or not. Also, as with everything else, they might be used to the feeling of itching and therefore not think about it because of that.

One of the questions in the aim was to see if the situation differs between men and women, and as these interviewees did not show many health effects it is hard to say. Only 7% of the men (1 man) and 3% of the women (2 women) did visit the doctor because of health problems and that was a man. But as it is not same amount of women and men interviewed it is difficult to see a clear pattern. When it comes to toilet habits it is clear that men with no access to toilets go for relieving more often than women with no access to toilets. The men did also drink more than the women, which might be because they did not have to hold it for as long as the women. Men with and without toilets did go for urination or defecation for about as many times per day and men with no access to toilet did drink more than men with

access which might be as their work was harder and they were working under direct sunlight for many hours. It, therefore, does not seem like a problem for men to have no access to toilets, as it does for women.

Women with access to toilets did go as much as the men but women with no access to toilets went considerably fewer times. To see more clear how the situation differs between the gender, a deeper study needs to be done as lots of questions would have got another outcome if the interviewees would have known the interviewer better and therefore been more comfortable with talking about private things.

In total, agricultural workers seems to be the working group that have most health effect caused by heat but female brick workers seem to be the group that are most affected by more serious health effects such as prickly heat and tiredness, whereas the agricultural workers feel thirst and excessive sweating. Brick workers are the group that are most affected by sanitation related diseases, such as symptoms that might be caused by urinal tract infections and kidney problems and it is also the group where most people feel dehydrated (Figure 17, 19 & 20).

6.2 Previous studies

The result is rather different from previous studies. The interviewees claimed that they feel much better than most of the earlier studies assumes, none of them are very affected by not having access to toilets or working in direct sunlight for many hours per day. Most of the symptoms that were asked for were something that did not affect them. Among the interviewees did the maintenance workers have most health problems, not caused by heat or sanitation, and the research fellows did have most problems with both the toilet situation and the heat even though these two groups are disadvantaged compared to the other study groups. Both agricultural workers and brick workers are working under the sun the whole day and do not have access to a toilet in their working areas or their homes. If previous studies are reliable these groups should have lots of symptoms such as urinal tract infection, kidney problems, itching around genitals and more, but are at the moment rather healthy. None of the women with no access to toilets have not either been abused or attacked by animals while they are going for urination or defecation. The reason for this may be, as they felt uncomfortable giving detailed answers about their health problems and sanitation habits. It may also be because these interviewee groups are disadvantaged comparing with other groups in India where the access to private places for urination and defecation is limited or absent.

As the body has different abilities to adapt with the heat, these groups might be more adapted than the research fellows, and the agricultural workers do find it more problematic to adapt to the cold weather. But the risk for health effects caused by heat is not eliminated even though one is adapted to the heat and health problems may appear among the interviewees even though they feel comfortable (Parry et al. 2007). Agricultural workers are one working group that is at most risk for heatstroke (Parry et al. 2007) and as brick workers do same type of work they are probably also vulnerable to symptoms and diseases caused by heat. Being dehydrated affects the sweat production and as many of the interviewees mentioned, they do feel dehydrated. The agricultural workers did only drink 1-2 litres per day which may have certain effects on their sweating and this in turn make it more difficult for the body to cool down, during hot temperatures. Recommendations say that wearing light weighted clothes, seek out an air-conditioned environment, avoid physical activities, avoid going out during the hottest part of the day and drink regularly, is needed during hot weather. All these advise are hard for these interviewees to adjust to as all of them are working outside. Only the maintenance workers can go to a shadowed area. The research fellows have access to air-conditioned areas at their university but are, during their fieldwork, not able to use these places. Avoiding physical activities are also impossible for these people as their work is rather physical. Only the brick workers avoid working during the hottest part of the day as they start

early in the morning to be done before the sun is too strong. But using this method they have to work very early in the morning when it is still dark and working in darkness does probably have other health effects. Men are freer to wear clothes that are suitable for the temperature. Women need to cover knees and shoulders and can thus not choose how much clothes they want, and might feel warmer than the men that wear lighter clothes.

Even though the interviewees felt well, adjust with temperatures higher than 27°C can make the coping mechanisms overwhelmed and lead to serious and fatal conditions (CCOHS 2008). As these people do not feel very much problems with the heat this might be a more serious problem than if they could see early sign for health problems caused by heat and therefore adjust their living. Now, incidents might happen without any warning and may cause major problems. The majority of the interviewees did feel tired though, which might be an indicator that the body is working hard to keep down the bodily temperature. Mainly the women did feel tired and absenteeism that makes sense, as women are generally less heat tolerant.

It is more difficult to cope with the heat if one has other health problems but as most of the interviewees did not mention any health problem we cannot see them as a risk group. But these people are poor and do a non-ergonomic work which may cause health problem that is not mentioned or that the interviewees are not aware of as they have got used to them. For this physical examinations are needed. Being over-weighted is also a problem due to heat (EPA 2012, Hunt 2011), but these interviewees did not include anyone with over-weight.

