

**Course: Post Graduate Diploma in Water, Sanitation and Hygiene Promotion - Assignment number 7**

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**Assignment**

1. Describe the particular challenges of providing WASH services in urban settings arising from each of the following factors.

* + - * 1. Increasing population size
        2. The diverse nature of the urban community
        3. Infrastructure required for WASH services
        4. Governance, in particular the process through which resources for improving WASH services are allocated and utilized.

2. What are the major health risks from?

* + - * 1. open defecation
        2. allowing food waste and litter to accumulate in a ditch
        3. not washing hands before eating.

Briefly explain how these risks could be reduced.

3. Describe three specific challenges posed by peri-urban areas and slums for improving access and utilisation of WASH services.

4. Explain three challenges associated with engaging stakeholders in planning and implementing urban WASH projects.

**1. Describe the particular challenges of providing WASH services in urban settings arising from each of the following factors.**

**(a) Increasing population size**

WASH service upgrade and expansion is slower than the rate of population growth, which puts pressure on the existing systems. As the services are shared by many more people, they quickly become inadequate and may break down (Open University, 2018).

Urban communities come from different backgrounds and have varying economic status. They are likely to be very mixed and include people from different ethnic groups and religions. Moreover, most people living in urban areas move frequently in and out of town. They may not feel they are part of a community or care very much about the place where they live. These characteristics make it difficult to raise awareness and understanding of basic service issues and pose significant challenges for mobilising people to change their behaviour and actions (Open University, 2018).

**(b) The diverse nature of the urban community**

The trend in urbanisation is strongly associated with economic growth and development. As economic activities increase in urban areas, opportunities open up for employment, which attract people living in rural areas to move into the towns and cities (Open University, 2018).

As the total population increases, the land available per person for farming in rural areas decreases. Furthermore, degradation of the natural environment leads to low productivity of the land. The shortage of land, coupled with reduced productivity, results in a low income for rural households. This encourages people, particularly young adults, to migrate from rural to urban areas in search of better employment opportunities (Open University, 2018).

The overall effect of these trends is that the number of people living in urban areas keeps increasing (Open University, 2018).

Political and administrative bodies in urban areas have to provide basic services such as electricity, telephone, water supply, waste disposal, healthcare and education. However, the infrastructure required to deliver these basic services to an acceptable standard is growing at a much slower pace compared to the increase in population (Open University, 2018).

Slums are becoming a common feature in most towns (Figure 1.1). Slums are urban areas that are heavily populated and have sub-standard housing and very poor living conditions. They provide minimum shelter requirements for communities with low or no income. Slums are the usual entry point for those from rural areas to the complex urban environment. However, due to intense competition, securing a job with reasonable pay often proves very difficult. As a result, the majority of people who live in slum areas remain there permanently because they cannot earn enough to move into better housing (Open University, 2018).



*Figure 1.1 Slum area of an Ethiopian town.*

Despite the very high population density – the number of people living in a unit area of land – and the dire need for access to water, electricity and roads, slums are not the main focus of attention for administrative bodies. Slums arise in areas with little or no government scrutiny and are mainly illegal settlements. Therefore these communities do not have legal rights to the land they live on, which is a fundamental requirement for claiming services in urban areas. Although the government recognises the need, it is difficult to provide basic services to slum areas as part of its regular work (Open University, 2018).

Peri-urban areas are another common feature of towns. These areas are interface zones, located on the outskirts of towns, which show characteristics of both rural and urban areas. They are similar to urban centres in that they have high population density and services such as electricity, water and transport are probably available nearby (but may not be affordable). However, people in peri-urban areas may be farmers and grow food to supplement their income so also share similarities with rural communities. As towns spread, peri-urban areas may become part of the main urban area (Figure 1.2) (Open University, 2018).

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***Figure 1.2 Peri-urban areas have similar characteristics to slums.***

**(c) Infrastructure required for WASH services**

The key challenge to meeting the increasing WASH service needs in Ethiopia’s urban areas is the availability of adequate resources, including finance and human resources that can provide and maintain the necessary infrastructures. The infrastructures required are:

water supply system stormwater drainage system solid waste collection, transportation equipment and disposal sites liquid waste (including faecal sludge from latrines) transportation and disposal sites waste recycling or reuse equipment and facilities (Open University, 2018).

Water supply systems include developed water sources, treatment plants, storage reservoirs, and a network of distribution pipes delivering water to users. Growing population numbers and economic activity in urban areas mean that:

Large amounts of investment are required to expand the capacity of these systems to meet the water needs of the population adequately. Mobilising sufficient funding is often difficult.

Water sources, especially groundwater, may become depleted over time because of high extraction rates (Open University, 2018).

Waste from industrial activities increases the threat of contamination of water sources.

Sanitation services include infrastructure for collection and safe disposal of liquid and solid waste. The amount of waste increases with the population size. Industrial activities also add to the type and composition of wastes generated. You may have noticed the excessive waste accumulated in different parts of urban areas. Figure 1.4 shows an example where rubbish and flooding have caused problems in a suburb of Accra in Ghana – similar scenes can also be found in Ethiopia (Open University, 2018).



***Figure 1.4 Accumulated solid waste and effluent from a latrine block have filled a drainage canal in Accra, Ghana.***

Wastes from residential areas and from industries often require treatment before being safely discharged into the environment. Faecal sludge from latrines or toilets needs to be transported, treated and disposed of safely. Most towns do not have a proper treatment facility or a suitable disposal site. In emerging towns, where agricultural processing is a growing trend, industrial wastes, for example from coffee processing plants and hide processing factories, are causing an additional burden. Wastes from such industries are often released into the environment without treatment (Open University, 2018).

Again, mobilising sufficient finance to expand services in a timely manner is critical to managing these situations, but is difficult.

**(d) Governance, in particular the process through which resources for improving WASH services are allocated and utilized.**

The term **governance** is used to represent many interrelated areas in government systems and refers to such things as the ways decisions are made and strategies are developed. Here, the focus is on responsibility and accountability of local governments in decision making to improve and effectively manage WASH services. **Accountability** means an obligation or a willingness by an organisation or individual to account for their actions and accept responsibility for them (Open University, 2018).

It is well known that finance is a key resource needed to improve WASH services. Appropriate allocation of public funds between WASH and other sectors, such as roads, is a governance issue. Within the WASH sector, most of the budget goes to water-related works and the sanitation component is usually left with very little. Even the small proportions of resources available are spent on financing major infrastructure in urban centres where most of the rich families reside. This may mean that tax collected from the larger community is only benefiting a selected few, which is not considered fair (Open University, 2018).

Effective operation and management of urban WASH facilities is another challenge related to governance. In principle, WASH facilities are managed by service providers, such as water utilities and micro- and small enterprises (MSEs). These groups are expected to recover costs for operating and maintaining the facilities but their performance is often below expectations. Service providers may not listen to the needs and complaints of user communities. Where services are not provided to the expected standard, the community’s motivation and willingness to pay the tariffs is reduced. This affects the capacity of the service providers to manage the WASH facilities and is a major challenge for governance (Open University, 2018).

**2. What are the major health risks from?**

**(a) open defecation**

The adverse health effects of OD can be divided into acute effects and chronic effects. Both cause a high burden of disease and a large number of premature deaths, especially in children under five years of age. These adverse health effects of OD occur because OD results in massive faecal contamination of the local environment; consequently, open defecators are repeatedly exposed to faecal bacteria and faecal pathogens, and this is particularly serious for young children whose immune systems and brains are not yet fully developed (Mara, 2017).

