THE PROBLEM OF HANDWASHING AND PAYING FOR WATER

IN SOUTH AFRICA

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THE PROBLEM OF HANDWASHING AND PAYING FOR WATER IN SOUTH AFRICA.

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ABOUT THE PROJECT

The Municipal Services Project (MSP) is a multi-partner research, policy and educational initiative examining the restructuring of municipal services in South(ern) Africa. The Project's central research interests are the impacts of decentralisation, privatisation, cost recovery and community participation on the delivery of basic services to the rural and urban poor, and how these reforms impact on public, industrial and mental health.

The research has a participatory and capacity building focus in that it involves graduate students, labour groups, NGOs and community organizations in data gathering and analysis. The research also introduces critical methodologies such as 'public goods' assessments into more conventional cost-benefit analyses.

Research results are disseminated in the form of an occasional papers series, a project newsletter, academic articles/books, popular media, television documentaries and the internet.

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SUMMARY

Water-related diseases, in particular diarrhoea, are widely recognised as a major threat to public health, especially in the developing world. It is estimated that globally 19% of all infectious diseases are related to water, sanitation and hygiene risk factors. Nearly two million children die annually from diarrhoeal diseases, making them one of the top three killers of children in the world today. Epidemiological investigations have shown that even in the absence of toilets, diarrhoeal morbidity can be reduced with the adoption of improved hygiene behaviours.

In South Africa the provision of basic infrastructure such as water and sanitation has been an important part of the social contract between the African National Congress–led government and its constituencies. In 2001 the South African government became a partner in the Water, Sanitation and Hygiene for All (WASH) campaign, which was, in brief, designed to bring attention to and attract resources towards addressing the situation of millions of people without access to adequate water supply and sanitation in the world.

In Johannesburg, a privately managed parastatal company – Johannesburg Water – has been contracted to deliver water and associated services in the city. As part of their water service delivery and improvement of services, the company has opted for various methods of delivery, some of which include the use of prepaid water meters and yard taps. A large pilot project of water service delivery through prepaid water meters has been embarked upon in Soweto.

The research question asked in this study was: Do households respond differently to hygiene and handwashing interventions such as WASH depending on the water systems and payment systems that they have? More specifically, is there a difference in handwashing behaviours between caregivers living in households with in-house prepaid water meters as compared to caregivers living in similar households with deemed consumption accounts for water (i.e. credit billing that is paid at the end of each month)? If so, why?

Hygiene education materials (specifically related to the transfer of pathogens and diarrhoea), which were developed, tested and used with great success by a group in Cape Town called the Khayelitsha Water and Sanitation Programme, were used to educate the selected sample households in Soweto with respect to hygiene practice, particularly those

aspects related to pathogen transfer. Each household in the Soweto case study was visited; the caregiver and all other interested members in the household were then given the intervention. Afterwards, questions were answered and appointments were made with the household to visit them for the observation (data collection) task.

Data were collected via observation of the carers at the selected households. The observations were carried out by trained researchers using a general questionnaire and a structured questionnaire/checklist.

Of the 107 households surveyed, 51 had prepaid meters and 56 were operating on deemed water consumption. All of the deemed consumption households had water available on the day of the observation, while in the prepaid households water was available in 48 (95%) of households. Water availability was considered an essential variable in determining water use with respect to handwashing and hygiene.

The most desirable practice (i.e. hands washed for several seconds with water flowing from a tap) showed a small difference between the two types of supply in terms of those who always used flowing tap water to wash their hands. This difference was negligible, however, as a very small proportion in both groups actually always washed their hands under flowing tap water. More importantly, there was a significant difference in the proportion of household carers with deemed versus prepaid water who never washed their hands with flowing tap water (43% with deemed consumption versus 77% with prepaid meters; $p<0.05$).

Of those who washed their hands under clean flowing water, two thirds (67%) of observed caregivers in both groups always displayed adequate washing. So, while the numbers of those actually washing their hands are small, it seems that this small proportion who are washing their hands seem to be doing it adequately.

Handwashing behaviours before handling food and after using the toilet are accepted as the best predictors of diarrhoeal and other diseases spread via the faecal-oral route. Of those caregivers observed in this study, it was found that just under 60% actually washed their hands before handling food (for both the deemed consumption and prepaid households). Of these, 40% of deemed consumption households were observed as having adequately washed their hands, while 57.1% of prepaid household caregivers were recorded as having adequately washed their hands.

This study illustrates that the WASH campaign has definitely not had any impact in the community under study. In fact, the campaign seems to have been completely ineffective in that hands were not even being washed at all, let alone being washed at 'the right times'. In general, hygiene behaviours were worse in households that were being supplied by the prepaid method.

INTRODUCTION

Water, Sanitation and Health

Water and health are related in a number of ways. Water-related diseases can be classified into four broad groupings: waterborne, water-washed, water-based and water-related vector-borne diseases and chemically contaminated.

First, there is the direct impact of consuming contaminated water – this is known as 'waterborne disease' and includes typhoid, viral hepatitis A, and cholera. Second, there is the effect of inadequate quantities of water being available for personal care or food. Without enough water, skin and eye infections (including trachoma) are easily contracted and spread, as are the faecal-oral diseases. These diseases are known as 'water-washed diseases' and include diarrhoea and dysentery. The latest United Nations Development Programme (UNDP) Human Development Report estimates that some 1.8 million child deaths occur each year as a result of diarrhoea – 4900 deaths each day, or an under-five population equivalent in size to that for London and New York combined. Together, unclean water and poor sanitation are the world's second biggest killer of children. Deaths from diarrhoea in 2004 were some six times greater than the average annual deaths in armed conflict for the 1990s. There is also a loss of 443 million school days each year from water-related illness (UNDP 2006).

The 1998 South African Demographic and Health Survey (SADHS) found that 13% of children under the age of five were reported to have had a bout of diarrhoea in the two weeks prior to the survey. A very much higher prevalence (23%) occurred in children 6-23 months of age, a finding consistent with age-specific diarrhoea morbidity patterns elsewhere in the developing world. A substantial stepwise decrease in prevalence occurred in the third (12%), fourth (8%) and fifth (5%) years of life. The lower prevalence rate in infants under the age of six months (11%), compared with the second half of infancy, is likely to reflect the protective effect of breastfeeding. Water, sanitation, and hygiene interventions reduce diarrhoeal disease on average by between one quarter and one third (Esrey et al 1991).

Thirdly, there are 'water-based diseases' and 'water-related vector-borne diseases' in which the aquatic environment provides an essential habitat for the mosquito vectors and intermediate snail hosts of parasites that cause human diseases. Malaria, schistosomiasis,

lymphatic filariasis, onchocerciasis and Japanese encephalitis are examples of these diseases. Intestinal worms infect about 10% of the population of the developing world. These can be controlled through better sanitation, hygiene and water supply. Intestinal parasitic infections can lead to malnutrition, anaemia and retarded growth, depending upon the severity of the infection. Two hundred million people in the world are infected with schistosomiasis, of whom 20 million suffer severe consequences. Three hundred million people suffer from malaria and two million people die of malaria in sub-Saharan Africa alone each year (WHO 2002). In South Africa, between 2000 and mid-2005, there were 138 828 reported cases and 945 reported fatalities from malaria (DWAF 2005).