Being tired and exhausted by the heat may be worse than they think though, as they are accustomed to their health condition and thus do not think about how tired they are. The brick- and agricultural workers might also have lower standards than the maintenance workers and the research fellows, as they are living under worse conditions. Having minor diarrhoea might not be something the interviewees think about if that is something they have had for their whole life caused by drinking water that is not sufficiently pure. The interviewees did, though, have better access to water than many people in the undeveloped world as they got their water from tanks and similar. This water may not be clean enough for a westerner and cause severe stomach problems, but for this people that are more used to the bacteria culture it may only cause minor diarrhoeas.

In previous studies it is clear that women in India's situation is disadvantaged and that they are more vulnerable than men (Burra et al. 2003, Coonrod 1998, Desai et al. 2011, Goldberg et al. 2011, Mahon et al. 2010, Rahman 2010, Ramesh 2012, Roy 2011, Scott 2003, UNU-INWEH 2010, Waterdrops 2009). This is nothing you can see in this study as they were working rather separate from each other and it is thus difficult to compare their working situations, and how their situation in their homes are, is not part of this study. You can only assume that women in this study are disadvantaged by using clues such as having never visited the doctor or going for reliving rarely. The interviewees do not mention that they feel disadvantaged and do not find problems with their life style but as they are used to this life style and used to be disadvantaged it might not be a problem for them, as they do not have an idea about how their life would be in a society of greater equality.

In previous studies you can see a correlation between bad sanitation and bad access to clean water, except in India where more people have access to clean water than to a toilet (Prasad 2012). The reason for this is probably that they have arranged systems that clean the water, through water tanks and bottled water. This is not a perfect option and to be able to give the people clean drinking water, a change in defecating habits is needed. If the people would be able to use water from the surroundings instead of buying or walk long distances to fetch water it would be a more sustainable solution, both for the economy, for the women's health and for the environment as everyone would have good access to clean water without using their energy for fetching it. As the interviewees in this study do have good access to drinkable water it is hard to see if water in their surroundings are affected by open defecation.

The interviewees in this study might not be the group of people that are most affected by bad sanitation and unclean drinking water. Doing interviews on for example villagers doing farm works might have given another outcome.

6.3 Strengths and weaknesses

Among all the answers from the interviewees, one should take into account that they may have other perspectives than the interviewer and thus respond different from what is expected. For example, changing sanitary pads regularly might mean one time per day for some but for someone else five times per day, which gives a different outcome. How the questions are asked may also change the answers. All question have been asked in Tamil, the main language in Chennai and it has therefore been hard to control that the questions are asked correctly and that the interviewees understand and answer properly. The questions in the questionnaire can be interpreted in several ways and the interviewees may give an answer to a slightly different question. The answers may therefore sometimes be somewhat confusing and own conclusions had to be drawn. To get more precise answers the questions from the questionnaires should have been tried on some groups before the real interviews.

As this topic is rather personal it might be embarrassing for the interviewees to answer this questions. Also being interviewed by someone from another social status and from a higher caste than your own may make you uncomfortable answering these question, as they might feel segregated from the interviewer. Only a few of the interviewees are educated and most of them are illiterate. This might make the interviewees uncomfortable and unsecure. It is only the research fellows that has a university education and thus are equal with the interviewer. As the questions are very intimate it might have been better to do a deeper study, where you get to know the interviewees. In that way you do not have to ask them personal question immediately and give them time to feel more comfortable with the interviewer. This kind of questions may give a better outcome if you let the interviewers talk in focus groups, together with each other with the interviewer in the background, mainly listening and only asking small questions to lead them right in the topic. Asking directly might scare them of and the answers will be that everything is perfect. Talking about bloody diarrhoea might not be something you openly talk with someone you have never met. An advantage, however, is that I, as the responsible for this study, am a woman. India is a segregated country where men and women do not stay closely with each other, most of the time. Women, though, seems to have a very open relationship with each other and it would therefore be possible to get personal answers from the women after some time.

As we only met the interviewees for a short time, we did not get to know the interviewees very well and it might be embarrassing for them to tell us about their stomach problems and give details about diarrhoea or menstruation, as it can feel personal and is nothing you talk about in the open with people you have never met before. Interviewing women about their health in a country where it is not common for women to talk about health or think about their own health does probably have effects on the study result and the result might have been different if these women were more accustomed to talk about their health.

Not knowing the language have probably changed the outcome for this study, as it has been hard to controlling the interviews. Some questions have been left out, that would have been important, sometime only as control questions, but still needful, as the interviewer have another background and find parts of the questionnaires more important than others as the interviewers are not part of this study.

To be able to visit the interviewees at their working places is a strength that produces more information than if they did only answer at the University area or similar. Some of the working places were hard to visit though and is one of the weaknesses with this project. It also made it difficult as they were speaking a different language, and for me, as the head of

this project, could not control that all the questions were asked and how they were asked. Interview people at their work about their working situation are difficult in a country as India. It was hard to ask the interviewees alone and some working places were not possible to visit. To visit all the work places certificate for permissions were needed. To be a part of the University and another study made by Indian people made it easier for me to get to these working places. On my own it had been very difficult as the supervisors of the work places were suspicious when someone wanted to ask questions. To be in India for a long time and meet lots of locals, both in this project and outside, did get lots of knowledge about Indian systems and common behaviours that has been useful during the whole study. Doing this study without visiting the country and only use literature would give a different result as lots of information is given during your daily life and not only during interviews or while reading literature. To gain more information about the interviewees health problems physical examinations are needed