**Acute health effects of OD**

The principal acute adverse health effect of OD is infectious excreta-related intestinal disease, of which diarrheal diseases (DD) are the most common. DD were the third cause of death in children under five years of age (U5) in 2015 in low-income and lower-middle-income countries (LICs and LMICs), resulting in 499,000 deaths (8.6% of all U5-deaths), and a disability-adjusted life year (DALY) loss of 45.1 million years (8.5% of total U5-DALY losses) (IHME 2016). One of the commonly ascribed reasons for high incidences of DD is a poor water supply, poor sanitation, and poor hygiene, especially poor hand-hygiene (WHO 2014). The burden of U5-disease in LICs and LMICs in 2015 due to no handwashing-with-soap was a DALY loss of 26.4 million years (5.7% of total U5-DALY losses); the corresponding figure for unsafe sanitation was a DALY loss of 26.6 million years (5.7% of total U5-DALYlosses) (IHME 2016). The World is not good at handwashing: Freeman et al. (2015) estimated that globally 81% of people do not practise safe handwashing. A further acute health effect of OD is adverse pregnancy outcomes, such as increases in low birth weights, preterm births, stillbirths, and spontaneous abortions (Padhi et al. 2014).

Finally, there is violence against women and girls, which is often life-threatening. Violence against women and girls of all ages in LICs and LMICs caused a DALY loss of 7.8 million years in 2015 (IHME 2014). Physical violence, which may include murder, rape, stabbing and other bodily harm, is a not uncommon experience for women and girls as they journey to a place of OD, especially at night (Gómez et al. 2008). Bhalla (2015) reported the occurrence of two ‘open-defecation murders’ in rural India:

A further acute health effect of OD is adverse pregnancy outcomes, such as increases in low birth weights, preterm births, stillbirths, and spontaneous abortions (Padhi et al. 2015).

*‘The two [girl] cousins, who were from a low-caste Dalit community and aged 14 and 15, went missing from their village home in Uttar Pradesh’s Budaun district when they went out to go to the toilet [in a neighbouring field]. The following morning, villagers found the bodies of the two teenagers hanging from a mango tree in a nearby orchard.’*

It transpired that the two girls had been attacked and gangraped by five local men before they were hanged. Unfortunately, such incidents are not at all uncommon: Gosling et al. (2015) reported that many women in Bhopal and Delhi, India, and Kampala, Uganda experienced violence and harassment on a daily basis.

Such violence may often induce longer-term psychological damage. To help counter such violence House et al. (2014) have prepared a practitioner’s toolkit on ‘Violence, Gender and WASH’.

**Chronic health effects of OD**

There are five principal widespread chronic health effects most probably due to OD: soil-transmitted helminthiases (STHs), increased anaemia, giardiasis, environmental enteropathy and small-intestine bacterial overgrowth (SIBO), and stunting (low height-for-age) with accompanying impaired cognition.

**Soil-transmitted helminthiases**

The most common STHs are ascariasis (caused by the human roundworm, Ascaris lumbricoides), trichuriasis (caused by the human whipworm, Trichuris trichiura), and human hookworm disease (caused by Ancylostoma duodenale and Necator americanus). Globally, an estimated 439 million people were infected with hookworm in 2010, 819 million with A. lumbricoides and 465 million with T. trichiura (Pullan et al. 2016). The burdens of disease associated with these STHs are high: in 2015 ascariasis in LICs and LMICs caused an all-age both-sex DALY loss of 878,000 years, trichuriasis 340,000 years, and human hookworm disease 2.2 million years (IHME 2014).

Ascariasis, trichuriasis and hookworm disease cause impaired cognition, notably in school-aged children (Nokes et al. 1992; Partovi et al. 2007; Spears & Haddad 2015). The areas most affected are verbal fluency, shortterm memory, and speed of information processing, which are precisely the areas most needed for people to be able to contribute effectively to socio-economic development. Infection with two or more of these helminths impairs cognition to a greater extent than infection with only one (Jardim-Botelho et al. 2008).

Trichuriasis is associated with ‘anaemia (see “Increased anaemia” below), growth retardation (i.e. stunting – see “Environmental enteropathy and SIBO” below) and intestinal leakiness’ (Cooper et al. 1992). In a study of 9,860 refugees in Texas, latent tuberculosis infection was found to be positively associated in those refugees with hookworm infection (Board & Suzuki 2015).

The World Health Organization has a global target to eliminate morbidity due to STHs in preschool and schoolage children by 2020 (WHO 2016). This is to be achieved by regularly treating (deworming at school) at least 75% of the children in endemic areas – an estimated 873 million children.

**Increased anaemia**

In adults, anaemia reduces productivity and is associated with higher maternal mortality; in children, it impairs physical and cognitive development directly, and it also affects human capital accumulation via impacts on behaviours such as school attendance (Coffey & Geruso 2015). Irondeficiency anaemia caused an all-age both-sex DALY loss in LICs and LMICs of 36.1 million years in 2015 (IHME 2016). In a study on anaemia in Nepal, Coffey & Geruso 2015) found that ‘poor local sanitation and, specifically, OD cause lower hemoglobin and higher rates of anemia in children’.

Giardiasis The long-term post-infection consequences of giardiasis include low height-for-age, low weight-for age, small midupper-arm-circumference-for-age, low serum-levels of zinc and iron, chronic and persistent diarrhea with consequent malabsorption, irritable bowel syndrome deficiencies, and impaired cognition (Halliez & Buret 2013).

**Environmental enteropathy and SIBO**

There has been considerable research on the association between stunting (see ‘Stunting’below) and environmental enteropathy (also called tropical enteropathy and environmental enteric dysfunction). Environmental enteropathy is a condition which results in the malabsorption of nutrients in the small intestine and this leads to stunting; some or many of the nutrients in a child’s foods are not absorbed and so are unavailable for the child’s growth. The term ‘environmental enteropathy’was used by Fagundes-Neto et al. (1984) to describe a common syndrome in which there are non-speciﬁc histopathological and functional changes of the small intestine in children of poor families living in conditions lacking basic sanitary facilities and chronically exposed to faecal contamination.

**Stunting**

Target #2.2 of the Sustainable Development Goals includes ‘achieving, by 2025, the internationally agreed targets on stunting and wasting in children under ﬁve years of age’ (United Nations General Assembly 2015). The ‘internationally agreed target’ for stunting is to reduce by 2025 the number of stunted children under the age of 5 in 2010 by 40% (de Onis et al. 2013). Stunting is deﬁned as a height that is two or more standard deviations below the median height for the child’s age and sex. (The World Health Organization publishes charts and tables for boys’and girls’ median heights-for-age and values of the appropriate standard deviations (WHO 2015). A ‘zscore’is used: fo example, a zscore of "2 means that a child’s height is two standard deviations below the median height for that child’s age and sex, and the child is therefore considered stunted; for severe stunting the zscore is "3 or lower.) In developing countries as a whole stunting is decreasing – from 251 million children under ﬁve in 1990 to 156 million children in 2014, except in Africa where it is increasing – from 47 million children in 1990 to 58 million in 2014 (UNICEF 2015). Stunting affects poor children much more than children from rich families: for example, in least developed countries, 49% of the poorest children are stunted vs 26% of the richest children; boys are more stunted than girls (43 vs 38%), and children living in rural areas are more stunted than those in urban areas (43 vs 32%) (UNICEF 2015). In 2015 stunting caused a U5-DALY loss in LICs and LMICs of 21.4 million years (IHME 2016).

Stunting is exacerbated by (a) the density of OD –the number of people practising OD per km2 (Spears 2013); (b) environmental enteropathy and SIBO (see ‘Environmental enteropathy and SIBO’above); and (c) DD and STHs (see ‘Soil-transmitted helminthiases’above) (Spears & Haddad 2015). In a 10-year study of 119 slum children in northeast Brazil, Moore et al. (2001) found that children who had had a high burden (∼9 episodes) of DD in their ﬁrst two years of life were on average 3.6 cm shorter at age seven than other children, and those children who had also had an early childhood helminthiasis were on average a further 4.6 cm shorter at the same age.

b) **allowing food waste and litter to accumulate in a ditch**

Poor SWM can pose serious risks to the health and safety of both the local population and people who work with waste. These risks include:

• Injuries and infection from direct contact with solid wastes: While all sharp items and chemicals may pose risks, there are particular concerns about contact with hazardous industrial wastes and pathogenic wastes from hospitals and clinics.

• Accidents and injuries: Waste collection and recycling workers face risks from traffic accidents and lifting injuries.

• Building rubble: This can be a physical danger because of partly collapsed buildings and unsafe surfaces.