Fourthly, there is chemically contaminated water such as water containing excessive amounts of arsenic or fluoride. Some contaminants are added to drinking water as a result of natural processes and some due to human activities such as industry and mining. Poor communities, especially in urban fringe areas, are particularly susceptible to dangers from polluted water from a variety of sources due to lack of or poorly enforced regulation of water pollution.

Water-related diseases, in particular diarrhoea, are widely regarded as the major threat to public health in the developing world. It is estimated that globally 19% of all infectious diseases were related to water, sanitation and hygiene risk factors in the year 2000. Diarrhoeal diseases are all of faecal origin. At least 20 viral, bacterial, and protozoan enteric pathogens multiply in the human gut, exit in excreta, and transit through the environment, causing diarrhoea in new hosts (Curtis and Cairncross 2003). One gram of faeces can contain as many as 100 million viruses and 10 million bacteria (Curtis 2003). If diarrhoeal disease is to be prevented, the transfer of pathogens from faeces to ingestion of these pathogens has to be stopped. Diarrhoeal disease in children is regarded as one of the better indicators of water and sanitation conditions within the area being studied. Research has shown that poor water quality and quantity, poor sanitation and bad hygiene practices all contribute significantly to an increase in diarrhoeal diseases, especially in children. According to data published by Murray and Lopes in 1996, globally 5.3% of all deaths and 6.8% of all disability adjusted life years (DALYs) are lost because of poor water supply, sanitation and personal domestic hygiene (Thompson and Khan 2003).

Some of the most common water-related diseases are due to intestinal worms. They come from human faeces, and they tend to affect children more than adults. In poor communities without sanitation it is typical to find well over half the children infected with intestinal worms. In a 1997 survey conducted by the South African Medical Research Council (Fincham et al. 1997), 1200 primary school children from Khayelitsha, a Cape Town township, were examined for worms. The results were astounding. Prevalence of whipworm (Trichuris trichiura) and roundworm (Ascaris lumbricoides) was estimated, respectively, as 80.3% and 69.7%.

The overall prevalence of infestation per school ranged between 91-100%. These intestinal worms have various effects. Ascaris diverts about one third of the nutritional intake of a child with a typical worm burden, and is also an important cause of asthma in poor communities. Trichuris is a serious cause of stunting in children, and of chronic colitis in toddlers, so long-lasting that their mothers rarely think of taking them for treatment as they tend to think that this diarrhoea is a normal condition for these children. The nutritional effect of intestinal worms is evident from cases where stunted children have been treated with deworming drugs, producing an immediate spurt in growth (Stephenson et al. 1989). Treatment alone, however, is not a sustainable option as the children are quickly reinfected.

Cholera is also an important indicator of water and sanitation conditions. Cholera is an infection caused by the bacteria Vibrio cholerae. People become infected by drinking water or eating food contaminated by the bacteria. This occurs in the context of poor sanitation as well as inadequate personal and domestic hygiene practices. The bacteria present in the faeces of an infected person are the main source of contamination and the principal site affected is the gastrointestinal tract. Symptoms include acute watery diarrhoea (sudden diarrhoea with profuse, watery stools), vomiting, suppression of urine, rapid (severe) dehydration, fall of blood pressure, cramps in legs and abdomen, subnormal temperature, and complete collapse. Death may occur within 24 hours of onset unless prompt medical treatment is given to the patient. Vibrio cholerae can remain in the intestinal tract long after recovery, being shed by the carrier for up to a year after infection. Consequently, the disease can spread rapidly in areas where drinking water supplies are contaminated by sewage and inadequately treated.

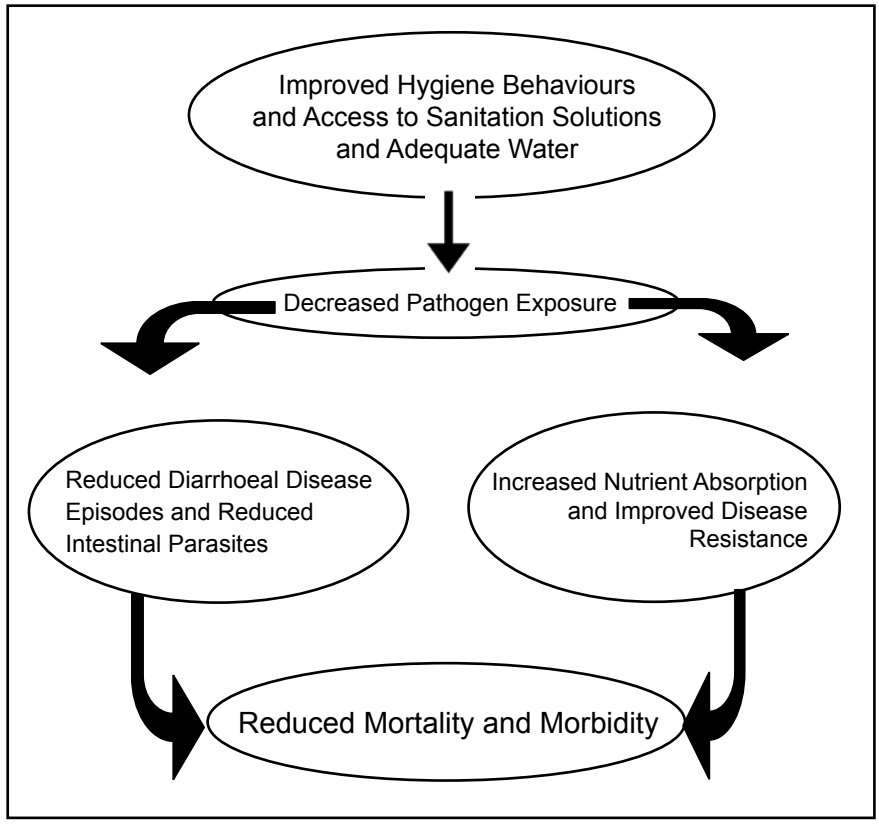
In August 2000 the province of KwaZulu-Natal experienced an outbreak of cholera that quickly spread to eight of the nine provinces in the country (the Northern Cape had no reported incidents), becoming the most serious such epidemic ever experienced in South Africa (Sidley 2001). In 20 months, the total number of cases was recorded at 117 147 and the total number of fatalities was 265 (DOH 2006).

After the outbreak of the epidemic, the government began implementing interventions in affected communities that included the trucking in of water via water tankers and the construction of temporary toilets and latrines. Much money was spent on trying to control the epidemic but despite the interventions the situation continued to worsen.

PREVENTING WATER-RELATED FAECALLY-TRANSMITTED DISEASES

Water and sanitation improvements affect health primarily by interrupting or reducing the transmission of disease agents, as illustrated in Figure 1 (Billig et al. 1999). This occurs through a variety of mechanisms. Of primary importance is the safe disposal of human faeces, thereby reducing the pathogen load in the ambient environment. WHO and UNICEF promote three key hygiene behaviours as having the greatest potential health impact: hand washing with soap (or ash or other aid); safe disposal of children's faeces; safe water handling and storage.