6.4 Knowledge about health effects and environmental effects

Totally 72 people have been interviewed. Among these 40 are illiterate and 14 do only have a primary education. Only the research fellows have a university education and only one has a higher secondary education. Having knowledge about the environmental and health problem is thus nothing one can assume. The global change and environmental problems might not be interesting for them. These people are doing a hard work, and their salary is not very high. Many of them have big families and lots of work to do in their homes as well, such as taking care of children and cooking, which takes long time as they do not have access to tool that simplify their work. To deal with sanitary problems may therefore be difficult as they have less financial and other resources to deal with sanitary problems. Some of them does not either have the energy as most of their energy is to stay alive and take care of their family. Not having toilets in India is very common and around 50% do not have access to toilet. To go for defecation on the fields is thus nothing strange and many people do it together with friends and family. Therefore, there is not a will for many people to change their situation. In India it is mainly men taking the decisions and as it mainly is a problem for women, it is also a problem that is not taken care of, not mainly because the men do not care about there women, but as the gender are very segregated and for many women it may be a hassle to tell there father or husband. Telling your boss about the problem is most likely even more of a hassle as it is not only embarrassing but also a risk for your job.

6.5 Conclusions

Nevertheless this is a major problem in India with around 600 million people without access to proper toilets. Inform the people, both people without toilets and people with power to change the situation for this people, is something that has to be done. Many of the people, the interviewees for this study for example, do not have any knowledge about how the lack of toilets affects their health. They have even less knowledge about how this affects their environment. To change the situation for this entire people, they need to understand how it affects them and how it may affect their children. But giving information to 600 million people is not done in a day and when many of this people are uneducated it might be hard to reach them and hard to capture their interest as for them, having food for the day or maybe save money for their children school or daughters dowry, is more important. To solve this problem you cannot only focus on this but you have to focus on many inequalities. Maybe you reach these people if you also try to get more people to school or give a higher salary to the people with low income as that may give them more free time and less money issues to worry about.

To change the situation for the workers that have been interviewed for this project information is vital. Most of the interviewees did not have knowledge about health effects caused by bad sanitation. Increasing interest in these questions is also important and is also best done with information. If the workers would have knowledge about dangers with their working situation they might have been more interested to change it. But not only the

workers need information, also the managers at the works. If they would realize that their workers would do a better job if their health were better they might be more interested in changing their situation. Without money no changes will be done though, and the key to a change is therefore through money. If the bosses or the workers would loose money in a change, a change would not be of interest as they are not very well paid and money thus is very important. But if they would see economical benefits in a changed working situation a lot can change and as this would have economical benefits there is hope for a change with the help of information for both the managers and workers. Building composting toilet would be an option for these workers as water is not needed and it is relatively easy and cheap to build. For the agricultural workers, the faeces from the composting toilets would also be useful as fertilizers.

As India will be a bigger and bigger country and climate change will affect the earth and the people more and more, it is important to change the sanitary situation. With drought and flooding's the access to clean water will be reduced. Chennai is a coastal city, which will therefore be more affected by the flooding's, than inland cities. Changing the situation is thus vital. The climate change will also lead to higher temperatures and the heat will affect the people even more. This will mainly happen in poor countries, where it is more difficult to find solutions to make their situations better, with help from air-condition etc.

The right to clean water and a healthy living is also for those less fortunate and as they are vulnerable for climate change and thus will be affected largely everyone, together, has to work for a better environment for everyone and to reduce the increased climate change.

7 References

Alley, Richard B., Terje Berntsen, Nathaniel L. Bindoff, Zhenlin Chen, Amnat Chidthaisong, Pierre Friedlingstein, Jonathan M. Gregory, Gabriele C. Hegerl, Martin Heimann, Bruce Hewitson, Brian J. Hoskins, Fortunat Joos, Jean Jouzel, Vladimir Kattsov, Ulrike Lohmann, Martin Manning, Taroh Matsuno, Mario Molina, Neville Nicholls, Jonathan Overpeck, Dahe Qin, Graciela Raga, Venkatachalam Ramaswamy, Jiawen Ren, Matilde Rusticucci, Susan Solomon, Richard Somerville, Thomas F. Stocker, Peter A. Stott, Ronald J. Stouffer, Penny Whetton, Richard A. Wood & David Wratt, 2007. Summary for policymakers. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Anand, Anita, 2012. Toilet Heroines will be the pioneers. India Today. <http://wonderwoman.intoday.in/story/toilet-heroines-will-be-the-pioneers/1/98443.html>. 2012-03-19.

Anderson, Ingvar & Carolyn Hannan, 2002. Gender Perspectives on Ecological Sanitation. EcoSanRes.

Arnell, Nigel W., 1999. Climate change and global water resources. Global Environment Change 9 (1999) S31-S49.

Ashbolt, Nicholas J., Jorge W Santo Domingo & Avnish K. Panikkar, 2012. Fecal pollution of water. Encyklopedia of Earth. Eds. Cutler J. Cleveland (Washington D.C. Environmental information Coalition, national Council for Science and the Environment.

