



Analysis of Research on the Effects of Improved Water, Sanitation, and Hygiene on the Health of People Living with HIV and AIDS and Programmatic Implications*

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Introduction

Diarrheal diseases are the most common opportunistic infections (OIs) experienced by people living with HIV and AIDS (PLHA) in Africa and elsewhere. Most of these diarrheal OIs are water borne or water washed and cause significant loss of functional days (missed work and missed school days), loss of income, considerable human suffering, increased burden on caregivers, weakening of general health and eventually death. Several case studies and position pieces (Kamminga 2006, UN-Habitat 2006, USAID 2006) have been written on the importance of integrating WaSH into AIDS programs. Surprisingly, few programs for PLHA have included a focus on basic water, sanitation, and hygiene (WaSH) behavior change or attended to services and products (such as chlorine for household water treatment, sanitary platforms, or soap) critical to the performance of key WaSH behaviors.

A small but growing body of literature has identified a series of linkages between water, sanitation and hygiene and HIV/AIDS: opportunistic infections negatively impact PLHA quality of life and can speed the progression to AIDS and infection frequency is tied to water and sanitation services available to households and the hygiene practices of household members (Hillbruner 2007). Ensuring proper WaSH practices benefits those infected with HIV and AIDS by keeping them stronger, well nourished, and able to contribute to the household. In addition, such good practices will also prevent the caregivers and other household members from contracting water-borne diarrheal diseases, which, in turn, helps to keep households economically viable and generally resilient for longer periods of time.

This paper reviews the existing scientific and programmatic evidence, raises WaSH issues in the HIV and AIDS context that need further study to build the evidence base, assesses current WaSH guidance through a review of National HIV/AIDS guidelines from five African countries, and identifies programmatic implications that home-based care programs and the WaSH sectors must consider.

Integrating WaSH into HIV/AIDS Home-based Care Strategies

Noting the general lack of integration of WaSH into AIDS programs, the Africa Unit of the Water and Sanitation Program (WSP) of the World Bank convened a one day “Think Tank” of key water, sanitation and HIV/AIDS stakeholders. The Think Tank recommendations underscored the need to increase cross-sectoral linkages as well as to examine the evidence for effectiveness and cost effectiveness of WaSH services for PLHA. This paper uses the literature review conducted by WSP/World Bank as a starting point, incorporates new research findings and expands the scope of the review to include additional aspects of risk and benefit associated with hygiene, hand washing, feces management, safe water, and disposal of waste water.

This expanded version of the WSP review has been developed specifically as a background resource for home-based care and water and sanitation program managers who are meeting in Malawi to discuss strategies for integrating HIV/AIDS and WaSH objectives into the home based care programs. A further objective is to offer recommendations to the water, sanitation, and hygiene sectors on ways to integrate HIV and AIDS into the strategic planning and programming of those sectors. Thus the prime target audiences for this document are policy makers addressing HIV/AIDS and/or water and sanitation issues and program implementers in these sectors.

In order to identify papers, gray literature, and other publications of research on the effects of WaSH on PLHA, the following databases were searched: Eldis, FirstSearch, BasicBiosis, Science Direct, Social Science Citation Index, PubMed, Cochrane Library, Popline, USAID's DEC, and WorldCat. The searches were run with MeSH terms and key words and included at least one AIDS term (HIV/AIDS, HIV, AIDS, Acquired Immune Deficiency Syndrome) and at least one WaSH term (water, chlorine, "household water treatment", sanitation, hygiene, latrines, sanitary platforms, hand washing, soap). In addition, the authors personally requested via e-mail advocacy documents, educational materials, project reports, manuals, country guidelines containing relevant sections or references on the intersection between HIV/AIDS and WaSH.

The final section of this review begins to outline implications for home-based care and the water and sanitation sectors, and adds practical guidance where appropriate. The purpose of this document is to serve as a springboard for the Malawi meeting participants to identify feasible, affordable, sustainable, and non-stigmatizing WaSH interventions that can be incorporated into HIV/AIDS home based care programs to yield maximum impact on PLHA and their families, on communities, and on government sectors.

HIV-affected Families and WaSH

Access to safe water is considered a basic human need and a basic human right (Kamminga 2006) for all people. Yet this basic right remains unrealized for a large majority of people in developing countries, especially in rural communities. The negative impact of low access to necessary quantities of water, to water of reasonable quality, to basic sanitation and hygiene are magnified for HIV-infected, immuno-compromised individuals. The added burden affects not only the HIV infected, but the entire affected family, increasing risk of diarrheal disease and lost productivity. Therefore, PLHAs and households affected by HIV and AIDS have a substantially greater need for WaSH services: more water; safe water; access to water and sanitation; proper hygiene. Evidence indicates that HIV affected households require more than the 20 liters of water per capita daily (WSP 2007) including 1.5 liters of safe water for drinking with medicines. Indeed, women in southern Africa required 24 buckets of water a day to wash PLHA as well as the clothing and bedding and the house, especially during bouts of extreme diarrhea (Kamminga 2006).

A study from South Africa (Mvula Trust 2007) surveyed home-based caregivers who estimated a need for 200 liters of water daily—a figure that included water necessary for income-generating activities and food production.

PLHA experience periods of illness and relative weakness (Voss 2007) requiring close access to water and sanitation facilities. Studies have shown that those traveling great distances to collect water will reduce intake of water and use less safe water sources and those without easy access to latrines will often resort to open defecation methods (WSP 2007). Increased access to water also assists PLHA and their families to maintain kitchen gardens or engage in income generating activities that will help ensure food security, improved nutrition, and provide additional income for the household.

In addition, the immuno-compromised status of PLHAs renders them more susceptible to opportunistic infections including those related to water, sanitation and hygiene—diarrhea and skin diseases.

In advanced stages of AIDS, PLHAs often have mouth sores which make eating difficult. Documented evidence has shown that softening food with water helps PLHA ingest the food needed to maintain good nutrition (Kamminga 2006, WELL Briefing Note 5). Further, when infants are weaned from HIV positive mothers, a safe water source must be used to mix formula or the babies will be at greater risk for dying from diarrheal diseases. In the first two months, a child who receives replacement feeding is six times more likely to die than a breastfed child (UNICEF 2002).

Fourth, people on antiretroviral treatment (ART) require greater amounts of water for drinking (at least 1.5 liters per day). A great irony exists in giving advanced, costly life-saving ART to patients with a glass of water that could infect them with a life-threatening illness. It is important to maximize the effectiveness of these medicines by using safe water for ingesting them, since a side effect of many ARV drugs is diarrhea. Further, diarrheal illness in PLHA can interfere with and compromise the absorption of these ARV drugs and can even contribute to developing HIV strains that are resistant to antiviral agents (Bushen 2004). Thus safe drinking water becomes that much more compulsory as ART becomes more pervasive in the developing world.

Analysis of Existing Research

Water Quality

Water quality, especially the absence of harmful bacterial, viruses, and parasites, is known to be very important in preventing infection in people with full immune systems. A meta-analysis on interventions to improve microbial quality of water showed that improved water quality is generally effective in preventing diarrhea (Clasen 2007). In extrapolating these findings to PLHA in low resources settings, the concern arises that the environment may be so contaminated that improved water will quickly become contaminated or that the pathogens will infect PLHA through other routes such as the oral-fecal route. It is possible to postulate that no amount of water treatment will have a measurable affect of the health of PLHA. Nevertheless, evidence points towards improving water quality for better outcomes for PLWHA and for their affected families.

Two studies were found on water quality and PLHA in developing countries. The most powerful of these two is a random case control by Lule et al of 392 HIV+ households (including 509 PLHA and their 1,521 HIV- family members) randomized to use home chlorination, safe storage of household water and basic hygiene education versus basic hygiene education alone (Lule 2005). Those PLHA in the intervention arm reported 25 percent fewer diarrhea episodes (a discrete case of diarrhea having a specific beginning and end and usually lasting from several days to several weeks) and 33 percent fewer days with diarrhea. The health benefits were extended to household members. This is important because compared to many targeted HIV and AIDS interventions which benefit only the target patient, WaSH services in general have the potential to improve the quality of life for the whole family and therefore increase their potential cost-effectiveness.

The Lule study found that the reduction in diarrhea for PLHA did not extend to those who consumed water outside the house. This group consisted mainly of people who worked outside the

home and undoubtedly drank from contaminated sources outside the house. Since income is critical to PLHA, lack of clean water should not be a barrier to employment. This evidence suggests the need to educate PLHA on carrying adequate supplies of clean water with them, or if possible, treating and storing clean water at their worksite.

Another interesting finding of the Lule study was that most HIV+ households (60%) did not treat their water before the study and the most common form of treatment was boiling, a practice which is expensive (fuel), time-consuming (boiling and cooling), and often improperly practiced (not boiling for adequate length of time) and which is difficult to use to treat large volumes of water. Other studies (Kangamba 2006, Lockwood 2006, WSP 2007) have yielded similar results, but the WSP study in India found that PLHAs adopted safer water and hygiene practices than the general population but that water treatment was considered costly and time consuming.

A study of home-based care of end-stage PLHA in Ngamiland, Botswana (two stage stratified random sample survey) (Ngwengya 2006) revealed that caregivers who experienced periodic water shortages due to equipment failure or temporary spikes in water costs, reported using lower quality sources of water such as open wells and surface water such as rivers and lakes. The study was not designed to measure adverse effects of this drop in water quality but reinforces anecdotal evidence that as the financial or time cost of water rises, PLHA must compromise on water quality and quantity. In the setting of decreased household finances and increased time required for chores such as water carrying, these data support the need for HIV/AIDS programs to assist PLHA to weigh carefully the value of safe water against other critical needs such as quality of housing, quality and quantity of food, access to medications, etc. Also if the quality of the available water source declines, the need increases for PLHA to use home-based water treatment and safe water handling.

Four studies were found on water quality for PLHA in the developed world. For HIV+ people living in San Francisco, drinking tap water (as opposed to bottled water or treated tap water) was a risk for having cryptosporidiosis (OR 6.76 inside the home, OR 3.16 outside the home) (Aragon). Tap water in developed countries was also found to be a source of atypical mycobacterial infections such as *M. genavense* (Hillebrand-Haverkort 1999) and *M. avium* (Aronson 1999). The Aronson study found that water in hospitals was more likely to be contaminated (100 percent) than water in private homes (82 percent). This finding reinforces the need for proper cleaning of water taps and proper water handling, especially in hospital settings where the risk of nosocomial infection is great. The Aronson and Hillebrand-Haverkort studies are not included in the table of research because they did not measure outcomes for PLHA.

Sorvillo (1994) studied a natural experiment on the effects of municipal water filtering on cryptosporidium infection in PLHA. Until 1986, Los Angeles had two municipal water suppliers, one that used filters that would remove cryptosporidium spores and one that did not. HIV+ people living in sections of the city provided with filtered tap water were 32 percent less likely to have cryptosporidiosis than those living in sections of the city provided with unfiltered tap water (4.2% compared to 6.2%).

Current water access and collection practice virtually guarantees high contamination by the time water reaches the home. Rural and municipal water systems are notoriously under-maintained and too often contaminated at the source. This is further compounded by the perception that piped water is “safe” so few measures are taken to treat or protect drinking water.

Although studies in developed countries do add to the overall knowledge pool and evidence for improving water quality for PLHA, clearly more studies are needed on the effectiveness of different water purification technologies on the reduction of diarrheal disease in PLHA in low resource settings.

Water Quantity

Water quantity is also a factor in caring for PLHA, especially in late stage AIDS. The WSP Field Note on WaSH and HIV in South Asia (June 2007) indicates that home-based care requires more than the 20 liters of water per person per day that is considered basic access, but it does not identify a specific amount of water required by HIV affected households. A home-based care study in Ngamiland, Botswana (Ngwengya 2006) revealed that care givers who experienced periodic water shortages due to equipment failure or prohibitive costs reduced the frequency of bathing patients from twice daily to once daily or not at all. For end-stage, bed-ridden PLHA, caregivers reported requiring 20 to 80 additional liters of water per day, depending upon the severity of the patient's symptoms, especially diarrhea.

A study by Molose and Potter interviewed caregivers of PLHA who reported that the average water needs for home-based care was 200 liters and included water for laundry and cooking, bathing, drinking. A large portion of the water, however, was also required for income generation schemes and food production. There was anecdotal evidence that hygiene improved based on water quantity, but the improvements were not quantified. In general, the methodology is not as rigorous as the Ngwengya study. For example, the cases were not chosen at random from a pool of PLHA nor were they matched with a control set and there was no adjustment for the caregivers' access to water which varied considerably from household to household. Clear definitions for inclusion were also not set. The publication was not peer reviewed and is presented more as an advocacy piece or formative research piece with extensive quotes and use of the names of the interviewees. The study also occurred in the context in which some caregivers are compensated for their caregiving which would affect their access to water.