Figure 1: Link between hygiene and mortality



Sanitation

Experience has shown that clean water alone leads only to minor health improvements. Sound hygiene behaviour must be recognised as a separate issue in its own right, with adequate sanitation and clean water as supporting components. While each of the three elements has some health benefit, it is their combined effect that has far greater impact. Thus, hygiene behaviour is virtually impossible without a source of clean water and a safe means of disposal of human and other wastes.

Studies have shown that improvements in water supply, sanitation and hygiene are associated with a reduction of 22% in diarrhoea incidence, and of 65% in deaths due to diarrhoea (Esrey et al. 1991). Other studies have shown that hygienic disposal of children's stools is associated with 30-40% less risk of serious diarrhoea (United Nations Children's Fund 1999). A study by Baltazar and Solon (1989) found a 64% increase in pathogen-positive diarrhoea in families where children's stools were inadequately disposed of. A case-control study of the risk factors for diarrhoea in children under three in Burkina Faso (Traoré et al. 1994) reported that the unsafe disposal of children's stools was associated with a 50% increase in the risk of hospitalisation with diarrhoea in comparison with disposal in a latrine. A further source of evidence for the importance of safe stool disposal is the literature on the impact of sanitation programmes in developing countries. If the construction of toilets reduces diarrhoeal disease then the effect is presumably due to the safe disposal of stools.

Improvements in sanitation have been shown consistently to result in better health, as measured by less diarrhoea, reductions in parasitic infections, increased child growth, and lower morbidity and mortality. The expected reductions in mortality can be substantial, particularly in areas with low levels of education. Modest improvements in sanitation, such as pit latrines, will result in better health, but major improvements in sanitation such as flush toilets, will result in even larger health benefits (Billig et al. 1999). These results have been reproduced consistently in a number of settings (e.g. Bateman and Smith 1991). Nutritional benefits have also been shown in individuals belonging to households without adequate sanitation, in communities where most other people had adequate sanitation. This suggests that all efforts in improving sanitation are worth undertaking, as they have community-level effects as well as individual ones.

Handwashing and Hygiene

It is, however, becoming more apparent that access to a toilet is not the same as adoption of sanitary practices in dealing with human waste. Nor is access to a toilet the same as its hygienic use and the adoption of other hygienic practices. Epidemiological investigations have shown that even in the absence of toilets, diarrhoeal morbidity can be reduced with the adoption of improved hygiene behaviours (WHO 1993). Studies of the health impact of water supplies and sanitation (Watt et al. 1953, Hollister et al. 1955, Stewart

et al. 1955, Schliessman et al. 1958, van Zijl et al. 1966) also suggest that shigella, the cause of bacillary dysentery and of much persistent diarrhoea, has a much lower infective dose and may thus be more susceptible than other pathogens to control by hygiene improvements (Curtis and Cairncross 2003) while a review by Huttly (1992) suggests that hygiene promotion reduces the risk of diarrhoea by 35% (Curtis 2003). To reaffirm the point, a review and meta-analysis by Curtis and Cairncross (2003) suggests that interventions to improve handwashing reduce diarrhoea risk by as much as 47%.

The addition of hygiene education is thus often required to see health impacts materialise. The most important hygiene messages concern the basic issues of handwashing, proper disposal of faeces, and protection of drinking water (Billig 1999). Several studies in different parts of the world have indicated that frequent handwashing, with and without soap, results in less diarrhoea (Black et al. 1981, Khan 1982, Sircar et al. 1987, Han and Hlaing 1989, Wilson et al. 1991, Shahid et al. 1996). Collectively these studies report a 42% reduction in diarrhoea from handwashing alone (Curtis and Cairncross 2003). When the results of studies with severe outcomes were combined, handwashing was found to be associated with a 48% reduction in severe enteric infections and a 59% reduction in shigellosis (Curtis and Cairncross 2003). The WHO commission on Macroeconomics and Health has stated that handwashing education and soap availability results in global reductions of 30-48% in disease prevalence, and that morbidity reductions of between 27% and 89% can result from handwashing alone (Vaz and Jha 2002)

There also seems to be a strong association between caregivers not washing their hands before food preparation (Clemens and Stanton 1987), or after cleaning a child after defecation (Saran and Gaur 1981), and an increased risk of diarrhoea. It is widely accepted that it is hands that carry pathogens from faeces, to surfaces, to food, and to future hosts (Curtis and Cairncross 2003), and handwashing with soap is effective in removing pathogens (Hutchinson 1956, Han et al. 1986, Kaltenthaler et al. 1991, Ansari et al. 1998). In the meta-analysis conducted by Curtis and Cairncross (2003) it was found that handwashing after stool contact was rare. They reported that in nine studies reporting rates of handwashing with soap after stool contact in developing countries the median rate of handwashing with soap after cleaning a child was just 13% (range 0-20%) and for the carer after defecation was 14% (range 1-20%) (Sircar et al. 1987, Yeager et al. 1991, Barros et al. 1999, Gilman et al. 1993, Huttly et al. 1994, Omotade et al. 1995, Curtis et al. 2001, Biran 2001). They noted that children are an important reservoir of diarrhoeal pathogens and the carer who cleans the child is often the main preparer of food for the household.

A more recent, randomised controlled trial in Pakistan by Luby et al. (2004) showed that children living in households that received soap and an intervention of handwashing promotion had a 53% lower incidence of diarrhoea (95% CI, -65% to -41%) and a 50% lower longitudinal prevalence of diarrhoea (95% CI, -65% to -35%) as compared to children living in control households. The study also found that infants who

were unable to wash their own hands had 39% fewer diarrhoea days in households that received soap and encouragement to wash their hands as compared to control households. For children aged between five and 15 years who were able to wash their own hands the reduction in diarrhoea was 57% (Luby et al. 2004). They reasoned that individuals who wash their hands are less likely to transmit pathogens from their hands to their mouths and, as such, this mechanism benefits the person washing his/her hands and is not available to infants. They noted, however, that persons washing their hands are also less likely to transfer pathogens from their hands to the hands of others or to the food or the environment that is shared with others. Also, parents and siblings who prevent their own episodes of diarrhoea are less likely to shed pathogens to the vulnerable infant's environment. They concluded that the study findings suggest that household handwashing interrupts transmission of diarrhoeal pathogens sufficiently to markedly reduce diarrhoea among infants (Luby et al. 2004).

In essence, all recent research findings strongly point to the fact that handwashing at appropriate times serves to successfully interrupt the transfer of pathogens and thus reduce the risk of disease. It must be noted, however, that handwashing can only take place when there is an adequate supply of water to do so.

In summary, the health benefits from water supply are mainly due to the hygiene improvements which water supply makes possible. Increasing the quantity of water allows for better hygiene practices such as handwashing. Raising the quality of drinking water reduces the ingestion of pathogens but this does not have the same impact as increasing the quantity of water (Esrey et al. 1991, Huttly et al. 1997). With less disease, children can eat and absorb more food, thereby improving their nutritional status. Also, a healthier adult population is a more productive population, and improvements in water and sanitation can improve income and the capacity to acquire food.