• Contaminated air: Irritants and pathogens can be inhaled directly from fine-grained refuse material at open collection points and during waste transfer. Also, burning waste generates a large amount of smoke which can cause respiratory problems.

• Fire and explosion: Methane is generated as waste decomposes. This gas may support long-lasting fires in landfills, or seep into basements of surrounding buildings and reach potentially explosive levels. Piles of uncontained rubbish are a fire hazard.

• Spread of disease by vectors: Heaps of discarded waste provide a breeding ground for flies and rats. These vectors can transmit disease and pathogenic micro-organisms from solid waste and excreta to the household. Concerns about the spread of pathogens are especially relevant in low-income countries where faecal matter is often present in solid waste. Water in tyres, old tin cans, or other containers encourages the breeding of mosquitoes, which also transmit diseases such as dengue, yellow fever, and malaria.

• Spread of disease by other animals: Foraging animals are likely to eat waste which may contain pathogens that are passed on when their meat is eaten.

• Diseases: Diseases that can spread through poor SWM include dysentery, viral and bacterial diarrhoea, gastro-enteritis, typhoid, trachoma, plague, typhus, salmonella, leptospirosis, filariasis, malaria, tapeworm, and trichinosis.

• Scavenging: Poor people, especially in times of famine or food scarcity, may also be attracted to waste to hunt for food, leading to an increased risk of gastro-enteritis, dysentery and other diseases.

• Groundwater contamination: Groundwater can become contaminated by polluted water (i.e. leachate) from unsatisfactory disposal sites (Humanitarian Innovation Fund, 2016).

**(c) not washing hands before eating.**

Hands play a major role in the transmission of infection in healthcare institutions, in industrial settings such as the food industry and also in all community and domestic settings. The importance of hand hygiene in the control of infection cannot be under emphasized. Recognition of the importance of hand hygiene in the control of the spread of infectious diseases is reﬂected in the increased number of publications in the medical literature during the last few years, including major articles on hand hygiene in prominent general medical journals. Using ‘handwashing’ as a key word in PubMed showed that from 1968—1983 there were187 citations, compared with 1535 citations from 1990—2003 (Jumaa, 2005). Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others. Many diseases and conditions are spread by not washing hands with soap and clean, running water (CDC, 2015).

There are 2—3 million deaths worldwide each year from diarrheal diseases, many of which could be prevented. It has been estimated that handwashing with soap could save a million lives a year (Jumaa, 2005).

Proper hand washing is one of the most effective ways of preventing the spread of diarrheal diseases. Pathogens cannot be seen on hands, and water alone is not always sufficient to remove them. Soap and wood ash are both cleansing and disinfecting agents when used with water and can be used to kill pathogens on hands and utensils. The most important times that hands should be washed with soap and water are (Africa Institute for project management studies, 2017):

* After defecating.
* After cleaning a child who has defecated.
* Before eating or handling food.

Historical perspectives in hand hygiene

Although handwashing has been considered a measure of personal hygiene for centuries, the speciﬁc link between handwashing and the spread of infectious diseases has been reported only during the last 200 years. Ritual handwashing was part of religious or cultural practice but cleaning hands was concerned with aesthetics rather than the prevention of infection. Bad smells were thought to spread infections such as the plague. Interestingly, during the Black Death in the 14th century, it was noted that Jews seemed to have a lower mortality rate than other groups. The ritual handwashing of the Jewish faith probably protected Jews during the epidemic, though the focus of the ritual washing was spiritual rather than infection control. In 1846, Semmelweis reported a reduction in the number of deaths from puerperal infection by the implementation of hand hygiene. However, the establishment of handwashing as an intervention to prevent the spread of infection did not occur for many more years and it is only during the last few decades that written guidelines for hand hygiene have emerged. In 1961 in the US, there were recommendations that healthcare workers (HCWs) should wash their hands with soap for one to two minutes before and after patient contact. Formal written guidelines on handwashing practices in hospitals were published by the CDC in 1975 and 1985. Further guidelines from other professional bodies emerged. While the earlier guidelines recommended the use of soap and water in preference to waterless antiseptic solutions, recent guidelines have included more widespread use of waterless antiseptic agents in preference to handwashing with soap and water (Jumaa, 2005).

How germs get onto hands and make people sick

Feces (poop) from people or animals is an important source of germs like Salmonella, E. coli O157, and norovirus that cause diarrhea, and it can spread some respiratory infections like adenovirus and hand-foot-mouth disease. These kinds of germs can get onto hands after people use the toilet or change a diaper, but also in less obvious ways, like after handling raw meats that have invisible amounts of animal poop on them. A single gram of human feces—which is about the weight of a paper clip—can contain one trillion germs. Germs can also get onto hands if people touch any object that has germs on it because someone coughed or sneezed on it or was touched by some other contaminated object. When these germs get onto hands and are not washed off, they can be passed from person to person and make people sick (CDC, 2015).

Washing hands prevents illnesses and spread of infections to others

According to CDC, handwashing with soap removes germs from hands. This helps prevent infections because:

People frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the body through the eyes, nose and mouth and make us sick.

Germs from unwashed hands can get into foods and drinks while people prepare or consume them. Germs can multiply in some types of foods or drinks, under certain conditions, and make people sick.

Germs from unwashed hands can be transferred to other objects, like handrails, table tops, or toys, and then transferred to another person’s hands (CDC, 2015).

Removing germs through handwashing therefore helps prevent diarrhea and respiratory infections and may even help prevent skin and eye infections.

Teaching people about handwashing helps them and their communities stay healthy.

Handwashing education in the community:

Reduces the number of people who get sick with diarrhea by 31%

Reduces diarrheal illness in people with weakened immune systems by 58%

Reduces respiratory illnesses, like colds, in the general population by 16-21% (CDC, 2015).

Not washing hands harms children around the world

About 1.8 million children under the age of 5 die each year from diarrheal diseases and pneumonia, the top two killers of young children around the world.

* Handwashing with soap could protect about 1 out of every 3 young children who get sick with diarrhea and almost 1 out of 5 young children with respiratory infections like pneumonia.
* Although people around the world clean their hands with water, very few use soap to wash their hands. Washing hands with soap removes germs much more effectively.
* Handwashing education and access to soap in schools can help improve attendance.
* Good handwashing early in life may help improve child development in some settings (CDC, 2015).

Handwashing helps battle the rise in antibiotic resistance

Preventing sickness reduces the amount of antibiotics people use and the likelihood that [antibiotic resistance](http://www.cdc.gov/drugresistance/about.html) will develop. Handwashing can prevent about 30% of diarrhea-related sicknesses and about 20% of respiratory infections (e.g., colds). Antibiotics often are prescribed unnecessarily for these health issues. Reducing the number of these infections by washing hands frequently helps prevent the overuse of antibiotics—the single most important factor leading to antibiotic resistance around the world. Handwashing can also prevent people from getting sick with germs that are already resistant to antibiotics and that can be difficult to treat (CDC, 2015).

**The hands as vectors of microorganisms**

The microbial population of the skin is divided into resident ﬂora and transient ﬂora. The resident ﬂora are associated with the deeper layers of the skin such as the sebaceous glands and these organ-isms are inaccessible to hand hygiene preparations. The resident ﬂora consist mainly of coagulase-negative staphylococci, Corynebacterium spp. and anaerobes such as Propionibacterium spp. and rarely cause infection unless the skin is breached by a device such as a central venous catheter. The transient ﬂora colonize the superﬁcial layers of the skin and are less adherent. They are more easily removed by handwashing and may be transferred by direct hand contact between human skin and the inanimate environment such as work surfaces or food, hence the term transient. The transient ﬂora include microorganisms which are frequently associated with nosocomial infection. Viruses are not considered part of normal ﬂora and are therefore included as transient or contaminating ﬂora which should be removed during hand hygiene practices. The number of microorganisms on intact areas of skin in the same person can vary from 100—106/cm2. The range of microorganisms can vary from person to person and HCWs may have different hand ﬂora from ordinary members of the public and become permanently colonized with pathogenic ﬂora acquired from the hospital environment (Jumaa, 2005).