The Ngwengya Botswana study was not designed to measure adverse effects of this change in bathing patterns, however bathing and proper hygiene at end-stage has two clear benefits: preserving the dignity of the PLHA and protecting caregivers and household members from infection with HIV or more likely, other disease-causing pathogens.

Water Access (Cost, Carrying Distance, Physical Requirement at Source)

No studies were found on the effect of water access on PLHA, yet WSP has noted that lack of access has led to the use of unsafe water among PLHA. Women and girls in Africa and Asia walk on average 6km per day to collect water; collectively spending 40 billion hours every year fetching water (WSSCC 2004) The WSP (2007) also observed that on average in India, women spend 2.2 hours per day fetching water which translates into 150 million working days/year or a cost of \$208 million. Studies in Zambia (Kangamba 2006) and Malawi (Lockwood 2006) indicate that water access in rural areas is on average 400 meters away from the home, but facilities are poorly maintained. In urban areas, water is purchased but the cost can become prohibitive. WELL Briefing Note (2004) indicates that improved water supply eased domestic burdens and improved economic productivity. It is further noted that 10 percent more water used for domestic cleaning led to a 1.3 percent reduction in diarrhea incidence in households where the effect of HIV was not known.

Criteria of access that are worth investigating include the cost of water, the distance the water needs to be transported, and the degree of physical effort needed to extract the water at the source (eg: number of pounds of force needed to depress a pump handle and the number of times the handle needs to be pumped; the number of feet that a bucket needs to be pulled up a well, etc).

Kaminga and others have also noted that PLHA's have less access to decisions being made in community-managed water systems which can further limit their access to water. The WSP study noted that PLHAs are highly marginalized in society due to stigma.

Several studies also mention the importance of water access in food security of HIV affected households (Kgalushi 2004, Kamminga 2006, WELL 2005). In addition, many income generation activities such as beer making, food production and livestock rearing require accessible water (Kangamba 2006) and these activities often ensure sufficient nutrition and the continued productive livelihoods for these households.

Sanitation

Only one study found that improved sanitation can improve the health of PLHA. The 2005 Lule study did not have sanitation as an intervention, however, researchers recorded the latrine access of all participants in the study and found that the presence of a latrine in the family compound was associated with fewer episodes of diarrhea (IRR 0.69), fewer days with diarrhea (IRR 0.63), and fewer days of work or school lost due to diarrhea (IRR 0.63).

Since many water borne pathogens that affect PLHA, such as *Mycobacterium avium*, are becoming increasingly resistant to water treatments such as chlorine, monochloramine, chlorine dioxide, and ozone (Taylor 2000), it is increasingly important to use sanitation to prevent the fecal contamination of drinking water.

Studies have revealed that in developing country settings, pathogens that affect PLHA are generally the same as those that affect people with full immune systems, although the concentrations may be different (Lule). This is significant for two reasons: 1) If diarrhea in PLHA is mainly caused by infectious agents already present in the environment and the body, then improved WaSH may not protect PLHA. 2) If the diarrhea of PLHA is more highly concentrated and therefore more infectious than that of HIV negative people, then WaSH efforts are critical to prevent further transmission of diarrhea causing pathogens in both the PLHA and other household members.

Kangamba and Lockwood (2006) found in Zambia and Malawi respectively that most home-based care clients had a latrine, but in many cases lack of water rendered these (flush) latrines unusable. Further, at least 20 percent of the latrines in both studies were poorly maintained, with fecal matter around them indicating prime transmission sites for water-borne pathogens. Barriers to improved sanitation were evident in both countries: inhospitable soils often led to latrine collapse; cultural beliefs prevented use; and cost, lack of donor interest, and fewer adult male headed households prevented new latrine construction. Further, in HIV-affected households, the available and diminishing resources have already been diverted to purchasing food, medicine and in some cases water.

Risks associated with feces and feces management

Feces itself presents little risk of HIV infection though great risk of transmitting diarrhea-causing pathogens. HIV has never been isolated in urine or feces (WEF 2000) and international guidelines all rate the risk of HIV infection from feces itself to be low to none (CDC 2007).

However, the feces of end-stage PLHA is likely to have increased amounts of blood and white blood cells carrying HIV virions and the late stage PLHA is more likely to have other infections that could affect household members.

Evaluating the risk of HIV transmission through feces is highly contextual and guidelines encourage use of general precautions (gloves) when handling feces or soiled clothing and bedsheets. Whether this recommendation is feasible in a resource-poor household environment is questionable, particularly in light of the relatively low risk of HIV transmission. Several studies indicate that HIV, a very unstable virus, loses its infectivity soon after leaving the body. HIV is also rapidly inactivated by heat or the presence of a hostile environment such as water or urine. Research also shows that the composition of feces and urine quickly diminish the infectivity of any HIV virions present (Moore 1993, WEF 2000).

One study (Moore 1993) showed that HIV infected blood introduced into dechlorinated tap water had no detectable HIV virions after 5 minutes. Other scientists have placed concentrated HIV virus in feces, wastewater and biosolids to study its survival. These studies have determined that urine and feces inactivate the virus within one hour and in wastewater the viral infectivity was gone within 48 hours (Water Environment Federation 2000) even at the high concentrations that far exceed what would normally be found in waste water.

Nonetheless, other infectious agents that cause diarrhea are easily transmitted to caregivers and other household members unless fecal matter is cleared away quickly and thoroughly with water and a cleaning agent. This is discussed further in the hygiene section, below.

Hygiene and Hand Washing

Evidence in general population studies clearly show a 30-40 percent reduction in diarrheal disease associated with hand washing or the proxy of presence of soap (HIP 2005, Curtis and Cairncross 2003, Fewtrell 2005). The few studies that consider HIV-positive status indicate a protective effect of hand washing on diarrheal disease. Three studies were found on HIV/AIDS and hygiene. In a study on the effects of hand washing with soap on diarrhea rates in PLHA in the United States, Huang and Zhou found a 58 percent reduction in diarrheal incidence from 2.92 episodes of diarrhea to 1.24 episodes (Huang 2007). In a study of male sexual partners of Kenyan women with genital symptoms, Meier et al (Meier 2006) found that men with reported lower hygiene behaviors were more likely to be HIV positive than the women's other sexual partners (OR 0.41), including adjustment for confounding factors. This study used five hygiene variables and was controlled for socioeconomic status and other potential confounders. It has also been suggested (Short 2006) that post-coital penile hygiene can reduce HIV transmission in men. This supports evidence that circumcision protects men from HIV infection, presumably because, in part, circumcision makes penile hygiene easier. It should be noted that post-coital douching in women is not recommended (CDC 2007) as it dilutes the anti-viral properties of the acidic vaginal secretions and can flush

vaginal pathogens up through the cervical os, into the uterus, and out through the fallopian tubes into the peritoneal cavity; although no specific studies were found regarding this phenomenon and HIV. This is relevant for secondary prevention of HIV infection.

The Lule study found that presence of soap in the household (an indicator for hand washing and general hygiene) was associated with fewer days of diarrhea (IRR 0.58) and fewer lost days of work or school due to diarrhea (IRR 0.56). It is important to note that some hygiene related opportunistic infections in PLHA such as TB or toxoplasmosis cause disease either by primary infection, re-infection, or recrudescence (Onadeko 1992) of the infectious agent. In this case, it is not clear whether increased hygiene can significantly affect these diseases.

In two southern states in India, knowledge of safe water, sanitation and hygiene issues were greater among HIV positive individuals than among the general public. And where possible, PLHAs had adopted safer water and hygiene practices such as purifying water with some method and washing hands with soap after defecation (WSP, 2007). Research in Zambia and Malawi found that fewer than half the houses studied had a hand washing facility and only 20 percent had water to use. A large gap was noted between hygiene knowledge and practice among those surveyed. Further, in Zambia only 38 percent surveyed had knowledge of hygiene practices and no homes surveyed had been visited by a hygiene promoter in the previous two months.

Although solid field research provides evidence that hand washing can decrease respiratory infections in people with full immune systems (Luby 2005), no similar research has been done on PLHA. Additionally, ample evidence exists that improved body hygiene (daily bathing) and regular laundering of clothing and bed linen decrease skin infections and skin parasites (scabies, lice, bed bugs, etc) in people with full immune systems and is also considered to be such a basic part of human dignity, that no other research is needed to justify their integration into HIV/AIDS programming.

Waste water related risk of HIV and water-borne disease

No direct studies document HIV transmission through waste water, but by definition, diarrhea pathogens are water borne. Questions have arisen about whether HIV can be transmitted through waste water contact. As documented above, HIV is relatively unstable and even at unusually high concentrations loses its infectivity after a few hours, an almost negligible risk exists for transmitting the HIV virus to household members through waste water, especially as the studies indicate that the virus is further inactivated by presence of water or urine. Studies have also shown (Moore 1993; Ansari 1992) that the necessary conditions for HIV transmission are absent in wastewater systems. However, pathogens causing diarrhea remain infective and can be transmitted through waste water, so guidelines should recommend that caregivers practice proper hygiene techniques to limit diarrhea transmission throughout the household.

Cost-Effectiveness

The only study on cost effectiveness of WaSH in improving PLHA health was by Shresha et al, separately analyzing the Lule study data. Using the program costs from the Lule study, the researchers calculated that it cost \$5.21 per diarrhea episode averted, \$0.62 per diarrhea-day averted, and \$1,252 per disability adjusted life year (DALY) gained. The cost per DALY was artificially high in this study for two reasons. First, the program studied rapidly diagnosed and treated diarrhea

though mortality remained high. Second, the DALY included all program costs, including those for start-up. If only the costs per household were calculated, it would be about \$5/year (Mermin 2005) and would be comparable to the cost effectiveness of the EPI program (tuberculosis, diphtheria, pertussis, tetanus, polio, measles) at \$7 per DALY (DCP2 2006). By comparison, the cost for ART therapy in Africa is calculated at \$910 per DALY (Walensky 2007).

Operations Research

No operations research studies were found of ongoing provision of WaSH services into PLHA programs. Clearly more research is needed on the best ways to integrate WaSH into programs.

Review of Existing National HIV/AIDS Guidelines

A cursory review of national home-based care HIV/AIDS guidelines of five Anglophone African countries - Kenya, Malawi, South Africa, Tanzania and Zimbabwe was taken to assess the current WaSH guidance available to HIV and AIDS programs and to those affected by or infected with HIV. Other guidelines are also critically inventoried with links for access in the annotated annexes, but are not summarized here.

Keyword searches on the words “water, sanitation, toilet, latrine, hand washing, hygiene” and different spellings of “feces and diarrhea” were conducted on each of the five national HBC guidelines reviewed. The South African guideline did not mention water, sanitation or hygiene. Each of the other national HBC guidelines specified the importance of drinking “safe water” while the Kenya guidelines specifically mentioned “boiling all untreated drinking water.” None of the national HBC guidelines provided guidance on how to treat water to make it safe, or on “feces management,” on the risk of HIV transmission via (blood and puss in) feces or the transmission of diarrhea and/or HIV via waste or wash water.

In the background document prepared for the Malawi workshop (Hillbruner 2007) summarizes a more rigorous review the home-based care guidelines for Zimbabwe and Malawi.

Zimbabwe is a notable exception. Its *Water and Sanitation Sector HIV/AIDS Response* is the most comprehensive government policy linking these two sectors. Other countries do not have this type of unified document, nor does its national HIV/AIDS policy address water and sanitation issues. However, Malawi’s *National Community Home Based Care Policy and Guidelines* (MOH 2005) does include some key guidance for caregivers related to water and sanitation. Its recommendations include:

- That water for PLWHA shall be obtained from a protected source and safety measures taken to avoid contamination.
- That during home visits caregivers should assess general cleanliness of home surroundings, waste disposal, availability of safe water and its utilization and intervene where necessary

In addition, the 2006 National Sanitation Policy for Malawi requires that sanitation policy and planning be “HIV and AIDS aware” and includes an appendix detailing the linkages between water, sanitation, hygiene and HIV/AIDS (MIWD 2006).

Clearly, enhanced guidelines and guidance are needed regarding water, sanitation and hygiene in national home-based care guidelines.

Building a Case for WaSH Solutions

Despite considerable increase in funding and global efforts fewer than 2 million PLHA in developing countries currently have access to antiretroviral treatment. In Africa in 2006, the growth of the epidemic (2.8 million) has outstripped the global efforts to put people on treatment (UNAIDS 2007).

Recognizing the need to manage limited access to ART strategically, many programs have explored balancing the development of resistance (which happens over time) with effectiveness and cost to maximize total productive lifespan and minimize cost and resistance (Badri 2006). Alternate ways to improve PLHA health will be essential to slow the progression to AIDS for those PLHA who do not yet require ART.