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THE WASH CAMPAIGN

In 2001 the South African government became a partner of the global Water, Sanitation and Hygiene for All (WASH) campaign. This campaign was initiated by the Water Supply and Sanitation Collaborative Council (WSSCC) in 2001 with the aim of:

> promoting partnerships between public and private sectors and the provision of more equitable and affordable services with priority given to the poor, particularly women and children, who suffer the heaviest burden of poverty and sickness in many developing countries (WSSCC 2001).

In brief, WASH was designed to bring attention to, and to attract resources towards, addressing the situation of millions of people without access to adequate water supply and sanitation in the world. The Council works with governments, parliamentarians, nongovernmental organisations, community groups and other stakeholders to promote a sanitation target, a goal that was overlooked by the Millennium Declaration that was signed by over 150 Heads of States and Governments at the United Nations General Assembly session in 2000. WASH aims to raise the commitment of political and social leaders to achieving these goals and effecting the necessary behavioural changes through various information and communication channels, using traditional and mass media, hygiene promotion in schools, training and building local capacity in communications and improving networking and research.

The South African Department of Water Affairs and Forestry (DWAF) states that WASH was officially launched in SA in 2002 and that it was decided that the focus of WASH in South Africa would be less about broad-level advocacy and more concentrated on niches and leverage points which supported existing initiatives. As such, WASH was to take up water, sanitation and hygiene issues in such a way that they complemented other activities (DWAF 2005).

DWAF further states the objectives of the WASH campaign in SA as being:

- To increase the incidence of handwashing at the right times such that it results in a significant decrease in the incidence of water-related diseases.
- To increase the awareness of the benefits of good sanitation and hygiene education to consumers and local government.

The 'business plan' developed by DWAF for WASH in South Africa for the years 2003/2004 made it clear that:

> The concerted focus on hygiene education and sanitation is intentional as these are the more significant priority issues in South Africa in terms of delivery at present.

This business plan also indicated that the amount allocated for WASH in South Africa for the financial year 2003/2004 was R5 500 000. DWAF took responsibility and ownership of the WASH campaign at a ministerial level.

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WATER DELIVERY AS A MUNICIPAL ISSUE IN SOUTH AFRICA

Water is a relatively scarce resource in South Africa. Furthermore, as a result of the legacy of apartheid, a large proportion of the South African population does not have access to safe water in their homes or even close by. It was estimated that in 1994 there were almost 16 million people without adequate water and 20 million people without adequate sanitation services. By 2005 government estimated that it had provided basic water supplies in both rural and urban areas to 15 million people but that a new backlog of approximately nine million people remained. It must be noted that 'basic water supplies' does not necessarily mean in-house piped water, but could mean a communal tap within 200 metres of a household. Government also conceded that while it had supplied basic sanitation to just over eight million citizens there was still a backlog of some 16 million people who were without adequate sanitation (DWAF 2005).

In 1994, the Reconstruction and Development Programme (RDP) identified basic water services as a critical human need and a national development priority in South Africa. Based on the Constitution of South Africa, "All South Africans have the right of access to Basic Water Supply and the right to Basic Sanitation Supply necessary to secure sufficient water and an environment not harmful to human health or well-being". According to the DWAF website:

> The Water Services Act of 1997 formulates policy to enable this constitutional right by addressing the historical backlog in water services infrastructure and by establishing effective management and regulatory systems for long-term service delivery. This includes the setting of national standards and norms for basic services and tariff regulations for effective management of all water services. The Act also recognizes the basic needs associated with domestic use, such as water supply and sanitation facilities at schools, clinics and hospitals. Basic water services are to be provided free of charge, specifically to all indigent households earning less than R800 per month. Additional management, technical and financial assistance is given to water services institutions to ensure that basic services are provided to all South Africans. Basic services criteria include the basic services needs, ongoing projects, development progress since 1994 and the remaining challenges in terms of basic service infrastructure and free basic service delivery.

It should also be noted that municipal services such as water and sanitation are moving towards becoming privatised and commercialised in South Africa. A part of this process has been the introduction of cost-recovery mechanisms for services such as water and electricity. The DWAF site states:

> Provision of domestic water services at higher than basic service levels is aspired to by many people. However, the higher levels of service are not financed by Government and must be self-sufficient through effective billing systems and cost recovery. Government has recognized the need for integrating these key development requirements into spatial and economic development programs. Water services development is a dominant element in these programs, which includes various spatial development initiatives (SDI's), economic clusters, poverty alleviation projects, transport corridors and tourism areas.

McDonald (McDonald and Pape 2002, 18) defines cost recovery as:

> The recovery of all, or most, of the cost associated with providing a particular service by a service provider. For publicly owned service providers, this may or may not include a surplus above and beyond the cost of production, whereas for private-sector providers it necessarily includes a surplus (i.e. profit). In either case, the objective is to recoup the full cost of production.

Cost recovery has been one of the main policies driving the privatisation and corporatisation of municipal services in South Africa. In order for cost-recovery policies to work, consumption has to be accurately measured and payments have to be made by the consumer without default. With regard to municipal services in South Africa such as water and electricity, consumers are disconnected from, or have limitations placed on, their water and electricity supply should they default on their payments for these services. McDonald (McDonald and Pape 2002, 19) states that cutoffs and evictions are expensive and politically sensitive enforcement weapons, which is why service providers who are pursuing cost-recovery policies are moving towards the use of prepaid meters wherever possible. Prepaid meters are described by McDonald as the ultimate cost-recovery mechanism: they collect money in advance, thereby earning interest for the service provider in the process; they do not allow the consumer to go into default; and they require no direct punitive measures to ensure payment for services.

The establishment of viable and effective local government is one of the key transitions in South Africa. The Constitution states clearly that local governments are responsible for the provision of municipal services to their constituency. According to DWAF:

> The Municipal Structures Act and its amendment defines this role by allocating the water services authority and provider function to District

> Municipalities. Where it is necessary, the Minister of Provincial and Local Government may authorize Local Municipalities to fulfil the water services authority functions. Various institutional options and municipal service partnerships can be used to support the capacity of the water services authority and to promote cooperative governance and effective service delivery. The Water Services Act provides a regulatory framework for water services institutions including the preparation of Water Services Development Plans (WSDP), setting of tariffs, accountability of water services providers and compilation of an annual water services audit. Water services authorities must obtain water allocations in terms of the National Water Act and must report to Catchment Management Agencies on water use and effluent releases.

In Johannesburg, a state-owned but privately operated company – Johannesburg Water – has been contracted to deliver water and associated services. As part of their delivery strategy the company has opted for various methods of service delivery, some of which include the use of prepaid water meters and yard taps. A pilot project of water service delivery through prepaid water meters has been embarked upon in Soweto, where over 120 000 households have been targeted for prepaid water meters.