Banarjee, Abhijit, 2009. Dry Compost Toilets: India's Solution to Meet Millennium Development Goal. Earth Resources, Sustainable Living in India. <http://india-reports.in/energy-peak-oil/sustainable-living-in-india/dry-compost-toilet-india%E2%80%99s-solution-to-meet-millennium-development-goal/>. 2012-03-21.

Bartram, Jamie, Kristen Lewis, Roberto Lenton & Albert Wright, 2005. Focusing on improved water and sanitation for health. Lancet 2005; 365:810-12.

Berntell, Anders, 2005. Health, Dignity and Development: What Will It Take?. Stockholm International Water Institute, SIWI, and United Nations Millennium Project, New York.

Burra, Sundar, Sheela Patel & Thomas Kerr, 2003. Community-designed built and managed toilet blocks in Indian cities. Environment&Urbanization Vol 15 No 2.

Calvert, Paul, 2002. Compost Toilets. Practical Action. Technology challenging poverty.

CCOHS, 2008. Hot Environment – Health Effects. Canadian Centre for Occupational Health and Safety. www.ccohs.ca/oshanswers/phys_agents/heat_health.html. 2013-01-09.

Chaih, Fadela, Sari Setogi, Nada Osseiran, Veroniques Taveau & Veroniques Cordier, 2008. Poor sanitation threatens public health. WHO/Unicef. <http://www.who.int/mediacentre/news/releases/2008/pr08/en/> 2012-03-13.

Colopy, Cheryl, 2012. How No-Flush Toilets Can Help Make a Healthier World. Yale environment 360. http://e360.yale.edu/feature/how_no-flush_toilets_can_help_make_a_healthier_world/2581/ 2013-01-09.

Conant, Jeff, 2005. Sanitation and Cleanliness for a Healthy Environment. The Hesperian Foundation.

Conrood, Carol S., 1998. Chronic Hunger and the status of Women in India. The hunger project. <http://www.thp.org/reports/india wom.htm> 2012-03-19.

Costello, Anthony, Mustafa Abbas, Adriana Allen, Sarah Ball, Sarah Bell, Richard Bellamy, Sharon Friel, Nora Groce, Anne Johnson, Maria Kett, Maria Lee, Caren Levy, Mark Maslin, David McCoy, Bill McGuire, Hugh Montgomery, David Napler, Christina Pagel, Jinesh Patel, Jose Antonio Puppim de Oliveira, Nanneke Redclift, Hannah Rees, Daniel Rogger, Joanne Scot, Judith Stephenson, John Twigg, Jonathan Wolff & Craig Patterson, 2009. Managing the health effects of climate change. The Lancet Commission.

Desai, Renu, Colin McFarlane & Stephen Graham, 2011. Everyday sanitation. Informal settlements in Mumbai. ESRC. Economic & Social Research Council, Durham University. http://www.dur.ac.uk/geography/everyday_sanitation/acting_without_sanitation/ 2013-01-08.

EPA, 2012. Human Health Impacts & Adaption. United States Environmental Protection Agency. www.epa.gov/climatechange/impacts-adaption/health.html#impacts 2012-03-19.

Field, Christopher B., Vicente Baross, Thomas F. Stocker, Qin Dahe, Davi Jon Dokken, Kristie L. Ebi, Michael D. Mastrandrea, Katharine J. Mach, Gian-Kasper Plattner, Simon K. Allen, Melinda Tignor & Pauline M. Midgley, 2012. Managing the risks of extreme events and disasters to advance climate change adaption. Intergovernmental panel on Climate Change.

Gale, Jason, 2009. India Failing to Control Open Defecation Blunts Nation's Growth. Bloomberg. http://www.bloomberg.com/apps/news?sid=aErNiP_V4RLc&pid=newsarchive. 2012-03-20.

Githeko A.K. & A. Woodward, 2003. International consensus on the science of climate and health: the IPCC Third Assessment Report in: Climate change and human health. Risks and responses. World health organization, Geneva.

Goldberg, Alan B. & Sean Dooley, 2011. Disappearing Daughters: Women pregnant with girls pressured into abortions. ABC News. <http://abcnews.go.com/Health/women-pregnant-girls-pressured-abortion-india/story?id=15103950#.T2c3ZGKFrCo>. 2012-03-19.

Goldstein, Rachel, 2011. Study: Indian Women Are the Most Stressed on Earth. Time NewsFeed. <http://newsfeed.time.com/2011/07/13/study-for-women-india-is-the-most-stressful-country-on-earth/>. 2012-03-19.

Government of India, 2007. Rural Drinking Water and Sanitation in the Eleventh Plan period – Excerpts. Government of India. 54th NDC Meeting.

Hajat, Shakoor, Madline O'Connor & Tom Kosastsky, 2010. Health effect of hot weather from awareness of risk factors to effective health protection. The Lancet, 2010, Vol 375 (9717), s. 856-863.

Hesselbarth, Susanne, 2005. Socioeconomic Impacts of Water Supply and Sanitation Projects. KfW Entwicklungsbank. <https://www.kfw-entwicklungsbank.de/migration/Entwicklungsbank-Startseite/Entwicklungsfinanzierung/Sektoren/Wasser/Engagement-der-KfW-Entwicklungsbank/Wirkungen.pdf>. 2013-03-15.