Beyond identifying cost-effective strategies for clinical management, governments must consider the most cost-effective strategies to reduce diarrheal diseases that impact HIV-affected and infected people, families and communities to include in national policies and official guidance and guidelines.

Many AIDS specialists (Mermin 2006, Grant 2005, Grubb 2005) have observed that the AIDS community has not yet explored other ways to prevent opportunistic infections and improve the health, wellbeing and longevity of PLHA and their families. And the water sector has not yet fully answered the call to contribute to the fight against HIV and AIDS.

Improvements in access to water for PLHA can either be targeted through systems such as vouchers or can be extended to the general community via efforts such as placing water sources closer to population centers or installing more ergonomic water extraction devices. The ergonomic issue and the carrying distance issue are particularly important for child-headed households in which the children or the immune-compromised may not have the physical strength to use the water extraction devices or carry water long distances.

Lack of proper access to WaSH products and services contributes to what UN-Habitat refers to as “difficult environments for the proper treatment of HIV” (UN-Habitat 2007). Good evidence exists that infections such as diarrhea hasten the reduction of the CD4 count and advance progression toward AIDS. Repeated diarrheal episodes weaken the immune system and severely deplete nutritional status. Mermin et al. found that in Africa, diarrhea is four times more common in HIV-positive children and seven times more common in HIV-positive adults than in HIV-negative family members. See Table 3 for a list of the various ways diarrheal disease affects PLHA. Thus reducing diarrhea transmission should be a primary objective.

Most WaSH activities require fewer skilled workers than ART. The product inputs to WaSH services (chlorine, soap, covered buckets, sanitary platforms) are usually available in local markets through effective private sector supply systems and do not require establishing parallel government systems. The fact that these products can be purchased locally maintains availability and keeps costs low. With further study, improved water, sanitation, and hygiene may be shown to improve the health and productivity of people living with HIV and AIDS and may be more cost-effective, less stigmatizing, and easier to deliver than antiretroviral treatment.

Further, the CDC has calculated the initial cost of a basic preventive care package at \$50/person for an insecticide treated bednet and a Safe Water System and \$20/person in subsequent years to retreat

the net and supply chlorine to treat drinking water for the year. Though seemingly expensive, the cost/benefit analysis might offset the recurring costs if the entire household is positively affected and diarrhea transmission reduced in addition to improving the health of PLHA. Indeed, healthy PLHAs can be productive longer, improving the economic viability of their households. Further, those PLHA taking ART with safe water will improve the effectiveness of the drugs themselves as diarrhea can limit absorption of the medication in the body (Bushen 2004).

Cotrimoxazole prophylaxis can decrease the incidence of diarrhea and mortality in PLHA, but resistance can easily be developed (Joloba and Mermin report areas of over 70% resistance), the drug is imported, relatively expensive, stigmatizing, benefits only the person taking it, relies on sophisticated logistics system, and is generally legally available only through the formal health care system. Improved water, sanitation and hygiene efforts when compared with Cotrimoxazole are generally more affordable, produced locally, distributed through legal formal and informal sector, and benefit the entire household.

No studies have documented the relative risk to caregivers in washing PLHA and their clothing and bedding at end stage disease when diarrhea may be mixed with blood and pus secretions that may contain the HIV virus. Yet, it is well documented that though blood and pustular secretions can contain the HIV virus, hostile environments outside the body such as feces and urine and indeed water itself, render the virus undetectable in a relatively short time. Thus, while caregivers in home care settings should practice caution to prevent unintentional transmission of HIV through blood-blood exchange, relatively low risk exists of HIV transmission through wastewater. Of greater concern may be the risk of further stigmatizing HIV-affected households by emphasizing cautionary hygienic practices to prevent HIV transmission. Instead, home-based care guidelines should emphasize hygienic practices to prevent transmission of diarrheal pathogens to other members of the household. So for example, wastewater should be disposed of in a special place to prevent diarrhea-causing pathogens from contaminating the environment and transmitting diarrhea.

How Much Evidence is Enough?

Trends in forming national policy and in the global development community show movement toward attribution, data-based decision- and policy-making, results-based management, and accountability that require evidence of the effectiveness and cost-effectiveness of interventions compared to other possible interventions. Organizations such as the Cochrane Collaboration and British Medical Journal's clinical evidence database have facilitated much of this work. The question that arises is: how much evidence is enough? How many studies need to be done in how many different settings before we can justify investing large amounts of limited funding? If an intervention is shown to work in Latin America, do we need to test it in Africa before scaling it up there? If an intervention is shown to be helpful in people with full immune systems, do we need to demonstrate that it is effective with PLHA before we can integrate it into large scale HIV/AIDS programs?

Fortunately, the two fields of HIV/AIDS and water have recognized venues through which the validity and sufficiency of evidence can be debated and decided: the annual Stockholm Water Week and the biannual World Water Forum and the biannual global and Africa-specific AIDS conferences.

Some progress has already been made on designing and recommending non-ART care packages for PLHA. Prevention is particularly valuable in developing country settings because curative services are difficult to access in many low resource settings (Peterson 2004). The US State Department's Preventive Care Package summarizes evidence-based interventions for PLHA and their families in resource-poor settings that include integrating three key hygiene practices (hand washing, treatment of drinking water and safe disposal of feces) into all HIV and AIDS programs (USAID 2006).

Consensus is growing that while additional research will shed further light on impacts and cost-effectiveness of WaSH interventions on health and well-being of PLWHA, enough evidence exists to more deliberately and clearly incorporate WaSH recommendations into national and programmatic guidance.

Programmatic Implications

The literature and research findings clearly point to ideal water, sanitation and hygiene recommendations to stem the transmission of diarrheal disease throughout the HIV+ community and their households. In general, knowledge is relatively high about WaSH technology and practices necessary to remain healthy, however, the challenge is to translate these ideal recommendations into feasible actions that governments, communities, and individuals can take to prevent the spread of diarrhea especially in households affected by HIV and AIDS.

Home-based Care Programs

Water, sanitation and hygiene have been shown to prevent or reduce waterborne opportunistic infections such as diarrhea and skin rashes in PLHAs and to prevent diarrhea transmission in families affected by HIV and AIDS. Yet studies and experience suggest that knowledge of wash practices among home-based care workers and PLHAs is uneven. Guidelines for home-based care programs exist, but do not routinely cover WaSH techniques and strategies to reduce diarrhea and skin diseases. Developing and integrating specific guidance on WaSH efforts should be incorporated into all home-based care resources and training.

The following begins to outline program implications suggested by the research:

Water quantity: The research has shown that PLHA and families with more water have cleaner environments and therefore fewer routes for transmitting diarrhea causing pathogens. A long term goal would be for every household to have a water source close to home, however, in the short term, water collection and saving technologies should be developed. Country programs should consider the following:

- National guidelines should include estimates for water consumption in HIV-affected households that are greater than the “basic access” of 20 liters per person per day.
- Home-based care guidelines should include a section on the amount of water needed to keep PLHAs and the environment clean. This should include an estimate of water quantity needs as well as information on what to clean and how.
- HBC guidelines should provide specification on water collection technologies such as rain water catchment plans should be elaborated in home-based care guidelines

Water quality: Safe drinking water is always important, but never more so than for people with compromised immune systems and indeed PLHA who have begun treatment with antiretroviral medication. In some home-based care guidelines safe water may be mentioned, but caregivers need more details on how to provide safe drinking water:

- Include detailed instructions on water treatment techniques including boiling, hypochlorite solution, SODIS, and instructions on proper storage and handling to reduce contaminants
- Include hypochlorite solution (chlorine), water storage container and information on other options as part of all ART distribution to ensure medicines are taken with clean water
- Include covered water vessels with spigots as possible in basic care package taking care to use the most typical vessels available to avoid stigmatization

Water access: Water access can impact HIV-affected households in several areas including consistent use of safe water sources, fewer resources spent in obtaining safe water, more time to engage in domestic chores and caring for PLHA, and greater economic productivity. Home-based care guidelines should:

- Identify water saving techniques and describe how to install them. For example, instructions on rain water catchment systems and installing a “tippy-tap” should be included in all home-based care guidelines in resource-poor areas.

Sanitation access: Although latrines are sometimes available, in most cases, they are not being used or properly maintained. Yet proper sanitation is a key factor in controlling water-borne pathogens and maintaining safe drinking water and a clean environment. Further, alternatives are needed when PLHA cannot easily use latrines. Home-based care guidelines should:

- Identify and promote sanitary options for defecation, including drawing from the disability literature to allow for people with mobility challenges to use latrines more easily
- Ensure that toilets or latrines can accommodate more than one person to assist unstable users
- Recommend/provide alternative technologies such as installing poles or strengthening venting poles to serve as support, providing seats/stools and other devices
- Identify and promote appropriate options for feces management when mobility is limited, such as potties, home-crafted potties and squat pots
- Provide detailed instructions on keeping the person, house, and surrounding environment clean

Hygiene and hand washing knowledge and practice: The research indicates that good hygiene practices are not consistent among caregivers and PLHAs. Barriers of knowledge, skills and supplies must often be overcome to promote proper hygiene practice. Home-based care programs should:

- Develop a comprehensive hygiene component to include in all home-based care guidelines and training, including guidance and technologies for washing in water scarce situations; proper disposal of waste water; and clear communication on risk and protective measures required for feces handling, bathing and laundering
- Make hygiene materials available for home-based care programs to distribute to caregivers and others who interact with HIV-affected households
- Include hygiene in all nutrition guidelines for HBC programs
- Include hypochlorite solution and soap in all HBC kits

Water, Sanitation and Hygiene Sectors

HIV and AIDS have and will continue to affect the WaSH sector through loss of skilled labor, shifting demand and reduced resources. These sectors have severely lagged in planning strategically to address the potentially devastating effects on the sector. Integrating HIV and AIDS into the WaSH sector at all levels (national, sub-regional, community) is critical to mitigate serious consequences.

The **Water Sector** should take the following actions:

- Mainstream HIV into water and sanitation planning and forecasting
 - Develop and implement workplace HIV policies
 - Have water policies and planning committees reflect the realities of HIV and AIDS
 - Target areas of HIV prevalence when constructing new water posts
 - Assess effects of inability to pay on water systems; develop alternative structures, such as focused subsidies

- Identify and address issues specific to HIV-infected and affected families
 - Develop and promote new water collection technologies and strategies to bring water closer to the home (rainwater catchment systems, ergonomic pump designs using local materials, etc)
 - Promote water saving technologies such as “tippy taps” for washing hands and clothing/linens
 - Integrate perspectives of PLHA and affected families into community water management and planning schemes
 - Identify cost containment and efficient water management strategies to manage community water supplies
 - Develop strategic partnerships with other sectors/stakeholders to address most vulnerable: women and children

The **Sanitation Sector** should take the following actions:

- Mainstream HIV into water and sanitation planning and forecasting
 - Develop and implement workplace HIV policies
 - Have sanitation policies and planning committees reflect the realities of HIV and AIDS
 - Recommend hand washing stations as part of a twin design for all latrine construction

- Identify and address issues specific to HIV-infected and affected families
 - Include minimum standards for latrines that allow for an assistant to accompany the PLWA to the latrine, and options for outfitting latrines with support poles, squatting stools, or seats for greater comfort
 - Develop strategic partnerships with other sectors/stakeholders to address most vulnerable: women and children

Other Entry Points

Counseling and testing programs are another entry point where WaSH efforts can be integrated into PLHA and home care settings through voluntary counseling and testing training and counseling guidelines.

WaSH efforts should also be promoted and strengthened in HIV and AIDS treatment programs with special attention focused on the need to consume safe water while taking ARV drugs. Further, prevention of mother-to-child transmission of HIV programs can also strengthen efforts to ensure that mothers who choose not to exclusively breastfeed have access to safe water and hygienic environment in which to prepare the replacement foods.

A potential synergy can be exploited by linking home-based care programs with other community support programs such as community water management and agricultural extension/micro-finance schemes.

School and orphans and vulnerable children (OVC) programs are also entry points to promote proper WaSH practices. Any guidance materials developed with the home-based care community will likely be relevant to school and OVC programs and should be shared and promoted within those groups to the greatest extent possible.

Conclusion

A vast amount of evidence exists on the effects of WaSH on populations in general and limited but encouraging research and field experiences exists on the effects of WaSH products and services on PLHA. The new program implications expounded above illustrate the vital necessity to integrate WaSH into HIV/AIDS programming. Similarly, the WaSH sector must immediately begin to consider HIV/AIDS implications in its own strategic planning and programming to adequately meet the needs and the challenges posed to the sector by HIV/AIDS.