The process of installing these prepaid meters began in late 2003. According to residents and local pressure groups, Johannesburg Water promised, in exchange for residents accepting the prepaid water meters, to fix leaky infrastructural mains as well as to fix leakages on the property – i.e. toilet cisterns, washers, etc. Residents said that they were also promised a debt write-off: If the homeowner agreed to the prepaid system and did not tamper with the meter for three years, all outstanding arrears would be written off. In the interim period the debt would be suspended. They also indicated that each stand would receive its allocation of Free Basic Water of six kilolitres (kl) per month – established by national government in 2001 – which would be administered at the beginning of each month.

There has been much resistance and opposition to the installation of prepaid water meters in Soweto. Residents here had traditionally been billed for their water on a deemed consumption basis, i.e credit billing based on very broad volume bands. With the introduction of prepaid water meters residents suddenly found themselves in the very unfamiliar position of having to pay for their water in advance with a much tighter link between volume consumed and price paid. In a community where unemployment rates are very high and where poverty and hunger dictate how money in the household is spent, it is hypothesised that the change in the cost of water would impact on the use of water. In particular it is believed that it will change practices relating to hygiene and specifically handwashing.

STUDY BACKGROUND

The study originally began with an agreed research methodology that aimed to compare the frequency and timing of handwashing amongst caregivers residing in similar households with and without prepaid water meters. Timing was chosen as an indicator to try and determine if carers living in households with prepaid water meters changed their hygiene practices during the course of the month as the free basic water quota was depleted.

However, after a month and a half of data collection it became clear that poor hygiene in general, and poor handwashing practices in particular, were the norm amongst all households, regardless of their system of water provision. As a result, the research strategies were adjusted, and a short, sharp educational intervention was introduced.

The intervention consisted of the fieldworkers going into homes that were to be observed and administering some hygiene education specifically related to handwashing and explaining the oral-faecal route. They specifically explained the importance of handwashing pre and post key activities such as eating or using the toilet. The fieldworkers were provided with materials (posters, booklets, etc.) that were developed by the Khayelitsha Water and Sanitation Programme in Cape Town. This team were involved in a deworming and sanitation project in the community of Khayelitsha in Cape Town and had developed materials for hygiene education using tested participatory methods.

The fieldworkers thus went into homes and explained that they were doing a study on hygiene behaviours. After having obtained permission from the household head, they administered the intervention to all who were present in the home at that time and left behind information where required. They then made appointments with these households to return and conduct an observation.

The revised research question was as follows: Is the uptake of a hygiene and handwashing intervention different amongst carers living in households with prepaid water meters compared to carers living in similar households with a deemed consumption account, and, if so, why?

The objectives of the research were as follows:

- To identify households with similar demographic, socioeconomic and cultural characteristics, but differing water provision – i.e. prepaid water meters versus deemed metering. (Note: all households had in-house water supply, as opposed to yard taps or communal taps.)

- To administer some hygiene education to each of these households using proven and tested materials.

- To measure and compare the timing, place, frequency and other relevant habits of handwashing amongst carers during specific times in the day and after specific household tasks in both these types of households.

- To record other possible confounding factors such as level of education, socioeconomic status, general hygiene knowledge as well as specific hygiene awareness related to handwashing, stable household size (demography), household income, etc., in all the selected households.

- To understand the impact of pricing, convenience and perception of prepaid meters on handwashing.

The null hypothesis for this research was that there is no difference in key handwashing practices between households with different payment processes.

METHODOLOGY

All households in a part of Soweto (Phiri) with a caregiver (defined as somebody who stays at home during the day caring for at least one child under the age of six or for an elderly person or a sick person in the household) were targeted for the survey. This sub-sample of households was chosen because of the additional importance of handwashing when caring for others.

Sections of Phiri were stratified according to water service provision (as provided by Johannesburg Water) and socioeconomic levels (as determined by Census 2001). Random households were then selected in each stratum. Selected households were visited, and if they contained a caregiver they were asked to participate in the study, failing which the next household on the list was visited.

Using washing of hands after use of the toilet, changing of nappies, or helping children in the toilet as the main outcome indicator, and assuming a prevalence of 75% in the 'unexposed' group (i.e. those with deemed consumption), to detect a 25% difference in washing of hands in the 'exposed' group (i.e. those on the prepaid system) at the 5% significance level with 80% power required a sample size of 65 in both the exposed and unexposed groups. Assuming a 10% refusal rate, the total sample size required was 150 households.

Each selected household was visited by a researcher, and the caregiver and all other interested members in the household were then given the educational intervention on hygiene. Afterwards, questions were answered and appointments were made with the household to visit them for the observation (data collection) task.

Data were collected via observation of the carers at the selected households. The observation was carried out by trained observers using a general questionnaire and a structured questionnaire/checklist. The general questionnaire recorded: household demographics; job security within the household; age and sex of carer; ages of those being cared for; monthly household income; possible confounders such as socioeconomic status and handwashing-specific hygiene knowledge; water connection and account details; date of prepaid water meter installation (if applicable); monthly water account amount (if applicable) and percentage of the account paid monthly (and/or arrears owing); toilet type; length of time with access to full service, in-house water connections.

A structured observation questionnaire and checklist was developed for use by the observers and included:

- time of commencement and conclusion of observation;
- current water status in household;
- carer's handwashing behaviour before and after certain household tasks including but not limited to:
    1. handling of food
    2. handling of dirty dishes
    3. pre and post toilet behaviours (including handling of soiled nappies, etc.)
    4. handling of those being cared for
    5. handling of dirty clothes
    6. household cleaning and garden tasks.

Five tertiary-level student researchers were trained to visit the households, complete the general questionnaires, observe and complete the structured questionnaire. In addition, the student researchers were asked to keep a fieldwork diary to record their personal experiences and anything else of interest. A fieldwork supervisor was also appointed to oversee the research assistants and to provide support as and when required. All interviews were conducted in the first language of the households being studied.

All visits took place at the same time of the day in all households so as to obviate differences in behaviours arising from different tasks being performed at different times during the day.

A structured observation checklist was drawn up based upon the household's water status and cleanliness as well as the general hygiene appearance of those being cared for and that of the caregiver. A structured questionnaire to determine household demography, electricity and water and sanitation connections and hygiene knowledge was formulated and administered. Both tools were pretested and modified before use. Reliability was assured through the training of the observers until they achieved over 90% interobserver reliability for at least two joint observations consecutively between themselves. A definition list and detailed observation and interview rules were developed. Data collection sheets were collected weekly after completion of fieldwork and checked. Any discrepancies were immediately discussed with the team.

RESULTS AND DISCUSSION

The findings of the research are discussed under the following themes: socioeconomic circumstances; water meters; general hygiene; handwashing and general water use.