Hospitalized patients can also become colonized with microorganisms which survive well in the hospital environment including Staphylococcus aureus, enterococci, and Gram-negative bacilli such as Pseudomonas spp, Klebsiella spp, and Acinetobacter spp (Jumaa, 2005).

There is evidence that although the skin ﬂora vary considerably from person to person, the transient and resident ﬂora remain uniform for an individual (Jumaa, 2005).

In a healthcare setting for example, data are limited on the types of activities which are most likely to result in the contamination of hands and the transmission of the pathogens to patients. Nosocomial pathogens can be recovered from body ﬂuids or infected areas of skin in patients, but also from intact skin of hospitalized patients. Nurses can contaminate their hands with nosocomial ﬂora even when performing clean procedures involving direct patient contact such as taking blood pressure or touching a patient’s hand or shoulder. Healthcare workers may also contaminate their hands by contact with a patient’s inanimate environment. The level of contamination depends on the duration and nature of the activity, though it is not known how many organisms are required for transmission or which activities are most likely to result in transmission (Jumaa, 2005).

The aims of hand hygiene practices are to eliminate rapidly, as far as possible, the transient (contaminating) ﬂora and also to have persistent antimicrobial activity on the resident ﬂora. In the context of a healthcare setting, this means decontaminating the hands of transient ﬂora before the next patient contact. The prolonged activity of hand hygiene preparations between use is particularly important in healthcare settings, where clean hands are required for prolonged periods of time (Jumaa, 2005).

Hand hygiene preparations should also not damage the skin. Apart from the discomfort associated with skin conditions such as contact dermatitis and eczema, and there will be a reluctance to perform hand hygiene practices. Damaged skin can also be more heavily colonized with pathogenic organisms and it is therefore possible that hand-washing with soap may result in damaged skin and an increase in the number of ﬂora over time.28Hand-washing damaged skin is also less effective in reducing the number of microorganisms than in healthy skin. Soap consists of esteriﬁed fatty acids with sodium hydroxide or potassium hydroxide. Soap preparations include bars, liquids and leaﬂets. Plain soaps have little or no antimicrobial activity and their cleaning activity is mainly detergent or mechanical where dirt and other organic substances are removed from the hands and the transient ﬂora, which are not strongly adherent to the skin (Jumaa, 2005).

In several studies, handwashing with plain soap did not remove pathogens from the hands of HCWs. Both bar soaps and liquid soaps may become contaminated with bacteria during use, with bar soaps being associated with heavier contamination compared to liquid soaps. However, other studies have suggested that while they may become contaminated with bacteria, these bacteria are unlikely to be transferred to hands. Soap may also result in skin irritation and dryness, as mentioned previously (Jumaa, 2005).

The alcohols used in alcohol-based hand antiseptics are ethanol, isopropanol, and n-propanol. These have been studied alone, in combinations of two alcohols and also in combination with other disinfectants such as hexachlorophene, quaternary ammonium compounds, povidone-iodine, triclosanor chlorhexidine gluconate. The antimicrobial activity of alcohols is attributed to their ability to denature proteins. A concentration of 60—95% is most effective. Higher concentrations are less effective because water is needed for the denaturation of proteins. Alcohols have a wide antimicrobial spectrum including Gram-positive bacteria, Gram-negative bacteria, mycobacteria, fungi and some enveloped viruses, but poor activity against bacterial spores, oocysts and some non-enveloped viruses. Alcohols have the most rapid bactericidal activity compared with other disinfectants when applied to the skin. However, there is little residual activity. Adding a disinfectant such as chlorhexidine, triclosan, or quarternary ammonium com-pounds increases the persistence of antimicrobial activity on the skin (Jumaa, 2005).

Hand rubs with an alcohol base have recently been recommended as being more effective in reducing hand contamination compared with handwashing with an antiseptic soap, where hands are not macroscopically contaminated. Their use has been recommended for years because of their increased convenience compared with handwashing and they have become widely promoted in hand hygiene practice in clinical settings. They have a wide antimicrobial spectrum, they act rapidly, they spread easily without friction which damages skin, they evaporate rapidly, there is no need for a sink or drying facilities and they save time when compared with conventional handwashing. There is also evidence that HCWs are more likely to use them than to wash hands with soap and water. In a healthcare setting they may also be cost effective in terms of the number of nosocomial infections prevented, though further analyses are necessary to substantiate this (Jumaa, 2005).

Sinks and taps

Sinks contain stagnant water, which supports the growth of microorganisms. Therefore sinks themselves can be sources of pathogenic bacteria which can in turn be transferred to hands during hand hygiene practices. Given the potential risks of hand contamination associated with sink contact, no-touch taps and automated sinks have become more common both in the healthcare setting and in public toilet facilities. However, while these may have the potential to improve the effectiveness of hand hygiene practices, automated sinks may still become contaminated with pathogenic organisms if not maintained properly (Jumaa, 2005).

Hand drying

Hand drying is an essential component of effective handwashing. It is universally accepted that the transmission of microorganisms is more effective in wet environments than in dry environments. In spite of this, guidelines generally direct little attention to the importance of hand drying when recommending handwashing and there have been very few articles in the medical literature which focus on hand drying. Hand drying should be effective in drying hands without contaminating them further. Damp hands as a result of ineffective hand drying can lead to skin excoriation which in turn leads to higher numbers of bacteria colonizing the skin and facilitation of the spread of blood-borne viruses as well as other microorganisms. Sore hands will also lead to decreased compliance with handwashing programmes (Jumaa, 2005).

There are three methods of hand drying: cloth towels, paper towels and hot air dryers. Hands can also dry by evaporation. There has been much debate regarding the efﬁcacy of these methods in terms of hand hygiene and the results of investigations have been conﬂicting. One report compared four methods of hand drying: cloth towels from a roller, paper towels left on a sink, hot air dryer and leaving hands to dry by evaporation. No signiﬁcant differences in the efﬁcacies of each method were noted. However, it should be noted that cloth towels are not recommended for use in healthcare settings because of evidence that microorganisms are less effectively removed. There is also the risk of cross-infection (Jumaa, 2005).

Differing results have been obtained when comparing paper towels and hot air dryers. It has been suggested that hot air dryers may disperse micro-organisms by the airborne route and hand towels are usually considered safer in a clinical area. However a recent paper did not ﬁnd that hand dryers were more likely to contaminate the environment with air-borne microorganisms than drying with paper towels (Jumaa, 2005).

The maintenance of a clean environment around paper towels is essential for non-hazardous hand drying. This includes the choice of dispenser allowing ease of delivery, correct use of the dispenser, jamming of the dispenser, site of dispenser in relation to sinks and splash zones. The dispenser itself may be the source of microorganisms if it becomes contaminated. Damp towels left in the dispenser may also pose an infection risk (Jumaa, 2005).

The quality of the paper towels is also important; poor quality towels may damage skin by abrasion and ineffective drying. Soft, absorbent paper towels are more acceptable to users and may con-tribute to compliance with hand hygiene recommendations (Jumaa, 2005).

Other issues relating to hand hygiene in the healthcare setting

Gloves

The use of gloves in healthcare settings has increased during the last two decades, particularly following the increased awareness of blood-borne viruses, especially HIV, and the subsequent promotion of universal precautions.58The use of gloves is recommended to reduce contamination of the hands with ﬂora which may be transferred to patients, to prevent the ﬂora of HCWs from being transferred to patients and to protect HCWs from acquiring infections from patients. Evidence that gloves can prevent hands from becoming contaminated with microorganisms both from the patients and the inanimate environment is provided by several studies. It is important that hands are prevented from becoming contaminated because hand hygiene practices are not always successful in removing all pathogenic organisms when hands are heavily contaminated. Also, in the absence of macroscopically visible contamination it is not usually possible to know how many organisms have been acquired and the subsequent risk of transmission (Jumaa, 2005).

Gloves have been used to reduce the transmission of pathogens in clinical settings and to help control outbreaks (Jumaa, 2005).