This paper has highlighted several key intersection points between HIV/AIDS and WaSH sectors based on the literature reviewed, but undocumented and future experience will also dictate new entry points. As a first step, the new program implications should be integrated into existing implementation guidance, current guidelines and training at all levels. Further, bold initiatives should be considered to advocate for revised national policies and guidelines, and placing increased attention and resources into developing and mainstreaming new technologies and labor saving schemes for water and sanitation that will benefit not only those HIV-affected families, but entire populations.

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HIV Bibliography (Draft 6, October 12, 2007)

Introduction

This bibliography contains citations and abstracts of 90 articles and reports that discuss linkages between water, hygiene and/or sanitation with HIV/AIDS care and treatment, or some aspect of health and well-being of people infected or affected by HIV and AIDS. In addition to the citations and abstracts, links to the full-text documents are included if available.

This bibliography is organized into 3 categories. These are:

A - [Peer-review Literature](#) – 32 published journal articles are included in this section.

B - [Reports](#) – This category includes 38 fact sheets, project reports and other documents from organizations.

C - [Guidelines/Manuals](#) – This section includes 20 guidelines and manuals on issues regarding home-based care (HBC).

A. Peer-review Literature

Ansari SA, Farrah SR, Chaudhry GR. (1992). **Presence of human immunodeficiency virus nucleic acids in wastewater and their detection by polymerase chain reaction.** *Appl Environ Microbiol. Dec; 58(12): 3984-90.*

The presence of HIV-1 was investigated in 16 environmental samples, including raw wastewater, sludge, final effluent, soil, and pond water, collected from different locations. The samples were analyzed for the presence of HIV-1 and HIV-1-specific proviral DNA and viral RNA were detected in three wastewater samples. The wastewater samples were also screened for the presence of poliovirus type 1, representing a commonly found enteric virus, and simian immunodeficiency virus, representing, presumably, rare viruses. While poliovirus type 1 viral RNA was found in all of the wastewater samples, none of the samples yielded a simian immunodeficiency virus-specific product.

Aragon TJ, Novotny S, Enanoria W, Vugia DJ, Khalakdina A, Katz MH. (2003). **Endemic cryptosporidiosis and exposure to municipal tap water in persons with acquired immunodeficiency syndrome (AIDS): a case-control study.** *BMC Public Health 2003: 6(32):2.*

In persons with acquired immunodeficiency syndrome (AIDS), *Cryptosporidium parvum* causes a prolonged, severe diarrheal illness to which there is no effective treatment, and the risk of developing cryptosporidiosis from drinking tap water in non-outbreak settings remains uncertain. To test the hypothesis that drinking tap water was associated with developing cryptosporidiosis, a matched case-control study was conducted among persons with AIDS in San Francisco. The study consisted of 49 cases and 99 matched controls. Tap water consumption inside and outside the home at the highest exposure categories was associated with the occurrence of cryptosporidiosis. The proportion of cases of cryptosporidiosis in San Francisco AIDS patients attributable to tap water consumption could have been as high as 85 percent.

Aronson T, Holtzman A, Glover N, Boian M, Froman S, Berlin OG, Hill H, Stelma G Jr. (1999). **Comparison of large restriction fragments of *Mycobacterium avium* isolates recovered from AIDS and non-AIDS patients with those of isolates from potable water.** *J Clin Microbiol* 1999;37(4):1008-12.

This study examined potable water in Los Angeles, California, as a possible source of infection in AIDS and non-AIDS patients. Nontuberculous mycobacteria were recovered from 12 (92%) of 13 reservoirs, 45 (82%) of 55 homes, 31 (100%) of 31 commercial buildings, and 15 (100%) of 15 hospitals. Large-restriction-fragment (LRF) pattern analyses were done with AseI. The LRF patterns of *Mycobacterium avium* isolates recovered from potable water in three homes, two commercial buildings, one reservoir, and eight hospitals had varying degrees of relatedness to 19 clinical isolates recovered from 17 patients. The high number of *M. avium* isolates recovered from hospital water and their close relationship with clinical isolates suggests the potential threat of nosocomial spread. This study supports the possibility that potable water is a source for the acquisition of *M. avium* infections.

Badri M, Cleary S, Maartens G, Pitt J, Bekker LG, Orrell C, Wood R. (2006). **When to initiate highly active antiretroviral therapy in sub-Saharan Africa? A South African cost-effectiveness study.** *Antivir Ther.* 11(1):63-72.

Large-scale programs increasing access to highly active antiretroviral therapy (HAART) are being implemented in sub-Saharan Africa. However, cost-effectiveness of initiating treatment at different CD4 count thresholds has not been explored in resource-poor settings. A cost-effectiveness analysis was conducted from a public health perspective using primary treatment outcomes, healthcare utilization and cost data derived from the Cape Town AIDS Cohort. HAART is reasonably cost-effective for HIV-infected patients in South Africa, and most effective if initiated when CD4 count >200/microl. Deferring treatment to <200/microl would reduce the aggregate cost of treatment, but this should be balanced against the significant clinical benefits associated with early therapy.

Bland RM, Rollins NC, Coovadia HM, Coutsooudis A, Newell ML. **Infant feeding counselling for HIV-infected and uninfected women: appropriateness of choice and practice.** *Bull World Health Organ.* 2007 Apr; 85(4):289-96.

This study examined infant feeding intentions of HIV-infected and uninfected women and the appropriateness of their choices according to their home resources. Feeding intentions of pregnant women were compared against four resources that facilitate replacement feeding: clean water, adequate fuel, access to a refrigerator and regular maternal income. The antenatal feeding intentions of 1253 HIV-infected women were: exclusive breastfeeding 73%; replacement feeding 9%; undecided 18%. Three percent had access to all four resources, of whom 23% chose replacement feeding. Of those choosing replacement feeding, 8% had access to all four resources. A clean water supply and regular maternal income were independently associated with intention to replacement feed. Most HIV-infected women did not have the resources for safe replacement feeding, instead choosing appropriately to exclusively breastfeed.

Brink AK, Mahe C, Watera C, Lugada E, Gilks C, Whitworth J, French N. (2002). **Diarrhea, CD4 counts and enteric infections in a community-based cohort of HIV-infected adults in Uganda.** *J Infect* 45: 99–106.

This study examined relationships between diarrhoea, CD4 cell counts and stool pathogens in a community-based cohort of HIV-infected adults in Uganda. A total of 1,213 HIV-infected individuals (70% women, median CD4 cell count at enrollment 215 cells/microl) were followed for 1,224 person years of observation. Forty-nine percent of diarrheal stools and 39% of stools from asymptomatic patients contained enteric pathogens. The most frequent isolates were helminths, followed by bacteria and then protozoa (8.9%). Rates of isolation of diarrhoea-associated pathogens were 29% from diarrheal stools and 17% from asymptomatic stools. The association between diarrhea and infection with bacteria or protozoa was weak and there was no association with helminths. *Cryptosporidium parvum* infection alone was associated with low CD4 counts. Diarrhea was common and most strongly associated with low CD4 counts. Bacteria were frequently found, even in stools from asymptomatic individuals. Over two-thirds of diarrheal episodes were undiagnosed, suggesting that unidentified agents or primary HIV enteropathy are important causes of diarrhoea in this population.

Bushen OY, Davenport JA, Lima AB, Piscitelli SC, Uzgiris AJ, Terezinha M, Silva J, Leite R, Kosek M, et al. **Diarrhea and Reduced Levels of Antiretroviral Drugs: Improvement with Glutamine or Alanyl-Glutamine in a Randomized Controlled Trial in Northeast Brazil.** *Clin Infect Dis.* 2004 Jun 15; 38(12):1764-70.

The effects of therapy with glutamine and alanyl-glutamine on diarrhea and antiretroviral drug levels in patients with acquired immune deficiency syndrome (AIDS) were examined in a study in northeast Brazil. Patients with AIDS and with diarrhea and/or wasting were randomized into 4 groups to determine the efficacy of glutamine or high- or low-dose alanyl-glutamine given for 7 days, compared with isonitrogenous glycine given to control subjects. The dose-related efficacy of alanyl-glutamine and glutamine in treating diarrhea and in increasing

antiretroviral drug levels shows that these supplements may help to improve therapy for patients with AIDS who have diarrhea and/or wasting in developing, tropical areas.

Clasen T, Schmidt WP, Rabie T, Roberts I, Cairncross S. (2007). **Interventions to improve water quality for preventing diarrhoea: systematic review and meta-analysis.** *BMJ.* 2007 Apr 14; 334(7597): 782.

Interventions to improve water quality are generally effective for preventing diarrhea in all ages and in under 5s. Significant heterogeneity among the trials suggests that the level of effectiveness may depend on a variety of conditions that research to date cannot fully explain.

Colebunders R, Francis H, Mann JM, Bila KM, Izaley L, Kimputu L, Behets F, van der Groen G, Quinn TC, Curran JW. (1987). **Persistent diarrhea, strongly associated with HIV infection in Kinshasa, Zaire.** *Am J Gastroenterol* 82: 859–864.

To determine the predictive value of persistent diarrhea for human immune deficiency virus (HIV) infection, 128 consecutive patients presenting at Mama Yemo Hospital with persistent diarrhea were tested for the presence of HIV antibodies. One hundred seven (84%) of the 128 patients with diarrhea lasting at least 1 month were found to be HIV seropositive. HIV seropositive patients with persistent diarrhea more often had a generalized papular pruritic eruption, a genital herpes simplex infection, a history of herpes zoster, and infection with cryptosporidia ($p = 0.006$) than HIV seronegative patients with persistent diarrhea. Presently, persistent diarrhea in adults in central Africa is strongly associated with HIV infection, but the pathophysiological mechanisms causing this diarrhea remain unclear.

Curtis V, Cairncross S. (2003). **Effect of washing hands with soap on diarrhoea risk in the community: a systematic review.** *Lancet Infect Dis.* 2003 May; 3(5): 275-81.

This study investigated the impact of washing hands with soap on the risk of diarrheal diseases in the community. The relative risk of diarrheal disease associated with not washing hands from the intervention trials was 1.88 (95% CI 1.31-2.68), implying that handwashing could reduce diarrhoea risk by 47%. When all studies, when only those of high quality, and when only those studies specifically mentioning soap were pooled, risk reduction ranged from 42-44%. The risks of severe intestinal infections and of shigellosis were associated with reductions of 48% and 59%, respectively. In the absence of adequate mortality studies, the study extrapolates the potential number of diarrhea deaths that could be averted by handwashing at about a million (1.1 million, lower estimate 0.5 million, upper estimate 1.4 million). Results may be affected by the poor quality of many of the studies and may be inflated by publication bias. On current evidence, washing hands with soap can reduce the risk of diarrhoeal diseases by 42-47% and interventions to promote handwashing might save a million lives.

More and better-designed trials are needed to measure the impact of washing hands on diarrhoea and acute respiratory infections in developing countries.

Doherty T, Chopra M, Jackson D, Goga A, Colvin M, Persson LA. (2007). **Effectiveness of the WHO/UNICEF guidelines on infant feeding for HIV-positive women: results from a prospective cohort study in South Africa.** *AIDS*. 2007 Aug 20;21(13):1791-1797.

This study of 635 HIV-positive mother-infant pairs across three sites in South Africa assessed mother to child transmission of HIV. Three criteria were found to be associated with improved infant HIV-free survival amongst women choosing to formula feed: piped water; electricity, gas or paraffin for fuel; and disclosing HIV status. The study concludes that counseling of mothers should include an assessment of individual and environmental criteria to support appropriate infant-feeding choices.

Fewtrell L, Kaufmann RB, Kay D, Enanoria W, Haller L, Colford JM Jr. (2005). **Water, sanitation, and hygiene interventions to reduce diarrhoea in less developed countries: a systematic review and meta-analysis.** *Lancet Infect Dis*. 2005 Jan;5(1):42-52.

46 studies were reviewed in detail. Data were extracted from these studies and pooled by meta-analysis to provide summary estimates of the effectiveness of each type of intervention. Water quality interventions (point-of-use water treatment) were found to be more effective than previously thought, and multiple interventions (consisting of combined water, sanitation, and hygiene measures) were not more effective than interventions with a single focus.

Goldie SJ, Yazdanpanah Y, Losina E, Weinstein MC, Anglaret X, Walensky RP, Hsu HE, Kimmel A, Holmes C, Kaplan JE, Freedberg KA. (2006). **Cost-effectiveness of HIV treatment in resource-poor settings--the case of Cote d'Ivoire.** *N Engl J Med*. Sep 14;355(11):1141-53.