Socioeconomic Circumstances

The chosen site, Phiri, like many other sections within the sprawling township of Soweto, is made up of a sprinkling of what can best be described as middle-income earners and a large number of low-income and very poor residents. The homes directly reflect this socioeconomic status, as illustrated in the following reflections by two of the research assistants (commenting on different homes):

> It's a smart house. They have extended their two-room house into three rooms and built a couple of rooms outside as well as a bathroom and toilet. They sell biscuits, cakes and ice cream.
>
> The people in this house are very nice. They are also very poor. The side wall of the door has a hole in it and there are people sleeping in the kitchen. The kitchen has no tiles or carpet, just plain cement. It is evident that there are people sleeping in the kitchen because when I arrived there was a sponge standing by the kitchen cupboard. The holes in the wall bring in cold air from outside. There is no ceiling in this house. Even the bedroom floor is made of cement.

The research assistants themselves became directly involved in trying to help out some of the poorer homes:

> The household is so poor they didn't even have sugar for tea. This morning luckily I had R4 on me that I gave them to buy sugar. They were so grateful.
>
> Even though they had no food, the caregiver told me that the last time they had anything to eat was the previous day around 4pm. I gave them R5 (all I had in my purse that day) so they could have food. The caregiver bought bread and vetkoek so they could have with breakfast and lunch since they had some teabags and sugar.

> I left R10 for sugar since they didn't have any. I was still angry about the level of poverty and squalor these two people are subjected to. Such people as those I saw …. represent poverty, mainly the urban poor in the whole of the country and I torment myself with the question of what am I doing to help those that do not have the same privileges as me.
>
> The child had left for school without breakfast. This seems to be common around here so his mother who is HIV-positive was from the shop to get bread when I arrived. She made a lunch box and we went together to give it to her son.

With regard to these poorer households' use of water, the following was recorded:

> Caring for her younger mentally handicapped sister. Both dependent on social grants. It is really heartbreaking but what is interesting is that people are surviving, always smiling and welcoming. Toilet is only flushed after several usages in order to save water.
>
> Situation at the household appalling. No means of income, thus they all depend on the social grant of the 86-year-old lady of the house. Water meter is locked at night because otherwise it will be stolen.
>
> What I have realised is that younger members (probably those who do not pay the bill) do not save water. For example, when washing dishes they do it under continuously running tap from the sink, which is a bit of a concern to the main carer (probably the one who foots the bill). She always reminds them to save water.

Water Meters

Residents were quite happy to talk about the water meters, the politics surrounding these and the impact it has had on their lives. A common theme picked up from many of the observed households on the prepaid meter system was that water was a "natural", "God-given" resource and should therefore not be charged for. This was one of the statements recorded:

> The feeling I got from the household is that they are not happy with the prepaid meter. One of the family members said it's understandable to pay for electricity but doesn't understand why they should pay for water. She further said that water does not belong to the government because it is part of nature.

Of greater significance (and a very emotive issue within the community) was the politics involving Johannesburg Water vis-à-vis their roll-out of the

prepaid water meter programme and their alleged high-handed attitude towards the concerns raised by the community. This had in fact led to many protests by the community (some of them violent), with most people seemingly opposed to the installation of the prepaid water meters. The following are some of the statements recorded by the researchers:

> There were people digging outside. They were putting a prepaid water meter in. The old lady, who is the owner of the house, said that they switched off her water supply seven days ago because she was refusing to put the prepaid system in. She has asked for a standing pipe outside but they refused. With the standing pipe you don't have to pay for all the water consumed but it's included with your electricity bill. She finally allowed them to put the prepaid meter in because her daughter has a ten-day-old baby and she is living with her. She will not allow the baby to live without water. She said three of her own children died because of water – she didn't elaborate. When she feeds the kids she tells them (there were four) to wash their hands first and she gives them water in a bowl.
>
> Fortunately for this family they aren't the ones who are moving to Bramfischer, where the council is forcing people to move to. The forced removals are influenced by the prepaid meter water installation. Due to their sharing, people here could resist the prepaid meters. But now the council insists that instead of two families sharing four rooms, one family has to move, leaving one family to own the four rooms, so as to facilitate and so that Johannesburg Water can justify prepaid meter installation.

However, there were some cases where support for the prepaid meters was expressed, as follows:

> It's common for the experimental houses to lock meters at night and/or during the day to prevent theft. The toilet and tap had been fixed as another measure to help conservation of water by Johannesburg Water [JW]. The caregiver's mother told me that JW improved the whole water infrastructure. She is glad they get to be given free water, which is as much as R30 worth of water and can last the whole month.
>
> What was interesting was to learn that their neighbours refused when the prepaid meter was installed. Now they don't have running water. They fetch water from across the main street in the deemed section. I saw two older boys fetching water in 80-litre containers using a wheelbarrow. The owner of the house was not there so I couldn't interview her. However the boys told me that as soon as they get jobs they don't care, they will ask Johannesburg Water to install the prepaid

meter because they are really tired of water fetching trips and their toilet is the only one without a new cistern.

General Hygiene

As stated earlier the general hygiene and hygiene behaviour specifically related to handwashing was found to be severely lacking and problematic in all the households under observation. This eventually necessitated an intervention to try and influence behaviour change with the resulting alterations in the design of the study. Descriptions of the general hygienic status of the households are illustrated in the following observations:

> The kettle is dirty and has lost its colour. It was white. The buckets that carry water are dirty, both of them. I mistook the bucket for the peeing bucket and I was surprised to find out it also carries drinking water for the whole household. Looking at these things, I imagine the germs they carry which the whole household take into their bodies.

> She changes the baby's nappy and leaves the nappy on the couch. She then prepares food for both kids without washing hands. She throws the nappy on the bedroom floor and doesn't wash her hands before feeding the children, nor after she feeds them and cleans the house.

> People tend to think that because they are doing their laundry or washing dishes their hands are clean so no need to wash/rinse them before handling food and feeding the children/sick/elderly.

> Household with two young babies with no proper hygiene. Babies' milk (bottled) is prepared without any handwashing irrespective of the person who was preparing food.

Some of the problematic hygiene behaviour may be related to the prepaid water meters. This conclusion is borne out by the following observations:

> They use a basin to wash in which they pour only minimum amounts of water in to bath with. They use probably 2 or 3 litres of water and it's not enough to bath with, especially because they tend to bath with one of the children in the same water and basin. I think they do this to save water, by bathing two people at the same time instead of using water for each person in the house.

> The caregiver goes across the street to control houses [i.e. deemed water services] to fetch water for laundry. Otherwise she uses water from the tap for cooking since stored water is used for bathing and household chores.