Glove wearing may also inﬂuence the hand hygiene behaviour of HCWs. In some studies this has meant healthcare personnel being less likely to wash their hands following patient contact. In another, glove wearing increased the compliance with hand hygiene practices. It is important to remind HCWs that hands must still be decontaminated following glove wearing as gloves do not give complete protection against contamination with patients ’ﬂora. Gloves may in turn contribute to the spread of pathogens if not used correctly. They should be changed between patients and should not be washed or reused. Also, transmission of hepatitis B and herpes simplex to HCWs wearing gloves has been reported. The route of trans-mission while wearing gloves may result from contamination when removing gloves or from small defects in the gloves and subsequent loss of the integrity of the physical barrier (Jumaa, 2005).

It is important that the gloves are well-tolerated by the wearers and that they are strong but also give good sensitivity. Studies have shown that there is considerable variation in the gloves available for clinical use. Gloves may be made from natural latex or synthetic materials such as vinyl or nitrile and it is important that more than one type is available because latex sensitivity among HCWs is more commonly reported. There have also been differences in the reported tendency of barrier protection for vinyl gloves compared with latex gloves; vinyl gloves being less reliable than latex gloves in some studies. Double gloving is some-times practised to increase the barrier protection. One study examined the gloves after use and tested them for leaks and found that double layers pro-vided little advantage over a single layer, especially if latex gloves were used (Jumaa, 2005).

Hand creams and emollients

Sore, dry hands is a frequently reported problem among HCWs who are required to wash or decontaminate their hands frequently. Lipids contribute to the barrier function of the skin and skin creams, lotions and emollients may increase the skin hydration and further add to the protection of skin. A double-blind, randomized trial of a barrier cream and an oil-based lotion demonstrated that scheduled use of either preparation signiﬁcantly protected the hands of HCWs who already had severe skin irritation. The same study also showed that improvement of the skin was associated with an increase in handwashing. However it is not yet known whether barrier creams make a signiﬁcant contribution to the overall prevention of skin problems. There is also concern that oil-based products may inhibit the barrier function of latex gloves and the effectiveness of antimicrobial agents used in hand hygiene practices (Jumaa, 2005).

Rings

The skin underneath rings has more microorganisms than control sites. The number of microorganisms increases with the number of rings worn. In one study, multivariate analysis suggested that wearing rings was a major risk factor for carrying Gram-negative bacilli and S. aureus on hands, both being important nosocomial pathogens. There is also evidence that the organisms found under rings may be carried for many months. In an experimental model using food handlers as subjects, hand-washing was slightly less effective in ring wearers, but this was in hands which were artiﬁcially contaminated, not in a real life situation. There is little evidence to suggest that handwashing is ineffective in ring wearers, with most reports showing similar bacterial counts in ring wearers and non-ring wearers. There is little evidence relating the wearing of rings to patient outcome, such as the incidence of nosocomial infection (Jumaa, 2005).

Wrist watches and bracelets

It seems obvious that hand hygiene practices in clinical areas cannot be adequate if a wrist watch or bracelet is worn. Most hospital infection control guidelines recommend that wrist watches and bracelets are removed before hand hygiene practices are performed. A Medline search of ‘hygiene’ and ‘wrist watches’ found only two citations concerning hand hygiene and no citations using ‘bracelet’ and ‘hygiene’ as keywords. A study investigating 20volunteer dentist and 20 non-clinical volunteers found that skin underneath a wrist watch was more heavily colonized with microorganisms than control sites, in common with the skin underneath rings. While the microorganisms were unlikely to cause infection in a routine dental setting, they were well-recognized nosocomial pathogens. However, there is almost no other evidence to support the recommendation not to wear a wrist watch and compliance is poor (Jumaa, 2005).

Sleeves and cuffs

Hand hygiene policies recommend that sleeves should be rolled up beforehand hygiene procedures. Most uniform policies also recommend short sleeves, though short sleeves are not usually enforced for HCWs who do not wear uniforms. It would be expected that wet sleeves, in common with any moist surface, could act as a reservoir for micro-organisms, which could then be transferred to hands by direct contact. The visible macroscopic contamination of cuffs during the normal wear highlights their potential for transmitting pathogens. But evidence in the medical literature to support short sleeves is lacking (Jumaa, 2005).

Fingernails nail technology and nail polish

The subungual region contains large numbers of bacteria which are largely inaccessible during hand hygiene practices and are therefore difﬁcult to clean compared with the rest of the hands. Most infection control guidelines recommend that ﬁnger-nails are kept short. This facilitates cleaning but it has also been shown that longer nails have increased numbers of microorganisms. Long nails are also more likely to tear gloves, thereby breaking the barrier (Jumaa, 2005).

Artiﬁcial nails are increasingly reported as having the potential to transmit infections in the health-care setting. Artiﬁcial nails are more likely to be colonized with Gram-negative bacilli and yeasts than natural nails. In one study, although artiﬁcial nails were more likely to be colonized with Gram-negative bacteria and yeasts, the overall numbers of organisms did not differ. Pathogens were also more likely to be isolated the longer the nails were worn. There is evidence that washing artiﬁcial nails is not as effective as for natural nails. A study comparing hand hygiene using soap or an alcohol gel found that HCWs with artiﬁcial nails had more bacteria remaining after cleansing than those with natural nails (Jumaa, 2005).

There are several reports linking ﬁngernails with the transmission of nosocomial infection. One study linked an outbreak of postoperative Serratia marcescens infection with a nurse, suggesting that artiﬁcial ﬁngernails may have facilitated the transfer of S. marcescens from home. In another study, an outbreak of Pseudomonas aeruginosa in a neo-natal intensive care unit was associated with two nurses with long ﬁngernails, one artiﬁcial and one natural. An outbreak of Candida albicans infection following laminectomy was epidemiologically linked to an operating room technician wearing artiﬁcial ﬁngernails. In this investigation, though C. albicans was not isolated from her nails, no new cases occurred following her treatment and her removal from duty. There is now sufﬁcient evidence to recommend that artiﬁcial nails constitute an infection risk in high-risk areas and should not be worn in clinical areas, though further investigations are necessary to better deﬁne the risks involved (Jumaa, 2005).

Other forms of nail art and technology have become popular in many countries and have recently been reviewed in the context of hand hygiene in HCWs. Practices include applying artiﬁcial material to the nails for extensions, nail sculpturing, protecting nails by covering them with a protective layer of an artiﬁcial material and nail jewelry, where decorations such as stones may be applied to the nails or the nails are pierced. While there are many potential health problems, including local infection for individuals who have under gone some form of nail technology, there is also the potential risk that these practices may pose a threat to patients and in other critical areas such as the food industry. Apart from artiﬁcial nails, data linking the other forms of nail art and nail technology with hand hygiene and the spread of infection are lacking, but this may change in the future. Given the evidence accumulated so far, it would seem appropriate to restrict artiﬁcial nails and nail art from high-risk areas (Jumaa, 2005).

Although most hand hygiene policies recommend that nail polish is not worn in clinical areas, there has been little work to investigate the effect of nail polish on the ﬂora of ﬁngernails and none linking nail polish with hospital-acquired infection. A study on the ﬁngernails of operating room nurses found increased bacterial counts associated with chipped nail polish or nail polish that had been worn for more than four days compared with fresh, intact polish. Freshly applied nail polish on natural nails did not result in increased bacterial counts compared with unpolished natural nails (Jumaa, 2005).

Hand art-tattoos

Temporary tattoos on the hands, made with henna, are very popular in the Middle East, parts of Asia and Africa and it is not unusual for female HCWs in these countries to be found wearing such hand tattoos. The practice is also becoming more widespread in western countries. No hand hygiene issues for any type of tattoos were found in the literature. However, there is need to further research on the hygiene aspect of these hand art-tattoos (Jumaa, 2005).