As antiretroviral therapy is increasingly used in settings with limited resources, key questions about the timing of treatment and use of diagnostic tests to guide clinical decisions must be addressed. This study assessed the cost-effectiveness of treatment strategies for a cohort of adults in Côte d'Ivoire who were infected with HIV. Undiscounted gains in life expectancy ranged from 10.7 months with antiretroviral therapy and prophylaxis initiated on the basis of clinical criteria to 45.9 months with antiretroviral therapy and prophylaxis initiated on the basis of CD4 testing and clinical criteria, as compared with trimethoprim-sulfamethoxazole prophylaxis alone. A strategy of trimethoprim-sulfamethoxazole prophylaxis and antiretroviral therapy, with the use of clinical criteria alone or in combination with CD4 testing to guide the timing of treatment, is an economically attractive health investment in settings with limited resources.

Grant AD, Djomand G, De Cock KM. (1997). **Natural history and spectrum of disease in adults with HIV/AIDS in Africa.** *AIDS* 11(Suppl B): S43-S54.

Survival after an AIDS diagnosis appears to be substantially shorter in African countries and this may be partly because of later diagnosis of AIDS in Africa, but may also be because of environmental factors such as increased exposure to pathogens of high virulence and lack of access to care. Tuberculosis and bacterial infections are the most important causes of morbidity and mortality among hospitalized patients. Bacteraemia is frequent, particularly due to non-typhoid salmonellae and *S. pneumoniae*. Cryptosporidia and *I. belli* are the most frequently isolated pathogens in patients with diarrhoea; non-typhoid salmonellae and *Shigella* species are also commonly isolated when stool cultures are performed. Cerebral toxoplasmosis, and meningitis due to *Cryptococcus*, tuberculosis and bacterial pathogens are the most frequent neurological infections and cognitive changes are frequently identified when specifically looked for. Individuals infected with HIV-2 progress to AIDS and to death more slowly than those infected with HIV-1, but seem to experience the same spectrum of opportunistic disease when they reach the stage of advanced disease. Tuberculosis is the single most important HIV-related opportunistic infection in African countries, but diagnosis remains difficult. More information is needed about gynaecological disease in HIV-infected women. The most important research questions concern the development and evaluation of cost-effective regimes for prophylaxis and treatment of opportunistic disease in order to prolong healthy life in HIV-infected individuals.

Hillebrand-Haverkort ME, Kolk AH, Kox LF, Ten Velden JJ, Ten Veen JH. (1999). **Generalized mycobacterium genavense infection in HIV-infected patients: detection of the mycobacterium in hospital tap water.** *Scand J Infect Dis* 31(1):63-8.

Three HIV-infected patients were examined with *M. genavense* infection. The use of corticosteroids possibly favored colonization and dissemination of atypical mycobacteria in these patients with low CD4 cell counts and may have masked symptoms of infection. The fact that these patients were treated with highly active antiretroviral therapy (HAART) together with antimycobacterial therapy may explain that 1 patient was free from mycobacteria 16 months after the end of specific treatment. Hospital tap water contained *M. genavense* at a concentration of >10 bacteria/l as examined by PCR. This species caused 12% of cases of non-tuberculous disseminated mycobacteriosis in HIV-infected patients at the hospital.

van der Hoek L, Boom R, Goudsmit J, Snijders F, Sol CJ. (1995). **Isolation of human immunodeficiency virus type 1 (HIV-1) RNA from feces by a simple method and difference between HIV-1 subpopulations in feces and serum.** *Clin Microbiol.* 1995 Mar; 33(3):581-8.

This article describes a simple method to isolate and subsequently detect human immunodeficiency virus type 1 (HIV-1) RNA from feces. The method was applied on fecal specimens from 18 HIV-1-infected individuals, among which were samples that had been stored for 9 years. It appeared that HIV-1 RNA was

detectable in the feces of 12 persons (67%). Viral RNA was present in the feces of persons who fulfilled the criteria for CDC class II and CDC class III HIV infection as well as in patients who were diagnosed with AIDS (CDC class IV). HIV-1 RNA is frequently present in the feces of HIV-1-infected individuals, and in some cases the HIV-1 subpopulation in feces differs from the HIV-1 subpopulation in serum.

Huang, DB, Zhou J. (2007). **Effect of intensive handwashing in the prevention of diarrhaeal illness among patients with AIDS: a randomized controlled study.** *J Med Microbiol* 56(5)659-63.

In this study, 260 patients were screened for those who had not had diarrhea in the preceding 3 months and who had received a stable highly active antiretroviral therapy regimen for at least 6 weeks prior to the study. Seventy-five patients were randomly assigned to an intensive handwashing intervention (i.e. handwashing after defecation, after cleaning infants who had defecated, before preparing food, before eating, and before and after sex) and 73 patients were randomly assigned to the control group. Patients in both groups were called weekly by telephone to determine compliance with handwashing and to determine the number of diarrheal episodes for the preceding week. Patients were observed for 1 year. Patients assigned to the intensive handwashing intervention group washed their hands more frequently compared with the control group (seven vs four times a day, respectively and developed fewer episodes of diarrheal illness during the 1 year observation. The most common pathogens identified in both groups in patients who developed diarrhoeal illness were *Giardia lamblia*, *Cryptosporidium*, *Entamoeba histolytica* and *Shigella flexneri*. These data suggest that intensive handwashing reduces diarrheal illness in patients with AIDS.

Joloba M et al. (2000). **Determination of drug susceptibility and DNA fingerprint patterns of clinical isolates of Mycobacterium tuberculosis from Kampala, Uganda.** *East Afr Med J*, 77(2): 111-5.

This study investigated the rate of initial drug resistance and transmission patterns of *Mycobacterium tuberculosis* in Kampala, Uganda. There were no significant differences in resistance rates between patients with and without HIV infection. It shows that in Uganda initial drug resistance rates to anti-tuberculosis agents are low and similar to other sub-Saharan African countries and that multiple strains of *M. tuberculosis* have been transmitted within the community.

Kaplan JE, Hu DJ, Holmes KK, Jaffe HW, Masur H, De Cock KM. (1996). **Preventing opportunistic infections in human immunodeficiency virus-infected persons: implications for the developing world.** *Am J Trop Med Hyg* 55: 1-11.

More than 18 million people worldwide are estimated to have been infected with human immunodeficiency virus (HIV), the cause of the acquired

immunodeficiency syndrome (AIDS). As immunodeficiency progresses, these persons become susceptible to a wide variety of opportunistic infections (OIs) Tuberculosis is the most common serious OI in sub-Saharan Africa and is also more common in Latin America and in Asia than in the United States. Bacterial and parasitic infections are prevalent in Africa; protozoal infections such as toxoplasmosis, cryptosporidiosis, and isosporiasis are also common in Latin America. Fungal infections, including cryptococcosis and *Penicillium marneffei* infection, appear to be prevalent in Southeast Asia. Research is needed to determine the spectrum of OIs and the efficacy of various prevention measures in resource-poor nations, and health officials need to determine a minimum standard of care for HIV-infected persons.

Lule J et al. (2005). **Effect of home-based water chlorination and safe storage on diarrhea among persons with human immunodeficiency virus in Uganda.** *Am J Trop Med Hyg.* Nov; 73(5):926-33.

This trial examined the effect of a home-based, safe water intervention on the incidence and severity of diarrhea among persons with HIV living in rural Uganda. Between April 2001 and November 2002, households of 509 persons with HIV and 1,521 HIV-negative household members received a closed-mouth plastic container, a dilute chlorine solution, and hygiene education (safe water system [SWS]) or simply hygiene education alone. Persons with HIV using SWS had 25% fewer diarrhea episodes, 33% fewer days with diarrhea, and less visible blood or mucus in stools. The SWS was equally effective with or without cotrimoxazole prophylaxis and together they reduced diarrhea episodes by 67%, days with diarrhea by 54% and days of work or school lost due to diarrhea by 47%. A home-based safe water system reduced diarrhea frequency and severity among persons with HIV living in Africa and large scale implementation should be considered.

Mata L. **Diarrhoea and AIDS.** (1988). *Dialogue Diarrhoea* (35):3.

Patients with acquired immunodeficiency syndrome (AIDS) are particularly susceptible to gut colonization or invasion by common enteroviruses, resulting in both acute and chronic diarrhea and in wasting. Bacterial overgrowth may also develop in the small intestine people living with AIDS (PLHA), causing chronic diarrhea and malabsorption. The fecal flora of PLHA and those of immunocompetent children living in deprived rural environments show many similarities in terms of pathogenic and opportunistic agents. Since gut pathogens are significantly more prevalent in developing countries, they are likely to affect AIDS more than in developed countries. Thus, efforts to improve personal hygiene and environmental sanitation should be given a high priority in less developed countries.

Meier A, Bukusi E, Cohen C, Holmes K. (2006). **Independent association of hygiene, socioeconomic status, and circumcision with reduced risk of HIV infection among Kenyan men.** *JAIDS* 43(1)117-118.

Among 150 Kenyan men recruited as sex partners of women with genital symptoms, 22 were HIV seropositive. Because male HIV infection and male hygiene were unexpectedly found to be associated with each other, this study examined the relationship of 5 hygiene variables with HIV infection in the men. By multivariate analyses, HIV infection in men was not only independently associated with previous illness and inversely associated with being circumcised, but also independently associated with a combined measure of hygiene.

Mermin J, Bunnell R, Lule J, Opio A, Gibbons A, Dybul M, Kaplan J. (2005).

Developing an evidence-based, preventive care package for persons with HIV in Africa. *Trop Med Int Health* 10(10)961-970.

Currently, 95% of the 40 million persons with HIV live in low and middle income countries; 27 million in sub-Saharan Africa. HIV/AIDS is a leading cause of death in Africa, yet access to care and treatment considered standard-of-care in the industrialized world is extremely limited. Standardized, evidence-based recommendations on preventive measures are needed. This article lists potential interventions based, when possible, on documented efficacy in reducing morbidity or mortality among persons with HIV in Africa. Potential components included cotrimoxazole prophylaxis, safe drinking water, isoniazid prophylaxis, insecticide-treated bed nets, micronutrients, and provision of HIV counseling and testing and condoms to family members of persons with HIV. Several additional interventions (acyclovir prophylaxis, food supplementation, hand washing, and fluconazole prophylaxis) require further evaluation before being included in a standard package of care.

Moore BE. (1993). **Survival of human immunodeficiency virus (HIV), HIV-infected lymphocytes, and poliovirus in water.** *Appl Environ Microbiol.* 1993 May; 59(5): 1437-43.

The potential for human immunodeficiency virus (HIV) to enter domestic sewers via contaminated body fluids such as blood has spurred interest in the survival of this virus in water and wastewater. This study focused on establishing the inactivation of HIV and productively infected lymphocytes in dechlorinated tap water. In addition, HIV survival was compared with that of poliovirus. Results indicated that either free HIV or cell-associated HIV was rapidly inactivated. In comparison, poliovirus showed no loss of infectivity over 24 h. In addition, blood from stage IV AIDS patients was introduced into tap water, and the recovery of HIV was monitored. Virally infected cells were no longer detectable after 5 min in dechlorinated tap water.

Onadeko MO, Joynson DH, Payne RA. (1992). **The prevalence of Toxoplasma infection among pregnant women in Ibadan, Nigeria.** *J Trop Med Hyg* 95(2): 143-5.

The seroprevalence of toxoplasmosis in pregnant women from the inner area of Ibadan was determined by the dye test. Two hundred and seventy-three of the 352 women (78%) had dye test titres of 1/16 or greater with 165 (47%) having

titres of 1/128 or greater. Social and environmental conditions indicate that the source of infection is contact with cat faeces.

Potgieter, N., Koekemoer, R. and P. Jagals. (2007). **A pilot assessment of water, sanitation, hygiene and home-based care services for people living with HIV/AIDS in rural and peri-urban communities in South Africa.** *Water Science & Technology Vol 56 No 5 pp 125–131.*

Researchers conducted a short-term assessment of water, sanitation, hygiene and home-based care services in two rural and two peri-urban communities in South Africa using specially designed questionnaires. The results indicated the shortcomings of various services to people affected and living with HIV/AIDS in South Africa. This paper summarized the assessment and outlines the inadequacies of some of these services.

Shrestha RK, et al. (2006). **Cost-effectiveness of home-based chlorination and safe water storage in reducing diarrhea among HIV-affected households in rural Uganda.** *Am J Trop Med Hyg 2006; 74(5):884-90.*

This study examined the cost-effectiveness of the Safe Water System (SWS) for HIV-affected households using health outcomes and costs from a trial in Tororo, Uganda. SWS was part of a home-based health care package that included rapid diarrhea diagnosis and treatment of 196 households with relatively good water and sanitation coverage. SWS use averted 37 diarrhea episodes and 310 diarrhea-days, representing 0.155 disability-adjusted life year (DALY) gained per 100 person-years, but did not alter mortality. Net program costs were 5.21 dollars/episode averted, 0.62 dollars/diarrhea-day averted, and 1,252 dollars/DALY gained. If mortality reduction had equaled another SWS trial in Kenya, the cost would have been 11 dollars/DALY gained. The high SWS cost per DALY gained was probably caused by a lack of mortality benefit in a trial designed to rapidly treat diarrhea.