Handwashing and General Water Use

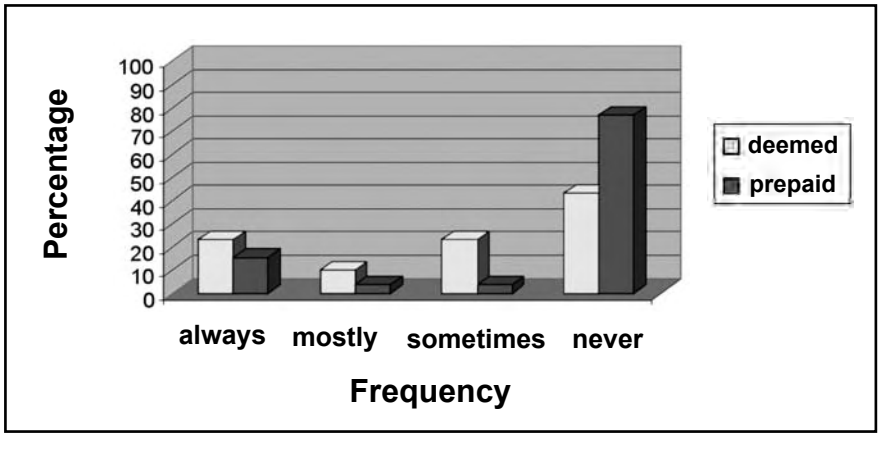
Of the 107 households in the study, 51 had prepaid meters and 56 were deemed consumption. All of the deemed consumption households had water available on the day of the observation while in the prepaid households water was available in 48 (95%) households. Water availability was considered an essential variable in determining water use with regard to handwashing and hygiene. Some of the recorded observations around the nonavailability of water included:

> At 8:30 there was no water from the tap. One of three boys above 17 years old went to fetch water from deemed houses, which are just across the main road. The water was utilised and within an hour the bucket was empty. Two people bathed and made tea for five people and the dishes were washed. They also used the dishwashing water to clean the house

> No tap water in the house. Outside toilet shared by four houses, over-flooded with stools and water overflowing. All families on that street store water in buckets (20 litres) in the house since there's no water indoors. No dishwashing basins; handwashing is very rare. All the family members are unemployed; some are doing voluntary jobs with no pay for days on end without that particular association giving them jobs.

Of great value and importance to the study was to note how hands were being washed when they were being washed. The most desirable practice – i.e. washing with water flowing from a tap – showed only a small difference between the two types of supply. This was, however, negligible as only a small proportion in both groups always washed their hands under flowing tap water. However, there was a significant difference in the proportion of household carers with deemed versus prepaid water who never washed their hands with flowing tap water even after the intervention (43% vs 77%; $p<0.05$) (Figure 2).

Figure 2: Handwashing with water flowing from a tap



It is significant to note that such a large proportion of those observed did not wash their hands. This was borne out in the qualitative data received as well:

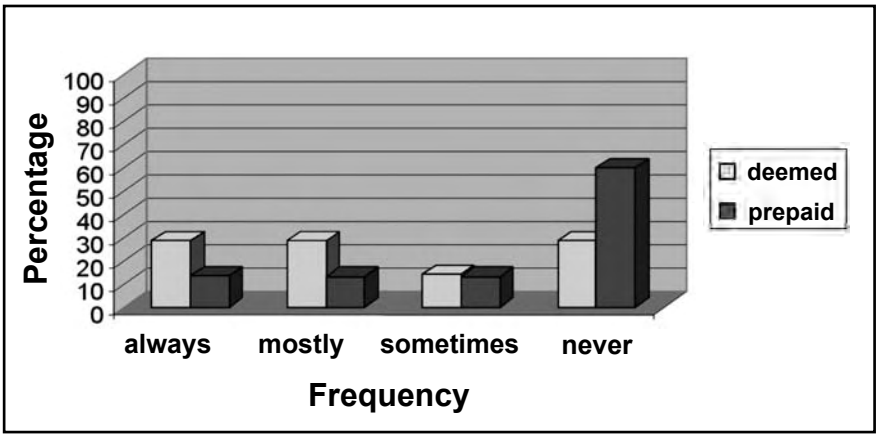
> She made food, didn't wash hands, went to the toilet and just rinsed her hands under flowing water. So too when she helped the child to the toilet. Didn't wash her hands after cleaning the house and washing the dirty dishes. She also didn't wash her hands before feeding the child but ironically she washed her hands after feeding the child.
>
> She made food without washing hands first (twice) and fed the child without washing hands first but washed her hands after feeding the child. She went to the toilet once and didn't wash hands properly…. She helped the child to the toilet.
>
> The daughter woke up and when the one child woke up she changed her nappies. She didn't wash hands. After that she started cooking soft porridge. She changed the other child's nappy without washing her hands and then fed the kids (the second child's stools have blood). The only time I saw her washing hands was when she threw a night bucket out.
>
> Main carer caring for a month-old baby and three siblings (school going kids) prepared bread and tea without washing hands. Never encouraged to wash hands before eating. It looked like these children were not washed (or made to self-wash) before eating. No handwashing of any kind observed. Cleaned the house and left the chores halfway to breastfeed the baby. Went to the toilet and never washed hands after using the toilet. Handwashing is not known in this household.

There were, however, cases where the extreme opposite was observed:

> The house is fairly clean. Carer was still sleeping and woke up when I got there. She sterilized the baby bottles for an hour before preparing the milk for the baby. She washes her hands before making anything for the baby. She even washes her hands before touching or picking up the baby. She doesn't let anything come near her child before washing her hands. She washes her hands when she wakes up, before preparing food, after going to the toilet, after changing nappies and before feeding the child. The carer is fairly happy with the prepaid [water meter] and doesn't mind paying for water for the child's safety.

Of those who used clean, standing water to wash their hands (total number 32), the results once again showed a significant difference between the two types of households (deemed water versus prepaid). More than half (57%) of deemed households used standing water to wash their hands all or most of the time, compared to only 29% of prepaid meter households (Figure 3). The difference is significant at the 5% level.

Figure 3: Handwashing with clean water standing in a bowl or sink



There were some instances where hands were washed in dirty, standing water:

> The carer changed the nappy of the child once and washed her hands in the same water that she used for wiping off the baby. She rinsed her hands after cleaning the yard, under flowing water with no soap.

Adequate handwashing was defined as using soap, rubbing the hands together four times or more and then rinsing them under clean flowing water. Of those who washed their hands under clean flowing water, two thirds (67%) of observed carers in both groups always displayed adequate washing. So, while the actual numbers of those washing their hands are small, it seems that this small proportion are doing it adequately.

Handwashing behaviours before handling food and after using the toilet are accepted as the best predictors of diarrhoeal and other diseases whose modes of transmission are faecal-oral. Of those caregivers observed in this study, it was found that just under 60% actually washed their hands before handling food (for both the deemed consumption and prepaid households (Figure 4). Of these, 40% of deemed consumption households were observed as having adequately washed their hands while 57.1% of prepaid household caregivers were recorded as having adequately washed their hands (Figure 5). In other words only about one third of the total sample adequately washed their hands before handling food.