The importance of hand hygiene outside the healthcare setting

Although most of the medical literature concerning hand hygiene refers to healthcare settings, the potential of hand hygiene as an achievable and viable option to reduce the global burden of infectious disease has been recognized for years. Diarrheal illness is common and is a major cause of death in children worldwide. Contact with human excreta is the main factor in the spread of diarrheal illness and washing hands after possible contact with faeces is the major intervention for breaking the chain of transmission of infectious agents. While it is known that compliance with hand hygiene guidelines is poor in a healthcare setting, it is also known from worldwide studies that hands are washed with soap less than 20% of the time. For example, workers in the UK found that in the home environment careers washed their hands on only 42%of occasions when they changed a child’s dirty nappy. Only 34% of male and 56% of female members of the public washed their hands after using a public toilet in a train station in the UK.95In other countries, handwashing after cleaning a child following defecation occurred in a minority of cases. However, increasing handwashing frequency worldwide, when only 60% of the world’s populations have adequate sanitation, is a major challenge (Jumaa, 2005).

The effectiveness of handwashing programs in reducing diarrhoeal cases in developed and developing countries has been reviewed recently.2Theresults suggest that handwashing may reduce the incidence of diarrhoea by 42—47%, which worldwide could reduce the number of deaths by about one million. However, further studies are necessary to identify the best way to achieve this in different geographical and cultural settings. The formation of public—private partnerships is an important development (Jumaa, 2005).

Scientiﬁc evidence and the organizational complexity of hand hygiene studies

One reason cited for the lac k of compliance with hand hygiene recommendations is the lack of scientiﬁc evidence for many of the issues concerned with hand hygiene practices. There are many basic questions, such as when should hands be washed, how they should be washed, which product should be used and for how long, which have not been resolved (Jumaa, 2005).

Hand hygiene practices are the result of a complex interaction of many factors and this makes designing methodologies for hand hygiene studies especially challenging. There are almost no standardized methods for many aspects of hand hygiene and therefore it is very difﬁcult to make comparisons between studies. Most hand hygiene data concerning microorganisms are for bacteria. While these are among the most frequent causes of com-munity and hospital infection, viruses are also extremely important and are far more difﬁcult to investigate (Jumaa, 2005).

Studies on hand hygiene have been mainly observational and may be subject to reactive biases because of the presence of an observer. Blinding, randomization and controlling for confounding variables may not be feasible. For example, studies comparing handwashing and waterless hand rubs are impossible to test blind since it will always be obvious to the subject which product was being used. There is rarely just one intervention in studies of hand hygiene behavior. Many studies involve small numbers of subjects and therefore lack statistical power. There has been little or no follow-up in hand hygiene studies and so it may not be known if any beneﬁcial effect of an intervention to improve hand hygiene behavior has resulted in sustained improvement with compliance (Jumaa, 2005).

One of the most challenging aspects of hand hygiene study design is trying to reﬂect what hap-pens in a real life situation, whether it is in a ward or in the home. Experimental models are an artiﬁcial medium. It is difﬁcult to perform investigations in a real life setting without disrupting normal practice or the smooth running of a clinical area. For example, most handwashing guidelines recommend that hands are washed vigorously for 15 seconds. In reality, in a working situation, hands are generally washed for less than 15 seconds. Most evaluations of hand rubs recommend 3 mL for 30 seconds. HCWs do not necessarily use hand rubs in this way. It is very difﬁcult to control how much of a product is used, its contact time with the skin and the rinsing time. All of these introduce variability into hand hygiene studies (Jumaa, 2005).

The overall aim of hand hygiene studies is to provide evidence that adherence to hand hygiene practices results in a decrease in infection. There are few studies which have focused on patient out-comes such as surgical wound infection rates. The diagnosis of infection is limited by the re cognition of symptoms and is therefore not straight forward and may be variable (Jumaa, 2005).

It is therefore a challenge, given all these methodological limitations, to provide convincing evidence for all the recommendations laid down in guidelines for hand hygiene. Nonetheless, despite these limitations, there is more evidence supporting the beneﬁt of hand hygiene in breaking the chain of transmission of infection in both the healthcare setting and in the community than there is for some widely accepted clinical practices (Jumaa, 2005).

Compliance with hand hygiene practices— behavioral and cultural factors

It is widely known that compliance with hand hygiene recommendations is poor. Improving compliance is about altering human behavior and therefore studying compliance with hand hygiene recommendations includes input from a wide range of disciplines, including behavioral and social sciences. Hand hygiene behavior is a complex interaction of many factors and no one behavioral theory can reliably predict hand hygiene behavior. Improving compliance with hand hygiene practices requires an understanding of what motivates hand hygiene behavior and this will vary from culture to culture. The main factors affecting compliance are summarized in Table 1. Some religions recommend when washing with water should be performed. The aim of this ritual cleansing is spiritual and there is no mention of the use of cleansing agents such as soap nor is there any precise association of ritual cleansing with infectious disease (Jumaa, 2005).

In the healthcare setting there is a dichotomy between hand hygiene knowledge and hand hygiene behavior. HCWs are aware of recommendations regarding hand hygiene, but knowledge and education do not in themselves motivate hand hygiene behavior, hence the low compliance. Self-reported rates and observed rates of compliance with hand hygiene practices also differ. There is evidence that HCWs may be unaware of their poor compliance when the intention to perform hand hygiene is there but other factors result in non-adherence (Jumaa, 2005).

Concern for third party opinion seems to be an important factor in determining hand hygiene behavior. For example, reasons given for performing handwashing following changing a soiled nappy in the UK included giving a good impression as well as aesthetics and the promotion of the well-being of the child.94In Botswana and Burkino Faso, for example, conforming to social ideals is also an important motivating factor for handwashing. In the healthcare setting it is essential to have strong commitment from management and superiors to change hand hygiene behavior (Jumaa, 2005).

Another approach to increasing compliance is patient pressure. The ‘Speak Up’ campaign sponsored by the Joint Commission on Accreditation of Healthcare Organizations in the US encourages patients to observe whether HCWs wash their hands and to remind them to perform hand hygiene where necessary. It will be interesting to see the effect that this programme has on hand hygiene and nosocomial infection rates in participating healthcare institutions (Jumaa, 2005).

While peer pressure and conforming to social ideals are important in motivating hand hygiene behavior, a culture of hand hygiene cannot be created by force or mandate. The acceptance of a new value system is necessary and the introduction of such changes is a major challenge (Jumaa, 2005).

The acceptability of hand hygiene preparations to the users is important when considering compliance. Although the provision of adequate hand hygiene facilities and easy access to hand hygiene preparations and equipment, such as the number of sinks, placing alcohol hand rubs at patients’ bed-sides, would seem obvious in improving compliance, the effects of improving facilities have led to conﬂicting results on compliance with hand hygiene recommendations. A recent study found that increasing the number of sinks was not effective in increasing the frequency of hand washing when this was the only measure to improve compliance and that a key factor for adherence to hand hygiene practice was the behavior of other HCWs, particularly superiors (Jumaa, 2005).

For many years, the message regarding hand hygiene has been to promote handwashing. Recently, to complicate the issue of compliance further, the message has changed to hand rubbing with alcohol-based preparations (Jumaa, 2005).

As mentioned, what motivates hand hygiene behaviour is a complex interdependence of many factors including cultural factors. In a UK hospital trust with a sizeable number of Muslim patients and staff, the infection control team has encountered refusal from staff and patients’ families to use alcoholic hand rubs on religious grounds (personal communication, Mr Paul Hateley). Interestingly, in a tertiary referral hospital in the United Arab Emirates where more than 95% of patients are Muslim and Muslim staff form a majority, refusal to use alcohol hand rubs on religious grounds has been encountered only once in the last three years (personal communication, Ms Sue Bacon). It is not yet clear whether this represents a serious issue for the future but it does illustrate the importance of external factors in determining hand hygiene behavior in a healthcare setting and the need for abroad-based approach involving professionals other than HCWs when trying to understand and improve compliance (Jumaa, 2005).