Short RV. (2006). **New ways of preventing HIV infection: thinking simply, simply thinking.** *PTRSLBS 361(1469)811-820.*

Five new methods are discussed to prevent HIV infection. (i) A natural microbicide; intravaginal lime or lemon juice has been used for centuries as a traditional contraceptive. The juice can also kill HIV in the laboratory, but clinical trials are needed to see if vaginal application is acceptable, safe and effective. (ii) Intravaginal oestrogen. Monkeys can be protected from Simian immunodeficiency virus (SIV) infection by keratinizing the vagina with topical oestrogen. If women take the oral contraceptive pill vaginally it retains its contraceptive efficacy, and the oestrogen it contains should thicken the vagina and protect against HIV infection. Clinical trials are needed. (iii) Male circumcision. Removal of the inner foreskin removes the main site of HIV entry into the penis, resulting in a sevenfold reduction in susceptibility to infection. The practice needs to be promoted. (iv) Post-coital penile hygiene. Wiping the penis immediately after intercourse with lime or lemon juice or vinegar should kill the virus before it has

had a chance to infect. A clinical trial of efficacy is needed. (v) PhotoVoice. Asking schoolchildren in developing countries to photograph their impressions of HIV/AIDS is a powerful way of getting them to discuss the subject openly, and develop their own preventive strategies.

Sorvillo F, Lieb LE, Nahlen B, Miller J, Mascola L, Ash LR. (1994). **Municipal drinking water and cryptosporidiosis among persons with AIDS in Los Angeles County.** *Epidemiol Infect* 113(2): 313-20.

This study measured the prevalence of cryptosporidiosis among people living with AIDS (PLHA) in Los Angeles County by water service area to assess whether unfiltered drinking water could be a source of cryptosporidium infection in PLHA. One water distributor, serving approximately 60% of the county's residents (area B), has consistently employed filtration. The other company serving the remainder of the county (area A), did not institute filtration until mid-December 1986. This difference provided a 'natural experiment' in which to assess the effect of municipal water filtration on the level of cryptosporidiosis among PLHA. The data suggest that filtration had no effect on levels of cryptosporidiosis among persons with AIDS. Thus municipal drinking water does not seem to be an important risk factor for cryptosporidiosis in PLHA residing in Los Angeles County.

Taylor RH, Falkinham JO 3rd, Norton CD, LeChevallier MW. (2000). **Chlorine, chloramine, chlorine dioxide, and ozone susceptibility of Mycobacterium avium.** *Appl Environ Microbiol.* 2000 Apr; 66(4): 1702-5.

Environmental and patient isolates of *Mycobacterium avium* were resistant to chlorine, monochloramine, chlorine dioxide, and ozone. For chlorine, the product of the disinfectant concentration (in parts per million) and the time (in minutes) to 99.9% inactivation for five *M. avium* strains ranged from 51 to 204. Chlorine susceptibility of cells was the same in washed cultures containing aggregates and in reduced aggregate fractions lacking aggregates. Cells of the more slowly growing strains were more resistant to chlorine than were cells of the more rapidly growing strains. Water-grown cells were 10-fold more resistant than medium-grown cells. Disinfectant resistance may be one factor promoting the persistence of *M. avium* in drinking water.

Voss JG, Sukati NA, Seboni NM. (2007). **Symptom burden of fatigue in men and women living with HIV/AIDS in Southern Africa.** *J Assoc Nurses AIDS Care.* Jul-Aug; 18(4): 22-31.

In 743 people living with AIDS (PLHA) from Southern Africa, the authors found ratings of HIV-related fatigue to be highly prevalent. The analysis focused on 538 patients who reported fatigue to investigate correlates and predictors of fatigue severity in relationship to demographic and HIV/AIDS illness indicators, as well as HIV-specific physical and psychological symptoms. Fatigue severity in Southern Africa was moderate, and the factors contributing to the perceived fatigue were most likely related to symptoms of acute HIV disease (such as fever and gastrointestinal problems). In conclusion, fatigue severity is less impacted by

demographic or environmental variables but much more by co-occurring symptoms and HIV disease severity. The study results imply the need for more research to understand if improvements in water quality and access to food would prevent infection and diarrhea and whether sufficient access to antiretroviral treatments to manage the HIV infection would improve fatigue and co-occurring symptom profiles.

Walensky RP, Weinstein MC, Yazdanpanah Y, Losina E, Mercincavage LM, Toure S, Divi N, Anglaret X, Goldie SJ, Freedberg KA. (2007). **HIV drug resistance surveillance for prioritizing treatment in resource-limited settings.** *AIDS*. 21(8): 973-982.

This study examined the value of resistance surveillance in influencing recommendations toward effective and cost-effective sequencing of antiretroviral (ART) regimens. A state-transition model of HIV infection was adapted to simulate clinical care in Côte d'Ivoire and evaluate the incremental cost-effectiveness of (1) no ART; (2) ART beginning with a non-nucleoside reverse transcriptase inhibitor (NNRTI)-based regimen followed by a boosted protease inhibitor (PI)-based regimen; and (3) ART beginning with a boosted PI-based regimen followed by an NNRTI-based regimen. Drug costs and treatment efficacies, but not NNRTI resistance levels, were most influential in determining optimal HIV drug sequencing in Côte d'Ivoire. Results of surveillance for NNRTI resistance should not be used as a major guide to treatment policy in resource-limited settings.

B. Reports (alphabetical by author)

Ashton, P. and Ramasar, V. (2001). **Water and HIV/AIDS: some strategic considerations in Southern Africa.** IN: A.R. & Henwood, R. (Eds.) *Hydropolitics in the Developing World: A Southern African Perspective*, African Water Issues Research Unit (AWIRU) (2002).
Link: http://www.internationalwaterlaw.org/Articles/hydropolitics_book.pdf

This publication discusses the negative effects of the HIV/AIDS pandemic on the provision of water supply and efficient resource management. First a strategic overview of the HIV/AIDS pandemic in Southern Africa is provided and then the extent in which it influences and is influenced by water resource management on the continent is examined.

Centers for Disease Control and Prevention. (1999). **HIV and Its Transmission.** Atlanta, GA: CDC. Link: <http://www.cdc.gov/hiv/resources/factsheets/PDF/transmission.pdf>

This Fact Sheet discusses HIV transmission factors in the environment, households and business settings. For households, HIV has been transmitted between family members but this type of transmission is very rare. These transmissions are believed to have resulted from contact between skin or mucous membranes and infected blood. To prevent even such rare occurrences, precautions, should be taken in all settings "including the home" to prevent exposures to the blood of persons who are HIV infected, at risk for HIV infection, or whose infection and risk status are unknown. CDC recommends that gloves should be worn during contact with blood or other body fluids that could possibly contain visible blood, such as urine, feces, or vomit.

Centers for Disease Control and Prevention. (2007). **What You Need to Know About HIV and AIDS.** Atlanta, GA: CDC. Link: www.cdc.gov/hiv/resources/brochures/careathome/care3.htm

This brochure discusses how HIV is spread and how it is not spread. The brochure clearly says that HIV is not spread through feces, but that other germs can be transmitted through feces.

Centers for Disease Control and Prevention. (2007). **What Women Can Do.** Atlanta, GA: CDC. Link: www.cdc.gov/hiv/topics/women/protection.htm

This resource outlines the things that women can do to protect themselves from getting infected with HIV. The document tells women not to douche as it removes some of the body's natural protection.

Chandler, R., Decker, C. & Nziyige, B. (2004). **Estimating the Cost of Providing Home-based Care for HIV/AIDS in Rwanda.** PHRplus.
Link: http://www.phrplus.org/Pubs/Tech045_fin.pdf

Partners for Health Reform Plus estimated the cost of Home-based Care for HIV in Rwanda, based on a sample of eight programs offering care in early 2004. The study found that facility-based care has higher estimated costs per client than community-based care, with monthly costs per client ranging from approximately \$ 31.20 to \$36.01 per month, the cost of community-based care ranged from \$ 12.75 to \$ 24.53 per month.

Fox, S. (2002). **Integrated Community-based Home Care (ICHC) in South Africa: a review of the model implemented by the Hospice Association of South Africa**. Cape Town, South Africa: POLICY Project.
Link: http://www.synergyaids.com/documents/Hospice_SAfrica.pdf

In 1999 the POLICY Project supported seven hospices to incorporate the Integrated Community-based Home Care (ICHC) model into their operational activities. In the light of the grant period drawing to an end, this report was commissioned to document the critical elements of the ICHC model and reflect on the experiences of those working in the field. Objectives of the research were to: (1) identify and discuss key similarities and differences between the hospice ICHC model and other home-based care models used in South Africa; (2) identify and critically review the core elements related to the ICHC model as implemented by Hospice Association of South Africa; and highlight key aspects of best practice related to the hospice ICHC model. This report outlines information from a literature review and field research pertaining to these three objectives.

HABITAT. (2007) **HIV/AIDS checklist for water and sanitation projects**. Nairobi: United Nations Human Settlements Programme.
Link: <http://www.unhabitat.org/pmss/getPage.asp?page=bookView&book=2068>

The HIV/AIDS checklist for water and Sanitation projects is a reference guide on how to deal with the issues raised by HIV/AIDS in the project cycle and to help practitioners in the water and sanitation sector design appropriate HIV/AIDS strategies, components and indicators to respond to the pandemic.

Hillbruner, Chris. (2007). **Workshop on Integration of Water, Sanitation and Hygiene into HIV/AIDS Home-based Care Strategies: Background Paper**. Baltimore, MD: Catholic Relief Services.

This paper is an introduction for a workshop in Malawi to integrate water, sanitation and hygiene into HIV/AIDS home based care strategies. The background section provides information on the current status of the HIV/AIDS epidemic in Malawi, the country's water, sanitation and hygiene situation and an outline of the key linkages between these two sectors. A second section focuses on common findings and recommendations from the six WHO/USAID country assessments with additional Malawi specific information. A third section then highlights key lessons learned and recommendations. The paper ends with a series of issues requiring further discussion.

Hygiene Improvement Project. (2006) **Integrating Hygiene Improvement into HIV/AIDS Programming to Reduce Diarrhea Morbidity**. Washington DC: U.S. Agency for International Development.

Link:

<http://www.hip.watsan.net/content/download/1528/7298/file/HIP%20HI%20and%20HIV-AIDS%20integration8-06.pdf>

The purpose of this paper is to highlight discrete hygiene improvement activities that can be incorporated into HIV/AIDS programs in different settings to help mitigate the impact of diarrhea on people living with HIV and AIDS (PLWHA) and their families—prolonging and improving the quality of life for PLWHA and protecting family members and caregivers from contracting diarrhea.

IRC Water and Sanitation Centre. (May 2007). **HIV/AIDS : caring for HIV-infected people in South Africa requires love, patience and 200 litres of water per day**. *SOURCE Newsletter, May 2007*.

Link: <http://quisana.antenna.nl/pipermail/source-weekly/2007/000148.html>

This newsletter article discusses a Mvula Trust survey of home-based caregivers in the peri-urban settlement Jeppe's Reef. HBC groups say that they need 200 litres of water a day to care properly for their patients – 75-100 litres for laundry and the rest for cooking, bathing and drinking. Water for bathing and laundry is disposed of in toilet pits rather than being used for other purposes as it is used for washing soiled clothing and bedding and contains disinfectants. Another finding was that it is important for people with HIV to have access to clean toilets. Caregivers found that some models were more suitable than others.

IRC International Water and Sanitation Centre. (2007) **HIV/AIDS: Making the links with WASH**. Delft: IRC.

Link: <http://www.irc.nl/page/32435>

This web page lists a series of questions that need to be answered for discussing the specific water, sanitation and hygiene needs of households affected by HIV/AIDS.

Jones, H. & Reed, B. (2005). **Water and Sanitation for Disabled People and Other Vulnerable Groups: Designing services to improve accessibility**.

Loughborough, UK: WEDC.

Link: <http://wedc.lboro.ac.uk/>

A major contributing factor to the poverty of disabled people is their lack of access to sanitation and safe water. Many vulnerable groups of people experience difficulties using water and sanitation facilities, such as frail, elderly people, pregnant women, parents with small children, and people who are injured or sick – including people with AIDS. Despite the size of the problem, almost nothing has been published on this subject to date, and disabled people continue to be ignored by providers of water and sanitation services. Based on three years of international research and collaboration with water and sanitation and disability

sector organizations, this book's main focus is on facilities for families in rural and peri-urban areas of low- and middle-income countries, but many of the approaches and solutions may also be applied in institutional settings, such as schools and hospitals and in emergency situations.