Figure 4: Handwashing before handling food

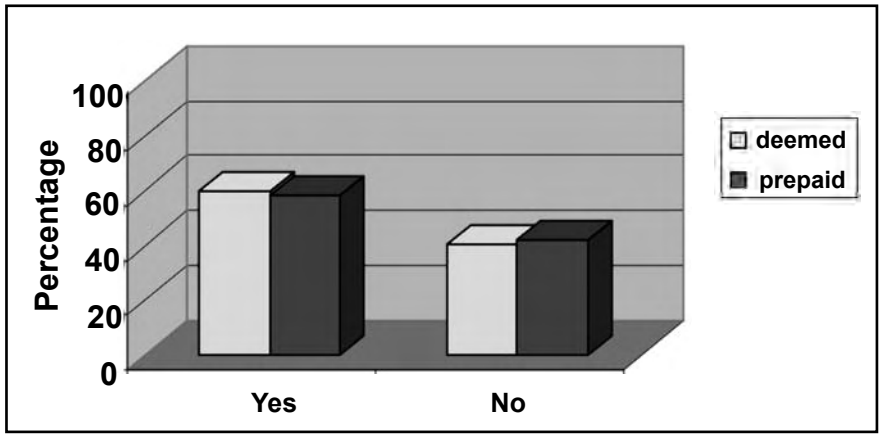
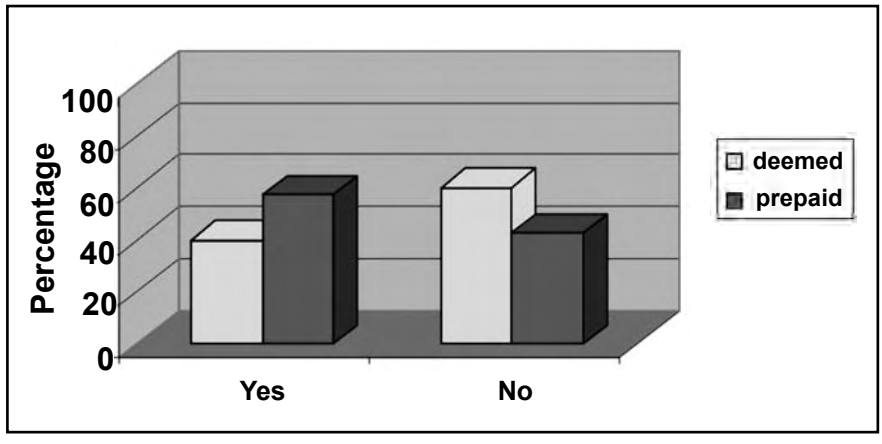


Figure 5: ADEQUATE handwashing before handling food

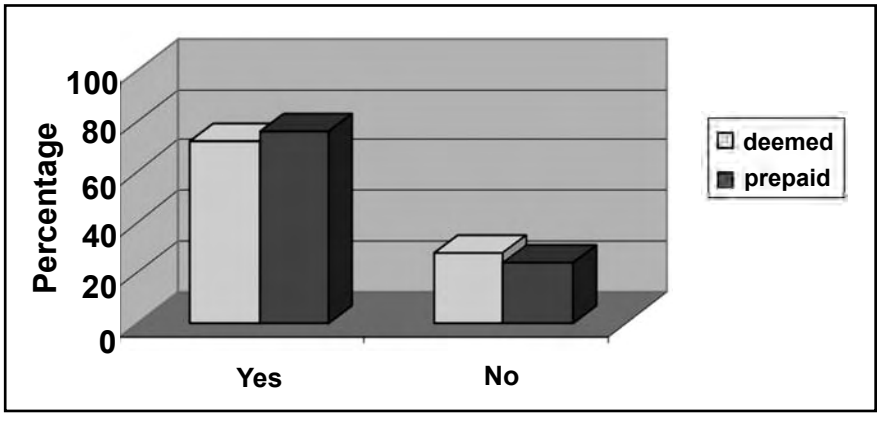


The qualitative recordings also bear testimony to the fact that hands did not seem to be washed before handling food or after using the toilet:

> Old lady had diarrhoea thus constantly visiting the toilet without washing hands. Thereafter at one point I volunteered to cut her nails and I could smell the faeces on the woman's hands. She was then going to drink tea and eat bread without washing hands. Baby's formula was done without any hand wash. All the family members had tea at same point but I never saw them wash hands before or after eating. The only consolation was that the baby's bottle was always soaked in water lying around.

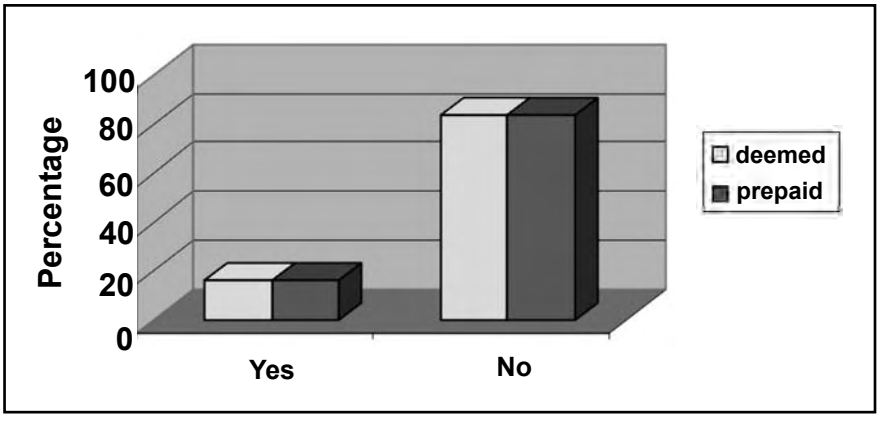
The observation around handwashing practices after use of the toilet proved to be even more interesting. There was a larger overall percentage in both groups that did wash their hands after using the toilet (72% in deemed consumption households and 76% in prepaid households – Figure 6).

Figure 6: Handwashing after using the toilet



However almost 80% of those in both groups did not adequately wash their hands (Figure 7). In other words fewer than one in ten adequately washed their hands after using the toilet.

Figure 7: ADEQUATE handwashing after using the toilet



CONCLUSION

The South African Government has recognised the need to complement efforts at improving water supplies with a concomitant improvement in sanitation infrastructure. It has also, rather belatedly, paid heed to the necessity of encouraging key hygiene practices. The WASH campaign – with its numerous pamphlets, newspaper articles and radio clips – has focused upon spreading these hygiene messages through the media. However, no attention has been paid to the cost-benefit analysis that individuals and households undertake in deciding whether to take up new behaviours. In particular the regular washing of hands requires an investment in time and in the use of water and soap.

This study has found that the WASH campaign has definitely had little or no impact in the community under study. In both prepaid and deemed consumption households regular handwashing was an infrequent act. Even washing at 'the right times' was only done in a minority of cases. This is all the more disturbing since the caregivers under study may actually have been exhibiting better behaviour during the study than they normally practise, perhaps because they were being observed and hygiene education was promoted at the beginning of the study.

A recently conducted Global Hygiene Survey (of which South Africa was one country surveyed), found that almost half (45%) of the South African population underestimated the effectiveness of handwashing in preventing the spread of disease. Fifty-five percent of South Africans believed that disinfecting surfaces, avoiding close contact with others and not letting animals into the house were more effective in preventing disease than handwashing.

Nevertheless, we did find evidence that those who were being asked to prepay for their water were practising poorer hygiene behaviours than their neighbours who were still on deemed consumption. This was bolstered by the qualitative data in which respondents were acutely aware of the cost of water, especially in the context of the deep poverty that they are already suffering. In a country where poverty is rife, where there is soaring unemployment, where there is a massive housing backlog, and where hunger is a daily reality, it is unrealistic to expect poor people to purchase, in advance, a basic good such as water.

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