Hunt, Andrew Philip, 2011. Heat Strain, Hydration Status, and Symptoms of Heat Illness in Surface Mine Workers. The School of Human Movement Studies and the Institute of Health and Biomedical Innovation. Queensland University of Technology.

Lahiri, Tripti, 2011. India Journal: Why Does India hate Women?. India Real Time. <http://blogs.wsj.com/indiarealtime/2011/11/06/india-journal-why-does-india-hate-women/>. 2012-03-19.

Mahon, Thérèse & Maria Fernandes, 2010. Menstrual hygiene in South Asia. A neglected issue for WASH (Water, Sanitation and Hygiene) programmes. Wateraid.

McMichael, A.J. 2003. Global climate change and health: an old story writ large, in: Climate change and human health. Risks and responses. World health organization, Geneva.

Menon, Ramesh, 2003. India needs another freedom struggler. India Together. <http://www.indiatogether.org/2003/dec/hlt-pathak.htm>. 2012-03-19.

Mercola, Dr., 2010. A Simple Solution to World Health Issues: Toilets. www.articles.mercola.com/sites/articles/archive/2010/07/01/a-simple-solution-to-world-health-issues--toilets.aspx. 2013-01-25.

NASA. Global Temperatures. <http://www.earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php>. 2013-05-22

NCDC, 2011. Global Climate Change Indicator. NOAA. National Climatic Data Center. National Oceanic And Atmospherics Administration. National Climatic Data Center. www.ncdc.noaa.gov/indicators. 2012-03-19.

O'Neill, Marie S., 2003. Air conditioning and heat-related health effect. Environmental Program, Department of Environmental health, Harvard School of Public Health, Boston, MA, USA.

Patel, Vikram, Betty R. Kirkwood, Sulochana Pednekar, Bernadette Pereira, Preetam Barros, Janice Fernandes, Jane Datta, Reshma Pai, Helen Weiss and David Mabey, 2006. Gender Disadvantage and Reproductive Health Risk Factors for Common Mental Disorders in Women. A Community Survey in India.

Peterson, Katie Maria, Ernie Diedrich & Jean Lavigne, 2008. Strategies for Combating Waterborn Diarrheal Diseases in the Developing World. Investigating Current Appropriate Technologies and their Effectiveness in Environmental Public Health. ES 395.

Popkin, Barry M., Kristen E. D'Anci & Irwin H. Rosenberg, 2010. Water Hydration and Health. Nutrition Reviews. Volume 68. Issue 8, s. 439-458.

Prasad, R., 2012. India is drowning in its own excreta. The Hindu. <http://www.thehindu.com/health/policy-and-issues/india-is-drowning-in-its-own-excreta/article3524150.ece>. 2013-01-08.

Rahman, M. Shamsur, 2010. Access to Water and Women Empowerment: A nexus in Cross Cultural Perspective. Public Administration Rajahahi University, Bangladesh.

Ramesh, Jairam, 2012. Lack of toilets is a huge issue for women and girls. Sulabh International Social Service Organisation. <http://www.sulabhinternational.org/?q=news/lack-toilets-huge-issue-women-and-girls/>. 2013-01-09.

Roy, Nilanjana S., 2011. Improving women's status, one bathroom at a time. NY Times. <http://www.nytimes.com/2011/03/16/world/asia/16iht-letter16.html>. 2012-03-19.

Saluja, Akansksha, 2012. Challenges in Eradicating Open Defecation. Design!public. <http://designpublic.in/blog/challenges-in-eradicating-open-defecation/>. 2013-01-08.

Sayre, Jed Christian, 2013. Ecological Sanitation Closes the Loop Between Health, Sanitation and Food Security. The Community Tool Box. http://ctb.ku.edu/en/out_of_the_box/finalists/communityinnovatorLocallyEmpoweredYouth.aspx 9-1-13. 2013-01-09.

Scott, Rebecca, Andrew Cotton & Beenakumari Govindan, 2003. Sanitation and the Poor. WELL Resource Centre. Network for water, sanitation and environmental health.

Shah Singh, Harmeet, 2009. In India's Villages: No toilet, no bride. CNN. http://articles.cnn.com/2009-10-28/world/intl.india.toilet.bride_1_toilet-villages-bathrooms?_s=PM:WORLD. 2012-03-19.

Sheikh, Shahana, 2008. An emphasis on the facilities for women in slum/resettlement areas. CCS Working Paper No. 192. Summer Research Internship Programme 2008. Centre for Civil Society.

UNU-INWEH, 2010. Sanitation as a Key to Global Health: Voices from the Field. United Nations University Institute for Water, Environment and Health.

Varghese, Cherian, N.S. Amma, K. Chitrathara, Namrata Dhakad, Preetha Rani, Letha Malathy & M.K. Nair, 1999. Risk factors for cervical dysplasia in Kerala, India. Bulletin of the World Health Organization.

Velkoff, Victoria A., 1998. Women's Education in India. Women of the world.

Water for all, 2009. India's sanitation for all: How to make it happen. Asian Development Bank.

Waterdrops, 2009. Women: water, sanitation and hygiene. Wateraid

Watson, Robert T., Marufu C. Zinyowers, Richard H. Moss & David J. Dokken, 1997. Summary for policymakers. The regional impacts of climate change: An assessment of vulnerability. Intergovernmental Panel on Climate Change.