Kamminga, E. & Wegelin-Schuringa, M. (2006). **HIV/AIDS and Water, Sanitation and Hygiene: Thematic Overview Paper**. Delft: IRC International Water and Sanitation Centre.

Link: http://www.irc.nl/content/download/4199/48511/file/TOP2HIV_AIDS05.pdf

IRC's Thematic Overview Paper on HIV/AIDS discusses the main principles of HIV/AIDS and water, sanitation and hygiene, based on worldwide experiences and views of leading practitioners. It also provides direct links to more explanations and documented experiences of critical aspects of the topic. Some of the topics in the document include: (1) Some basic facts about the HIV/AIDS epidemic; (2) Linkages between HIV/AIDS and water, sanitation and hygiene from different perspectives: health, gender, community management, poverty alleviation and human rights, (3) The impact of HIV/AIDS on WSH organizations and service providers, etc.

Kangamba, M., Roberts, C. Campbell, J., Service, J. & Adalla, C. (2006). **Catholic Relief Services – Water and Sanitation Assessment of Home-based Care Clients in Zambia**. Baltimore, MD: Catholic Relief Services.

Link: http://pdf.usaid.gov/pdf_docs/PNADJ423.pdf

CRS responded to an announcement by the World Health Organization to conduct an assessment on the adequacy of water, sanitation and hygiene in relation to home-based care strategies for people living with HIV&AIDS in Zambia. One goal of the assessment was to provide evidence-based guidance on water and sanitation needs in home-based care strategies, particularly in resource-poor situations. Another goal was to identify the most critical measures to be taken by the health sector and the water and sanitation sector to provide short- and medium-term solutions in the area of water, sanitation and hygiene support to home-based care.

Kgalushi, R., Smits, S. & Eales, K. (2004). **People living with HIV / AIDS in a context of rural poverty: the importance of water and sanitation services and hygiene education, A case study from Bolobedu (Limpopo Province, South Africa)**. Johannesburg, South Africa: The Mvula Trust and Delft, IRC International Water and Sanitation Centre.

Link:

http://www.irc.nl/content/download/11414/167794/file/Case_study_Limpopo_South_Af.pdf

This case study was undertaken by the NGO, The Mvula Trust, and recommends that the water sector give more attention to the specific effects of inadequate services on those who are HIV positive. It states that efforts to strengthen targeted multi-sectoral initiatives – notably with health and agricultural sectors

and in schools – can have a key role in promoting closer integration of support and training to care givers.

Kiongo, J.M. (2005). **The Millennium Development Goal on Poverty and the Links with Water Supply, Sanitation, Hygiene and HIV/AIDS: A case study from Kenya**. Delft: IRC International Water and Sanitation Centre.
Link: http://www.irc.nl/content/download/14995/199310/file/Case_study_Poverty-Watsan-H.pdf

This case study reviews the water supply and sanitation conditions in Kenya in relation to the Millennium Development Goals and with specific reference to the HIV/AIDS epidemic. Major conclusions are that the National HIV/AIDS strategy does not address any of the water and sanitation related needs of HIV/AIDS affected families. The Human Resource Development strategies of the WATSAN sector do not sufficiently take the implications of the HIV/AIDS epidemic into account. One of the recommendations is a partnership initiative for water, sanitation and hygiene promotion for health and livelihoods of the poor.

Laurent, P. (2005). **Household Drinking Water Systems and Their Impact on People with Weakened Immunity**. Geneva: World Health Organization. Link: http://www.who.int/household_water/research/HWTS_impacts_on_weakened_immunity.pdf

This report evaluates selected household water treatment systems, their respective strengths and weaknesses and their potential impact on people with weakened immune systems. The water treatment options that were evaluated include: boiling, pasteurization (fuel, firewood, solar radiation or cooking), solar disinfection, UV lamps disinfection, chemical disinfection (chlorination, preceded or not by coagulation/flocculation and/or filtration), and ceramic filters in particular, other types of filters in general.

Lockwood, K., Msapato, K., Senefeld, S., Nigi, J., Perrin, P., Mitka, M. (2006). **Catholic Relief Services: Water and Sanitation Assessment of Home-Based Care Clients in Malawi**. Baltimore, MD: Catholic Relief Services.
Link: http://pdf.usaid.gov/pdf_docs/PNADJ422.pdf

Catholic Relief Service conducted an assessment on the adequacy of water, sanitation and hygiene in relation to home-based care strategies for people living with HIV&AIDS in Malawi. The assessment was commissioned by the World Health Organization with the goal of producing evidence-based guidance on water and sanitation needs in home-based care strategies, particularly in resource-poor situations. In addition, to the assessment findings, this report makes recommendations to be made at the policy level, while also identifying the most critical measures to be taken by the health sector and the water and sanitation sector to provide short and medium-term solutions in the area of water, sanitation and hygiene support to home-based care.

Millennium Water Alliance. **Quality of life: Exploring the links between living with HIV/AIDS and safe water and sanitation.**

Link: [www.mwawater.org/pdf/MWA%20H2O%20HIV%20final%20404%20\(2\).pdf](http://www.mwawater.org/pdf/MWA%20H2O%20HIV%20final%20404%20(2).pdf)

This paper provides a concise and useful overview of the many links between HIV/AIDS and clean water, improved sanitation, and adequate hygiene.

Mohammed, N., Gikonyo, J. (2005). **Operational Challenges: Community Home Based Care (CHBC) for PLWHA in Multi-Country HIV/AIDS Programs (MAP) for Sub-Saharan Africa.** Washington DC: World Bank.

Link: <http://www.worldbank.org/afr/wps/wp88.pdf>

This paper documents Community Home-based Care for Africa, focusing on the operational challenges and limitations. It does not deal specifically with water and sanitation issues but provides a thorough discuss of current CHBC practices in Africa. Research shows that an effective and affordable CHBC for PLWHA, has the potential to positively impact the health and social status of patients, families and the community as a whole. However, research has also shown that CHBC area facing a multitude of challenges and limitations which not only adversely affect their ability to carry out their activities, but also have the potential to exacerbate poverty and existing gender inequalities among affected families and communities

Obi, C.L., et al. (2006). **The interesting cross-paths of HIV/AIDS and water in Southern Africa with special reference to South Africa.** *Water SA* 32(3) July 2006 pp 323-344.

Link: <http://www.wrc.org.za/downloads/watersa/2006/Jul%2006/1955.pdf>

This article gives estimates of the HIV/AIDS epidemic in South Africa. In rural areas that lack electricity and potable water, the impact HIV/AIDS is more profound because of the role of water in cooking, drinking, consumption of anti-retrovirals and in the preparation of milk supplements for infants. People with compromised immune systems are more prone to several diseases than individuals whose immune systems are not compromised by HIV/AIDS. HIV/AIDS patients therefore have greater requirements for potable water than uninfected individuals. Improving water quality will lead to a decline in child and adult mortality as well as diarrheal diseases in people living with HIV/AIDS. The cross-paths between HIV/AIDS and water have long-term implications for effective water resource management and the provision of wholesome water to communities.

Potter, A. and Clacherty, A. (2007). **Water services and HIV/AIDS. Water, sanitation and health and hygiene education in the context of HIV/AIDS : a guide for local government councillors and officials responsible for water, sanitation and municipal health services.** Pretoria, South Africa, Water Research Commission.

This report is intended to assist local government water services and environmental health officials with planning and implementing water and sanitation services, together with health and hygiene education, in order to reduce the impact of HIV/AIDS. It sets out a framework for municipal responses to HIV/AIDS and highlights ways in which HIV/AIDS can be mainstreamed into water and sanitation planning, regulation, implementation and provision. In order to clarify the institutional complexities in water and environmental health services, it provides a model, strategies and indicators for implementing project-related health and hygiene education in the context of HIV/AIDS.

Schuler, N. (2005) **Lessons and Experiences from Mainstreaming HIV/AIDS into Urban/Water (AFTU1 & 2) Projects**. Washington DC: World Bank.

Link:

http://iris37.worldbank.org/domdoc/PRD/Other/PRDDContainer.nsf/WB_ViewAttachments?ReadForm&ID=85256D2400766CC785257097005B8959&

This study gives an overview of HIV/AIDS interventions in the World Bank's African urban portfolio and reviews the challenges and lessons learned from 13 urban /water projects in Benin, Burundi, Lesotho, Mozambique and several other African countries.

UNICEF. (2002). **HIV and Infant Feeding: a UNICEF Fact Sheet**. New York: UNICEF.

Link: http://www.unicef.org/publications/files/pub_hiv_infantfeeding_en.pdf

The Fact Sheet provides facts on breastfeeding and replacement feeding to protect infants and a brief overview of UNICEF infant feeding activities and projects.

UNICEF. (2002). **Mother to Child Transmission of HIV: a UNICEF Fact Sheet**. New York: UNICEF.

The Fact Sheet provides facts on mother-to-child transmission of HIV, core principles and strategies to prevent transmission from a mother to her child and a brief overview of UNICEF MTCT activities and projects. Link:

www.unicef.org/adolescence/files/pub_factsheet_mtct_en.pdf

UNICEF. (2001). **Teacher's Guide for the Integrated Water, Sanitation and Hygiene Education, and HIV/AIDS for Grades 1 to 7**. Lusaka, Zambia: UNICEF. Link:

UNICEF. Link:

www.schoolsanitation.org/Resources/Readings/Zambia_teachersguide%5B1%5D.pdf

The guide covers the following themes: personal, water, food and community hygiene as well as HIV/AIDS facts, prevention, support, and care for those with HIV/AIDS. It includes participatory activities such as role-play, guessing games, case studies, surveys, mime, etc.

Water and Sanitation Program. (2007). **Water, Sanitation, and Hygiene for People Living with HIV and AIDS**. Washington DC: Water and Sanitation Program.

Link: http://www.wsp.org/filez/pubs/72200723130_SAHIVAIDSFN.pdf

This WSP study was conducted among people living with HIV and AIDS and a section of the population in selected areas of the Indian states of Tamil Nadu and Andhra Pradesh. It was followed by a national consultation for disseminating the findings of the study, building consensus on the need for mainstreaming water, sanitation, and hygiene safety messages in care and support programs for people living with HIV and AIDS, and identifying further strategies. This was followed by two state-level consultations in the two states. The Field Note summarizes the learnings from the study commissioned by the Program, the proceedings of the national and state-level consultations, and from desk research on other studies and experiences, mainly in South Asia.

WaterAid – **Making the links: Mapping the relationship between water, hygiene and sanitation, and HIV/AIDS: a joint think-piece by WaterAid Ethiopia and Prognist**. London: WaterAid.

Link: <http://www.wateraid.org/documents/makinglinks.pdf>

This paper highlights key connections in the relationship between water, hygiene and sanitation provision, and HIV/AIDS. It also makes recommendations for additional research that needs to be conducted such as how many HIV/AIDS sufferers are contracting (and eventually dying from) hygiene and sanitation related illnesses. More in-depth analysis of the different needs and concerns of different categories of people living with HIV/AIDS is important. The situation in rural areas is likely to be significantly different to that in congested urban slum areas. And any future study should differentiate along gender and age lines, as well as considering the different situations of those who may only recently have become infected with the virus compared to those who are in an advanced stage of full-blown AIDS. Many questions need asking. These include: What is the nature of the link between levels of infection of HIV/AIDS and the provision of hygiene and sanitation facilities? What is the relative importance of hygiene and sanitation compared to nutrition, medical care, etc? Do we need a better understanding, briefly alluded to, of the three-way causal relationship between hygiene and sanitation, poverty and HIV/AIDS? Should agencies working to improve the well being of people living with HIV/AIDS be concentrating their efforts on hygiene and sanitation activities? And how might the WATSAN sector reduce the risk that people living with HIV/AIDS experience hygiene and sanitation related discrimination?

WaterAid. (2006). **Assessment of the Adequacy of Water, Sanitation and Hygiene Facilities in Resource-poor Areas of Nigeria in Relation to the Needs of Vulnerable People**. Abuja, Nigeria: WaterAid Nigeria.

This study was conducted in 36 communities in six of Nigeria's 36 states. Respondents indicated their HIV status had financial, health, social, physio-social and educational impacts on their lives. However, generally, there was considerable social support from relations and family members even though their major caregivers were adult females (90%). The study revealed that PLWHAs did not have adequate access to water and sanitation. Although a variety of improved and unimproved water sources were available in the communities studied, the improved sources (e.g. boreholes) which provided potable water were less than a quarter of what is required to serve the entire population. Availability of water varied with the season: more water was available to respondents in the rainy season because respondents predominantly relied on rain water during this period. During the dry season when water is scarce or in during times of illness, some PLWHAs (18.6%) resort to unimproved water sources of very poor quality. Stigma and discrimination against PLWHAs is a significant factor affecting access to water supply. 29% of respondents attested that they have felt unwelcome, uncomfortable, and discriminated against at a water point. They resorted to commercial water vendors to avoid such confrontations. Access to sanitation among PLWHAs was low. 47% of the PLWHAs did not have their own household latrines. Although the use of personal latrines was believed to promote privacy for respondents, many could not access these due to lack of funds.