Hand hygiene as part of an integrated approach to reducing infection

It is being recognized in the healthcare setting that adequate hand hygiene as an isolated intervention will not interrupt the spread of infectious disease if other aspects of hygiene are not adequate or if there is overcrowding and understafﬁng. Effective hand hygiene practices are impossible without clean environmental surfaces and adequate hand hygiene facilities and this is relevant both in the healthcare setting and in the community (Jumaa, 2005).

|  |
| --- |
| Table 1 Factors inﬂuencing compliance with hand hygiene |
| Material factors   Convenient and accessible hand hygiene facilities e.g. fast-drying hand rubs, no-touch sinks, hand rubs at patients’ bedsides, hand rubs outside patients’ rooms, hand rubs on the patients’ notes trolley during a ward round   Preparations which do not cause skin irritation   Preparations which are aesthetically acceptable  Behavioral and social factors   Perceived danger for carer of omitting hand hygiene practices   Perceived beneﬁt for dependent or patient   Concern for third party opinion e.g. peer pressure, conforming to social ideals   Gender   Educational background  Factors in a healthcare institution   Avoid overcrowding and understafﬁng   Rewards and sanctions   Promotion of a positive culture for hand hygiene   Provision of reminders for hand hygiene   Encourage active participation in the design of hand hygiene programs at all levels |

In conclusion, to encourage hand washing to become part of the daily routine, suitable facilities must be located near to places such as latrines and kitchens, where they will be needed. If running water is available, the facilities should include a tap and a sink as well as soap. Hands may also be washed at a tap stand as shown in Figures 8.1 and 8.2. If running water is not available, an oil can or bucket fitted with a tap is a simple way of providing hand washing facilities; the larger the container, the less frequently it will need filling. Some containers are mounted on stands with a ledge for soap. A leaking container (such as a tin can with holes in its base) can also be used to scoop water from the water storage container and provide a stream of running water for hand-washing. Another approach involves a suspended container that, when tipped, pours water onto the hands of the user. The system can easily be made from plastic cooking oil containers. Soap itself can be kept clean by suspending it above the ground on a string (Jumaa, 2005).

**Future**

There are many issues concerning all aspects of hand hygiene which remain unresolved. While hand hygiene practices are simple, compliance with hand hygiene is about human behavior and altering human behavior is complex and constitutes an enormous challenge. This is reﬂected in the lack of success so far (Jumaa, 2005).

This promotion of hand hygiene cannot be con-ﬁned to a healthcare setting. There must be the creation of a culture promoting hand hygiene at all levels of society to provide a foundation on which to establish a structure promoting compliance. It is impossible to make global recommendations regarding hand hygiene practices because what works in one culture may not work in another and all recommendations must take geographical and cultural factors into account (Jumaa, 2005).

There is not enough evidence to recommend one preparation over another. Standardized protocols and deﬁnitions are required both for laboratory investigations of hand hygie ne preparations and for the study of hand hygiene behavior. More well-designed studies are necessary. The establishment of the cost-effectiveness of recommendations is particularly important where resources are limited (Jumaa, 2005).

But the promotion of hand hygiene should not go too far and it raises the question: can clean be too clean? Exposure to environmental ﬂora is important in the development of a normal immune system. In the domestic setting the message regarding hand hygiene practices should be focused on interrupting the transfer of microorganisms and the spread of infection rather than just killing microorganisms per se. In the high-risk health care setting, then the need to reduce the overall microbial load in the hospital environment becomes important (Jumaa, 2005).

**3. Describe three specific challenges posed by peri-urban areas and slums for improving access and utilisation of WASH services.**

**Briefly explain how these risks could be reduced.**

**Introduction**

The term **WASH services** include supply and distribution of clean water, promotion and implementation of environmental sanitation, and promotion of safe hygiene practices to communities. **Sanitation** includes provision of latrines and other methods to protect health by preventing human contact with wastes. All three components – water, sanitation and hygiene – are important to ensure healthy community life. These services are also interdependent. For instance, handwashing with soap after visiting latrines is a safe hygiene practice. However, communities can only do this if clean water is available. Even when communities have an adequate supply of water, the lack of latrines can lead to open defecation and pose threats to health. Contamination of water and the wider environment is the source of many diseases caused by micro-organisms found in faeces (Open University, 2018).

WASH services should ideally be provided for the whole urban area at all times. Lack of services in one small area can lead to significant risk of contamination of water or food. A disease outbreak in a poorly serviced area of town can quickly spread to better serviced areas. Lack of WASH services therefore directly affects the health and well-being of whole communities. If not tackled, this will diminish Ethiopia’s capacity to progress towards its goals for economic development. WASH services are issues of basic human rights and dignity, and reflect politically on local and national government (Open University, 2018).

**WASH-related emergencies in urban areas**

Emergency situations can arise as a result of disease outbreaks, natural disasters or man-made incidents. Contamination of water sources or distribution systems by disease-causing micro-organisms is a common cause of widespread disease outbreaks, leading to emergency in urban areas. Contamination at the source, or along the pipe network where there are leakages, can reach a large number of people very quickly. Piped-water systems are more likely to become contaminated when pipes are allowed to become empty, either as a result of the common practice of rationing water distribution or because the supply has dried up. This is because the pressure goes down in empty pipes, which can lead to contaminated water seeping in through defects in the pipe (Open University, 2018).

Floods are another common cause of emergency situations in urban areas. When extreme rainfall occurs, the run-off generated can exceed the capacity of the town’s drainage systems. Accumulated solid wastes may have already piled up in the canals, reducing their water carrying capacity. As a result, flood water can overflow into streets and houses and, as this happens, harmful bacteria living and reproducing in the waste are also transported to households (Open University, 2018).

In developing countries, the number of people living in towns and cities is growing rapidly – both as a result of natural urban growth and because of migration into towns and cities from rural areas. This will add significantly to the number of people living without clean drinking water or adequate sanitation in urban areas. It will also cause more unemployment and poverty, widening the gap between the urban rich and the urban poor – who lack access to a whole range of basic services besides clean water and sanitation, including health care, education, transport, adequate housing, security, information and justice (Swedish Water House, 2007).

The rapid urbanisation has in many places resulted in an increase in slums. According to the UN-HABITAT definition a ‘slum’ household is one that lacks one or more of the following: (1) water, (2) sanitation, (3) durable housing, (4) a living area with a maximum of two people per room, and (5) secure tenure. It is estimated that more than 920 million people lived in slums in 2001 – that is about one-third of the world’s total urban population. By the year 2020, as much as half the world’s total urban population, which include those who live in the peri-urban areas surrounding city centres, could be living in poverty (Swedish Water House, 2007).

Poverty is one reason that the number of slums is growing. However, slums are not the only urban areas without adequate access to water and sanitation. It is a fact that in many cities the necessary infrastructure simply cannot be built quickly enough to keep up with growing urban populations. For example, the urban population served with improved drinking water sources increased nearly 36% from 1990 to 2004. Despite this effort the number of urban people unserved is increasing over time (Swedish Water House, 2007).

If efforts to provide sanitation coverage in urban areas continue at the current pace, coverage rates will increase from 80% in 2004 to only 82% in 2015 because of expected population increases. In absolute terms, this small increase means that 692 million people will be living without basic sanitation in urban areas in 2015 – 81 million more than in 2004 (Swedish Water House, 2007).

Cities and towns account for a large share of the nonrenewable resources that are consumed, producing large amounts of waste and serious air and water pollution in the process. This makes good water and wastewater management, as well as provision of adequate sanitation, essential in order to limit pollution and minimise health risks (Swedish Water House, 2007).

In fact, most cities today are environmentally unsustainable. With a substantial percentage of their residents living in areas without adequate shelter and basic services, many cities in the developing world are also socially unsustainable. Decision makers therefore need to view sustainable urbanisation as a crucial issue for the future of humanity. In so doing, they must recognise that the proper handling of water supplies and sanitation are fundamental dimensions of such sustainability (Swedish Water House, 2007).

**Peri-Urban Areas – The Interface Between Urban and Rural**

Most people have a clear idea of what is an ‘urban’ area and what is a ‘rural’ area, usually visualising some ideal landscape that corresponds to each. But simple divisions like this are meaningless in reality, and of no use to policy makers. Nowhere is there a neat dividing line where the city meets farmland, forest or desert (Swedish Water House, 2007).