Wherever the need, 2007. Women's eco-sanitation toilets, India. Wherever the need. www.wheretheverneed.org.uk. 2012-03-19.

WHO, 2005. Almost 2 billion more people need access to basic sanitation by 2015 to meet millennium target. WHO. <http://www.who.int/mediacentre/news/releases/2005/pr23/en/>. 2013-01-09.

WHO, 2011. Fact file. 10 facts on sanitation. WHO. www.who.int/features/factfiles/sanitation/facts/en/index1.html. 2013-01-25.

WHO, 2012:1. Water Sanitation Health. Fast facts. WHO. www.who.int/water_sanitation_health/monitoring/jmp2012/fast_facts/en/index.html. 2013-01-25.

WHO, 2012:2. 10 facts on climate change and health. WHO.
http://www.who.int/features/factfiles/climate_change/facts/en/index.html. 2013-01-08.

8 Appendix 1

MAIN STUDY QUESTIONNAIRE

Part 1 General information about person interviewed and the organization she/he represents

1. Name:
2. ID No:
3. Date of interview:
4. Name of the interviewer:
5. Name of the industry:
6. Location of the industry:
7. Type of industry:
8. Age:
9. Age group: ☐₁ 20-30 / ☐₂ 30-40 / ☐₃ 40-50 / ☐₄ 50 and above
10. Sex: ☐₁ Male / ☐₂ Female
11. Education: ☐₁ Illiterate / ☐₂ Primary / ☐₃ Secondary / ☐₄ Higher Secondary / ☐₅ University / ☐₆ Polytechnic/Diploma
12. Designation: ☐₁ Worker ☐₂ Supervisory ☐₃ Manager
13. Worker category:
14. Smoking: ☐₁ Smoker / ☐₂ Non Smoker / ☐₃ Ex smoker
15. Consuming alcohol: ☐₁ Yes ☐₂ No ☐₃ Ex
16. Any existing illness: ☐₁ Diabetes ☐₂ Hypertension ☐₃ Respiratory illness, specify ☐₄ Others, specify

Part 2 Questions concerning the type of work

1. Type of work: ☐₁ Light ☐₂ Moderate ☐₃ Heavy ☐₄ Very Heavy
2. What was your previous job and where (relating to temp)? _____
3. How long you are employed here? _____ years/months (more than 6 months means acclimatized)
4. Have you been doing this kind of work for the past few months regularly _____
5. How many hours per day do you usually work excluding regular break timings? -----
6. Do you work near a direct heat source (naked flame/hot air/outdoors/radiant heat)
☐₁ Yes / ☐₂ No
7. Is the place you work well-ventilated? ☐₁ Yes / ☐₂
8. Do you have additional breaks during summer? ☐₁ Yes / ☐₂ No
 - a. If yes, mention no. of hours/minutes _____

Part 3 Questions in relation to heat exposure at work

1. Are you comfortable with the ambient temperature? ☐₁ Yes / ☐₂ No
2. How many people work in this area? _____
3. Is heat exposure a problem during the hot season? ☐₁ Yes / ☐₂ No
4. How many months do you feel hot /uncomfortably hot in this workplace?
 - a) 1-3 months
 - b) 4-6 months
 - c) 7-9 months
 - d) 9-12 months
 - e) Never
5. Describe how bad the heat stress can be in the hot season.
 - a) Extremely bad
 - b) Very bad
 - c) Bad
 - d) Manageable
 - e) No stress at all

Part 4 Questions concerning impacts of heat on health

1. What symptoms do you face during summer months?
 - a) Excessive Sweating
 - b) Exhaustion
 - c) Thirst
 - d) Wanting to go to comfort zone
 - e) Others_____
2. Have you ever had these symptoms at work?
 - a. heavy sweating ☐₁Yes / ☐₂No
 - b. muscle cramps ☐₁Yes / ☐₂No
 - c. Tiredness/weakness ☐₁Yes / ☐₂No
 - d. dizziness ☐₁Yes / ☐₂No
 - e. headache ☐₁Yes / ☐₂No
 - f. nausea or vomiting ☐₁Yes / ☐₂No
 - g. fainting ☐₁Yes / ☐₂No
3. Have you ever been affected by any of the following?
 - ₁ Prickly heat
 - ₂ Heat cramps
 - ₃ Heat exhaustion
 - ₄ Heat syncope (fainting)
 - ₅ Heat stroke

Part 5 Questions concerning impacts of heat on worker's productivity

1. Have you ever taken sick leave/permission due to heat? Yes /No
 - a. If yes, approx. how many hours in a week?----- Month-----
2. Have you lost any wages due to absenteeism in summer months?
 - a. If yes, how much _____?(currency)
3. Have you ever been advised to take off due to heat related illness? ☐ 1 Yes / ☐ 2 No
4. Have you ever been admitted in hospital/medical centre due to heat related sickness?
Yes/No
 - a. If yes, approximately how many days_____
5. How does heat affect other aspects of your work (during hot seasons)
 - a) Absenteeism
 - b) Less productivity
 - c) Irritation/Interpersonal issues
 - d) Work related issues with manager
 - e) Take more time to complete same task
6. How much production target do you have? _____
7. Do you complete your production target? Yes/No
 - a. If no, how much target is not completed? _____units
8. To achieve production target or complete work do you have to work extra hours?
 - a. If yes, how many extra hours _____

Part 6 Questions concerning impacts of clothing on heat stress and productivity

1. Dress material of the workers (Indian equivalent to ACGIH)
 - a) Breathable cotton
 - b) Thick cotton overall
 - c) Rayon/Nylon
 - d) Plastic PPE
 - e) Others_____
2. Worker perception about dress Material of the worker:
 - a) Comfortable
 - b) Moderately comfortable
 - c) Uncomfortable

- d) Others____
- a. If uncomfortable, can you give any suggestions to improve?
3. Do you feel hotter with uniform/ Does the Dress Material increase heat stress/comfort?
- a) Sure
b) Maybe
c) Not sure
d) No, not at all
4. Does clothing reduce your work output?
- a) Sure
b) May be
c) Not sure
d) No, not at all
- a. If clothing impedes your work out put, based on your perception can you tell how much?
- a) About 10%
b) 10-25%
c) 50%
d) No sure

Part 7 Questions concerning coping mechanisms:

1. How do you limit heat exposure, when needed?
 - a) Get away for a while
 - b) Remove the clothing
 - c) drink water
 - d) any other method, do specify_____
2. If you are feeling unwell from heat exhaustion how do you cope with this?
 - 1take rest
 - 2cool shower, bath, or sponge bath
 - 3move to an air-conditioned/cooler environment
 - 4switch to Light weight clothing
 - 5any other method, do specify_____
3. Do you drink water at work? Yes / No
4. Is sufficient water available at all times when you need it? Yes / No
5. How much do you drink in a day in hot conditions? _____ltrs/cups
6. Do you take any traditional special diet to cope with heat? _____
7. What traditional or other methods do you adopt for coping with heat? _____
8. Do you spend more money during hot seasons to cope with heat? _____
 - a. If yes, specify _____ (Currency units)
9. Do you spend more time to cope with heat? If yes how much _____ (min/hrs) – convert to % of productivity time or personal time
10. Does the time spent on coping heat impact your social life? Yes/No
11. How does it affect your social life?
 - a) Moderately
 - b) Highly
 - c) Extremely
 - d) No impact

Part 8 Questions concerning access to toilets:

- 1 Do you have access to toilets at work? 1Yes / 2No

Part 9 Questions if you have access to toilets:

1. How many toilets do you have in the work location?
a. 1-2 b. 3-4 c. 5-6 d. >6
2. Do you use the toilets? 1Yes / 2No
a. If yes: How often
 a) They are too far away
 b) Difficulties to get away from work
 c) They are too dirty
 d) Others
b. If no: Why not
 a) 1-2 times per day
 b) 3-4 times per day
 c) 5-6 times per day
 d) >6 times per day
3. Can you talk about it in the open? 1Yes / 2No
a. If no: Why not
 a) It makes you feel uncomfortable
 b) It is taboo
 c) People around you would treat you outrageous
 d) Others

Part 10 Questions if you don't have access to toilets

1. How often do you go to urinate and defecate?
a) 0 times
b) 1-2 times
c) 3-4 times
d) 5-6 times
e) >6 times

If b-e:
2. Where do you go to urinate and defecate?
a) An hidden area (small building etc.)
b) In the forest
c) On the streets
d) Others
3. Do you go alone? 1Yes / 2No
4. Do you feel comfortable with that option? 1Yes / 2No
a. If no: Why not?
 a) Feel scared
 b) Needs to hold it for longer than convenient
 c) Feel uncomfortable
 d) Others
5. Have something inconvenient happened to you when you go for urination or defecation? 1Yes / 2No
a. If yes: What have happened
 a) Bitten by an animal
 b) Someone has been watching
 c) Assaulted
 d) Others
6. Do you feel that you have to hold it for longer time than convenient?
1Yes / 2No
a. If yes: For how long approximately?
 a) 1-2 hours

- b) 3-4 hours
 - c) 4-5 hours
 - d) >6 hours
- 7. Do you sometimes have to stay home from work because of the toilet situation during some stomach infection or similar situation?
1Yes / 2No
 - a. If yes: How often
 - a) Once per year
 - b) 2-5 times per year
 - c) 6-11 times per year
 - d) Once per month
 - e) More than 1 time per month
- 8. Do you think your working situation would be better if you had access to toilets?
1Yes / 2No
- 9. Do you have access to toilets in you home? 1Yes / 2No

Part 11 Questions concerning reproduction history and menstrual history:

- 1. Is your menstrual cycle regular? 1Yes / 2No / 3Others
 - a. If yes: Can you work during your menstrual cycle? 1Yes / 2No / 3Others
 - a) If no: Why not?
 - a) Nowhere to take care of sanitary pads
 - b) Feel to dirty
 - c) Not allowed
 - d) Lack of toilets
 - e) Others
- 2. Do you have access to sanitary pads during your menstrual cycle?
1Yes / 2No
- 3. Do you have access to a place to change sanitary pads during your menstrual cycle?
1Yes / 2No
 - a. If yes: Do you go there? 1Yes / 2No
 - a) If no: Why not
 - a) It is too far away
 - b) It is to dirty
 - c) It is not private enough
 - d) Afraid that someone will be aware of you menstrual cycle
 - e) Others
- 4. If you don't have access: How do you manage?
 - a) Go somewhere else
 - b) Wait the whole day
 - c) Stay home from work
 - d) Others