In fact, although cities have spread rapidly they have not grown uniformly, because how they grow is dictated by a range of factors. These include the type of terrain and environmental barriers, the availability and cost of transport networks, land tenure systems, the value of the land around the city and the uses to which it is put, and different administrative and political boundaries (Swedish Water House, 2007).

In general, the peri-urban interface is characterised by strong urban influences, easy access to markets, services and other inputs, and ready supplies of labour. The interface can be roughly divided into two zones (Swedish Water House, 2007).:

(1) a zone of direct impact, which experiences the immediate effects of the demand for land exerted by urban growth, pollution, waste disposal and the like; and

(2) a wider market-related zone of influence – characterised by the production and trade of food and other products such as fibre and fuelwood, to satisfy demand from the urban area.

**The Water and Sanitation Challenges and the Peri-Urban Areas**

Peri-urban areas face a unique set of water- and sanitation related challenges which can only be tackled by good planning. Peri-urban areas include open spaces, for example, that are easy to access from built-up urban areas. As a result, they are often used as dumping grounds for urban waste – which has a severe impact on the areas’ ecosystems and the people living there. So, it is important to consider the peri-urban zone as an extension of the city rather than as an entirely separate area, and to plan the services provided accordingly (Swedish Water House, 2007).

Such planning must also take into account the wide range of variety found in a peri-urban area, however. The outer zone, for example, will contain rural settlements with urban characteristics – which neither rural water and sanitation programmes nor urban utilities will be able to serve effectively. The peri-urban interface will also contain slum areas and informal settlements that lack essential services like water and sanitation. The problem of sanitation in such areas is both critical and complex, because within them many people live in sustained poverty in cramped conditions without infrastructure, or any form of secure tenure, and at the mercy of those more powerful than them. Equity is also a crucial issue, as neighbouring communities may have different levels of access to water and sanitation (Swedish Water House, 2007).

As stated previously, overcoming these issues will require good urban planning, which should be used to properly coordinate land-use, infrastructure, urban functions and the provision of green areas. Good urban planning also involves coordinating the social and economic aspects of the development of new or improved infrastructure. It is a process that aims to coordinate the different institutional systems needed to properly provide and manage urban and peri-urban services (Swedish Water House, 2007).

**The ‘Rules’ of Good Peri-Urban Planning**

In order to achieve sustainable solutions in water and sanitation in peri-urban areas, comprehensive assessments of different options need to be supported. Any meaningful analysis requires a holistic approach – which can only be achieved if it considers (1) the system’s technical structure, (2) its organisation, and (3) the system’s users (Figure 2). The technical structure of the water supply system includes necessary treatment and distribution; the sanitation system includes collection, transport, treatment and end management of human excreta, greywater and solid waste. In some areas, industrial wastewater and storm water management are also included in the system structure (Swedish Water House, 2007).

A comprehensive analysis of sustainability should always address the following five issues: health, the environment, the economy, socio-culture aspects and technical function.7 Other issues may also have to be included in the assessment, however, in order to take account of issues specific to a particular area – what might be called local planning issues (Swedish Water House, 2007).

Key to sustainable peri-urban development is the promotion and use of a strategic planning process that is based on open, creative and constructive communication and cooperation between decision makers, experts and the public. In addition, planning must be driven by local needs and carried out at the local level (Swedish Water House, 2007).

Planning in this way creates a forum which brings decision makers into contact with business people, researchers and members of the public with local knowledge (Swedish Water House, 2007).

What is more, when interested parties are involved from early on in the planning process, they can help to (1) identify the first steps to take, (2) formulate the main aims of the process, and (3) develop and assess planning alternatives (Swedish Water House, 2007).

For strategic planning to be both integrated and comprehensive it needs to consider the technical, economic and cultural aspects of sustainable development. Public participation can play an important role in preventing the process from being dominated by one of the aspects over the others. Good planning is a systematic process that defines (1) a strategy that sets goals, and (2) what has to be done (in terms of allocating resources) to achieve those goals. The planning process is iterative, in that it can be repeated until an acceptable consensus is achieved. It should also be able to respond to any future changes that may occur (Swedish Water House, 2007).

**4. Explain three challenges associated with engaging stakeholders in planning and implementing urban WASH projects.**

**1. Lack of coordination**

In the past there has tended to be a lack of coordination among the organisations and agencies responsible for WASH projects, for example between governmental and non-governmental organisations, and this has resulted in duplication of effort, contradiction or inconsistency (WUP, 2003). There has also tended to be separation between projects to improve water supply and those related to sanitation and hygiene. As a result of this fragmented approach, there have been gaps in communications with stakeholders and some have been left out of the planning and knowledge sharing in a project (AIPMS, 2018).

New approaches to WASH are more integrated and aim to bring different stakeholders together. There is a new emphasis on the importance of communication and collaboration. For example, the One WASH National Programme, launched in 2013 is a shared programme across four federal ministries. The National WASH Coordination Office has mandates to support stakeholder communications, knowledge sharing and dissemination, and to facilitate concerted urban WASH efforts at both national and sub-national levels can be useful when developing a plan for stakeholder engagement. Such a plan should outline (AIPMS, 2018):

 objectives (what are you trying to achieve?)

 scope (who and what is included?)

 methods (how will you put the plan into action?).

The methods used will vary for different stakeholders and will depend on several factors including how actively they are involved. For example, for users and beneficiaries, mediated discussions with service providers could be appropriate. For other, less engaged stakeholders, printed leaflets or other methods for providing information could be considered (AIPMS, 2018).

**Challenges for stakeholder engagement**

Involving stakeholders in planning and implementing projects is essential for their success and sustainability. However it can present challenges that need to be understood and overcome.

**Lack of coordination**

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* + - 1. **Reaching low-income households**

The delivery of water supply and sanitation to low-income urban and peri-urban communities is complex. Poor consumers may not be adequately represented in community organisations and are often perceived as being ignorant and apathetic. However, in many instances this is clearly not the case because they have proved themselves able and willing to help bring about change that will improve their living conditions (WUP, 2003). Effective communication strategies that reach out to low-income communities will be needed to ensure they are also included within the stakeholder group of users and beneficiaries (AIPMS, 2018).

* + - 1. **Working across boundaries**

One of the particular challenges of WASH is that it means working across sector and disciplinary boundaries. Although commonly referred to as the ‘WASH sector’, WASH is a combination, as you know, of water, sanitation and hygiene sectors and is therefore cross-sectoral, meaning it involves people from different sectors working together. In particular it involves representatives from offices and bureaus of water, health, urban development and finance. It is also cross-sectoral in the sense that it involves both public and private sectors including government departments and agencies, and contractors, consultants and other private companies (AIPMS, 2018).

Cross-disciplinary communication is also essential because many complex WASH problems require more than one source of information to solve them. Cross-disciplinary refers to the academic disciplines and training of the people involved. These could include engineers, sociologists, hydrologists, doctors, nurses, accountants and managers to name but a few. People trained in different disciplines often have different ways of thinking and approaching an issue that can make communication between them difficult. Care is needed to ensure that everyone understands each other and that the information provided by and to stakeholders is accurate, relevant and can be easily understood (AIPMS, 2018).

Although it can be a challenge, it is important to realise that cross-boundary working has many advantages as well. The combination of different perspectives and experiences brings a diversity of thinking and approach that can ultimately make a project more successful. The key issue is to recognise the differences and work with them to ensure all voices are heard (AIPMS, 2018).

Imagine you are working on a programme that involves liaising with officials from different government departments, including water resources, health and education. What issues would this raise?

The officials from the water resources department (engineers or water supply technicians), those from the health department (community health workers, nurses or midwives) and those from the education department (teachers) would all have different academic backgrounds and varying knowledge which they could contribute to the discussion (AIPMS, 2018).

Cross-disciplinary engagement is about teamwork, where individuals bring different skills to the table and see issues from different perspectives. However, in order for a new cross-disciplinary team to become effective that team must develop shared values and culture. As a WASH practitioner you may be involved in the development and maintenance of effective forms of cross-sectoral and cross-disciplinary communication to manage complex WASH problems in your locality (AIPMS, 2018).

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