Part 12 Questions concerning access to drinking water

- 1. Do you have access to drinking water at your work? 1Yes / 2No
 - a. If yes: From where do you get that water?
 - a) From a water tank
 - b) Water bottles
 - c) A river or lake etc. close to the area
 - d) Others
- 2. Do you drink when you feel thirst? 1Yes / 2No
 - a. If no: why not?
 - a) Not access to water

- b) It will be too difficult to hold it
 - c) The work does not allow it
 - d) Others
- 3. Do you think you would drink more if you had better access to toilets? 1Yes / 2No
 - a. If no: Why not?
 - a) The access to water is not good
 - b) The work does not allow it
 - c) Others

Part 13 Questions concerning effects on daily life:

- 1. Does the toilet situation impact your social life? 1Yes / 2No
 - a. If yes: How?
 - a) Have to stay home more than if there had been toilets
 - b) Feeling tired
 - c) Others

Part 14 Questions concerning urinary tract infection:

- 1. Do you have burning sensation during urination? 1Yes / 2No
 - a. If yes: How often?
 - a) Every day
 - b) Few days a week
 - c) Once a week
 - d) Less than once a week
 - b. If yes: For how long?
 - a) The last week
 - b) The last month
 - c) The last 6 months
 - d) Longer than 6 months
- 2. Do you have difficulties to hold it? 1Yes / 2No
- 3. Do you feel difficulty while urinating even if it is needed? 1Yes / 2No
 - a. If yes: How often?
 - a) The last week
 - b) The last month
 - c) The last 6 months
 - d) Longer than 6 months
- 4. Do you think this problem would have been better if you had better access to toilets? 1Yes / 2No
- 5. Have you ever been admitted to hospital/medical centre due to urinal or defecation problems? 1Yes / 2No
 - a. If yes: Approximately for how many days?.....

Part 15 Questions concerning kidney problems:

- 1. Have you noticed changes in your urine volume? 1Yes / 2No
- 2. Do you have excessive tiredness or skin itching? 1Yes / 2No
- 3. Do you have numbness or swollen legs or hands due to water retention? 1Yes / 2No
 - a. If Yes to 1, 2 and 3, What is the colour of your urine?
 - a) Reddish
 - b) Dark Yellow
 - c) Yellow
 - d) Colourless
 - e) Have not noticed
 - f) Don't know

4. Have you been treated for kidney stones? 1Yes / 2No
 - a. If yes: When? -----
5. Do you feel pain in the bottom of your back? 1Yes / 2No
 - a. If yes: For how long?
 - a) The last week
 - b) The last month
 - c) The last 2-6 month
 - d) Longer than the last 6 months
6. Do you think this problem would have been better if you had better access to toilets? 1Yes / 2No
7. Have you ever been admitted to hospital/medical centre because of kidney problems? 1Yes / 2No
 - a. If yes: Approximately for how many days?.....

Part 16 Questions concerning dehydration:

1. Do you feel dehydrated? 1Yes / 2No
2. Do you have any pressure ulcers? 1Yes / 2No
3. Do you have any other skin conditions? 1Yes / 2No
4. Do you have nausea or fainting spells? 1Yes / 2No
5. Have you ever been admitted to hospital/medical centre due to dehydration? 1Yes / 2No
 - a. If yes: Approximately for how many days?.....
6. Do you think this problem would have been better if you had better access to toilets? 1Yes / 2No

Part 17 Questions concerning drinking defecated water:

1. Do you feel constant hunger even if you are eating? 1Yes / 2No
2. Do you have diarrhea? 1Yes / 2No
3. Do you have diarrhea with blood and mucus? 1Yes / 2No
4. Do you feel swollen in your stomach? 1Yes / 2No
 - a. If yes: Which part?
 - a) Upper part
 - b) Lower part
 - c) The whole belly
5. Do you feel itching around anus? 1Yes / 2No
6. Do you feel cramps in your stomach? 1Yes / 2No
7. Do you have fever? 1Yes / 2No
 - a. If yes: How often
 - a) Every day
 - b) 1-6 days per week
 - c) A few days per month
 - d) A few days per year
 - e) Less than a few days per year
8. Do you think this problem would have been better if you had better access to toilets? 1Yes / 2No
9. Have you ever been admitted to hospital/medical centre because of defecation problems? 1Yes / 2No
 - a. If yes: Approximately for how many days?.....

Part 18 Questions concerning menstrual cycle:

1. Do you wash yourself regularly during your menstrual cycle? 1Yes / 2No
2. Do you feel itching around your genitals? 1Yes / 2No
 - a. If No, Do you think this problem would have been better if you had better access to toilets? 1Yes / 2No

Part 19 Questions concerning other health effects:

1. Do you feel any other health problems than the ones mentioned above? 1Yes / 2No
 - a. If yes: What kind of health problems?
.....
 - b. If yes: Do you think they may be caused by lack of toilets? 1Yes / 2No
2. Do you think it would be less health problems if you would drink more? 1Yes / 2No



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