Water Environment Federation. (1997). **WEF/U.S. EPA Biosolids Fact Sheet: Can AIDS Be Transmitted By Biosolids?** Alexandria, VA: Water Environment Federation.

Link: <http://www.biosolids.org/docs/intro.pdf>

The possibility of HIV entering municipal sewer systems has prompted inquiries as to whether HIV may be transmitted through contact with wastewater or with biosolids, the solid product created during wastewater treatment. Research has refuted links between contact with wastewater or biosolids and HIV transmission.

Water Supply and Sanitation Collaborative Council; Water, Engineering and Development Centre. (2004). **For Her It's the Big Issue: Putting Women at the Centre of Water Supply, Sanitation and Hygiene**. Water, Sanitation and Hygiene Evidence Report. Geneva: Water Supply and Sanitation Collaborative Council.

Link:

http://www.wsscc.org/fileadmin/files/FOR_HER_ITs_THE_BIG_ISSUE_Evidence_Report-en.pdf

This report provides key messages and recommendations to promote the role of women in water, sanitation and hygiene (WASH) interventions. Even though women's involvement in the planning, design, management and implementation of such projects and programs has proved to be fruitful and cost-effective, the

substantial benefits of this approach are not properly recognized. One result is that, all too often, women are not as centrally engaged in water and sanitation efforts as they should be.

Wegelin-Schuringa, M. Kamminga, E. & de Graaf, S. (2003) **Towards the Millenium Development Goals: HIV/AIDS and Its Implications for the Water and Sanitation Sector**. Abuja, Nigeria: WEDC 29th International Conference.

Link: <http://wedc.lboro.ac.uk/conferences/pdfs/29/Wegelin-Schuringa.pdf>

This conference paper has a section on Home Based Care and concludes that: "caregivers need to be trained in safe water handling and sanitation practices, personal hygiene, domestic hygiene, food hygiene and safe waste water disposal and drainage to effectively reduce the exposure to water and sanitation related diseases of their patients. Therefore, hygiene education must be one of the elements in training for home based care. Most training manuals for home based care do mention the need for hygiene and the use of safe water and latrines, but the manuals are based on an assumption that everyone has access to safe water and sanitation. They moreover assume that caregivers are informed on safe water handling practices. The advice that most care givers give to households with people living with HIV/AIDS (PLWHA) is to boil water for drinking. This is not always realistic."

Wegelin-Schuringa, M. & Kamminga. (2006). **Water and sanitation in the context of HIV/AIDS - The right of access in resource-poor countries**. *Health and Human Rights*, 9(1) 2006: 153-172.

Link: [Download pdf \(154 Kb\)](#).

This article reviews the linkages between these sectors and HIV/AIDS from a rights perspective and gives suggestions for strategies to be undertaken by state and non-state actors to promote access to water and sanitation as a right in an HIV/AIDS context.

Wegelin-Schuringa, M., and G.Tiendrebeogo (eds) (2004), **Techniques and Practices for Local Responses to HIV/AIDS. Part 1: techniques Part 2: practices**. Amsterdam: KIT Publishers; and Geneva: UNAIDS.

This toolkit documents experiences of communities around the world in dealing with HIV/AIDS. Techniques and practices are presented for others to learn from and adapt to their own context. Whenever possible, a contact address is given to enable users to get more information or to share their experience of using and adapting a given technique or practice. 'Part 1: Techniques' contains 20 techniques for application in different stages of the planning cycle. The purpose and use of each technique is described, and practical guidelines are given on how to proceed. 'Part 2: Practices' contains 50 practices used to address one or more specific problems. The practices are grouped into four categories: prevention, care and treatment, support and mitigation, and partnership and coordination.

WELL Project. (2004). **WELL Briefing Note: The HIV / AIDS Millennium Development Goal - What water, sanitation and hygiene can do.** London: WELL Project.
<http://www.lboro.ac.uk/well/resources/Publications/Briefing%20Notes/BN%20HIV%20AIDS.htm>

This Briefing Note states that even if there is no direct evidence of the impact of water, sanitation and hygiene on the care of HIV/AIDS patients, it is clear that water, sanitation and hygiene makes care of the sick within the home easier. Due to the establishment of a safe water supply, water used for personal bathing, washing clothing and utensils increased from about 3 0% to more than 50% of total water consumption. Volume of water consumption for potable and non potable purposes increased from 40 to 100 litres per day in India. Bathing using soap increased from less than once a week to as often as every day. The existence of a yard tap nearly doubles the chances of a mother washing her hands after cleaning a child's anus, and doubles the chances of her washing faecally soiled linen immediately. Households with a distant water source cooked little, and only once a day because of a lack of water. A study in Salvador, Brazil, showed that children in households with no toilet, had twice the incidence of diarrhea than those with sanitary toilets.

WELL Project. **The HIV/AIDS Millennium Development Goal HIV/AIDS and water supply, sanitation and hygiene in Southern Africa.** London: WELL Project. Link:
<http://www.lboro.ac.uk/well/resources/Publications/Briefing%20Notes/WELL%20HIV%20Poster%20Southern%20Africa%20NC.pdf>

This Poster looks at what school water, sanitation and hygiene can do to help fight HIV/AIDS in children in Southern Africa.

Wijk van, C. (2003). **WELL Factsheet: HIV/AIDS and water supply, sanitation and hygiene.** London: WELL Project.
Link: <http://www.lboro.ac.uk/well/resources/fact-sheets/fact-sheets-htm/hiv-aids.htm>

An overview of the impacts of HIV/AIDS on families and households is discussed and a section on recommendations for the water sector is provided. It recommends that more robust water supplies, water treatment and sanitation systems requiring less (and less complex) maintenance and repairs, and more attention to home systems, including home treatment of drinking water, would make communities and households less dependent on outside support.

World Health Organization. (2000) **Home-based Long-term Care: Report of a WHO Study Group.** Geneva: World Health Organization.
Link: http://whqlibdoc.who.int/trs/WHO_TRS_898.pdf

This report of a WHO Study Group provides guidance on the development, implementation, adjustment and monitoring of home-based long-term care. It

includes definitions of long-term care and home-based long-term care and covers policy development, organization and management, financing mechanisms, and material and human resources (both formal and informal). The report also looks at the challenges of migration and living conditions; changes in the family and work-place; natural and other disasters and their aftermath; cost and sustainability; and accessibility, acceptability, adequacy, coverage, and quality of services and care.

World Health Organization. (2003). **Emerging Issues in Water and Infectious Disease**. Geneva: World Health Organization.

Link: http://www.who.int/water_sanitation_health/emerging/emerging.pdf

This WHO report provides an overview of HIV/AIDS and other infectious diseases that are spread by contaminated water supplies.

C. Guidelines/Manuals

Colton, T., Dunnington, L., Hainsworth, G. & Israel, E. (2006). **Community Home-Based Care for People and Communities Affected by HIV/AIDS: A Handbook for Community Health Workers**. Watertown, MA: Pathfinder International.

Link:

http://www.pathfind.org/site/DocServer/CHBC_HB_Complete.pdf?docID=7961

The Handbook draws on the experience of Pathfinder community home-based care (CHBC) in projects in Kenya, Tanzania, Ethiopia, Nigeria, and Uganda. Pathfinder's CHBC model, emphasizes community mobilization for prevention as well as participation in care and support for those affected by HIV/AIDS. It includes diagrams and instructions for purifying drinking water and sections on personal and food hygiene.

Colton, T., Dunnington, L., Hainsworth, G. & Israel, E. (2006). **Community Home-Based Care for People and Communities Affected by HIV/AIDS A Comprehensive Training Course for Community Health Workers, Trainer's Guide**. Watertown, MA: Pathfinder International.

Link:

http://www.pathfind.org/site/DocServer/CHBC_Trainer_s_Guide_Complete.pdf?docID=8001

This curriculum is primarily based on Pathfinder's experience in sub-Saharan Africa, But it is intended to provide a global model for community home-based care which can be adapted into local contexts as needed. Other successful approaches from local and international organizations and projects were also added to enrich the content and training methodologies. The curriculum was pre-

tested in Tanzania and Mozambique, and underwent an internal and external peer review.

Family Health International. (2004). **Module 4: Monitoring and Evaluating Community Home-Based Care Programs**. Research Triangle Park, NC: Family Health International.

This training module is for workshop participants and teaches: (1) the components of community home-based care (CHBC) that need to be monitored, (2) how to develop home-based care (HBC)-specific process indicators, and (3) to identify appropriate monitoring and evaluation methodologies and tools.

Link:

<http://www.fhi.org/NR/rdonlyres/ehz3d4ozmhvbvbjjpcehueub57rj222dojjm6nvyo du4ljdambpht2ipj5mxelce7w4ctj3eyyl5dc/Mod04.pdf>

Hsi, N. Musau, S. & Chanfreau, C. (2005). **HIV/AIDS Home- Based Care Costing Guidelines**. Bethesda, MD: PHRplus.

Link: http://pdf.usaid.gov/pdf_docs/PNADE226.pdf

The guidelines present costing principles that can be applied to HBC interventions at community level, to allow for determinations of the cost of HBC approaches. They then take users through a 10-step process in which they define the boundaries of an existing, expanding, or proposed HBC program; identify and quantify the resource requirements of that program; collect needed cost and other data; analyze the data in terms of total and unit costs; and apply the results.

Kenya National AIDS/STD Control Programme. (2002). **National Home-Based Care Programme and Service Guidelines**. Nairobi: Ministry of Health.

These guidelines call for the use of “clean boiled water for cooking and drinking to prevent diarrhea. It states that after cleaning soiled children or sick people more protection is required, especially the use of gloves or other protective material. For cleaning infected wounds, it recommends the use polythene bags (or gloves if available) and washing hands before and after the procedure. For dressings that are re-used, rinse thoroughly in cold water and pour the rinse water into the latrine. Soak dressings in bleach solution or boil. Wash with water and soap, rinse well, and hang in the sun. Dispose of soiled dressings that are not reused by burning or throwing into the pit latrine.

Lamprey, P.R. (n.d.). **HIV/AIDS Prevention Care Resource-Constrained Settings: A Handbook for the Design and Management of Programs**. Research Triangle Park, NC: Family Health International.

www.fhi.org/NR/rdonlyres/eh7tyyfcpxmy6w3okmfxspm3cyenzp55jaooz3omemjlg_hh3w4sn2dnybkbhw3sq4cegcvfivihmm/HIVAIDSPreventionCare1enhv.pdf

This comprehensive manual provides guidelines on planning, implementing and evaluating HIV/AIDS programs. It mentions boiling and filters to improve

household water quality and states that “improvements in water and sanitation reduce labor demands on affected families and community members who want to help, thus giving them more time to do so.”

Malawi Ministry of Gender and Community Services. (2003). **National Policy on Orphans and Other Vulnerable Children**. Lilongwe: Ministry of Gender and Community Services.

This policy document does not deal with water, sanitation and hygiene issues. The key areas covered by the National Policy on Orphans and other Vulnerable Children include Provision of Assistance, Coordination, Institutional and Legal Framework, Transparency and Accountability, Monitoring and Evaluation. It emphasizes that care for orphans and other vulnerable children remain the responsibility of families and communities. The Policy emphasizes community-based approaches because they have proved to be highly sustainable. In this regard institutional care for orphans and other vulnerable children should be the last resort.

Malawi Ministry of Health. (2005). **National Community Home Based Care Policy and Guidelines**.

In the section on Nutrition Support, the Guidelines specify that “water shall be obtained from a protected source and safety measures taken to avoid contamination.”

Malawi National AIDS Commission. **Community home-based care providers’ handbook**. National AIDS Commission. Link: <http://www.aidsmalawi.org.mw/contentdocuments/HBC%20Providers'%20Handbook.pdf>

The handbook provides information about the organization of Malawi’s national home-based care program and includes chapters on counseling, communication, treatment and other topics.

Malawi National AIDS Commission. (2003). **Malawi national HIV/AIDS policy: a call for renewed action**. Lilongwe: National AIDS Commission. Link: <http://www.aidsmalawi.org.mw/contentdocuments/Malawi%20National%20HIV/AIDS%20Policy.pdf>

Malawi’s policy provides technical and administrative guidelines for the design, implementation and management of HIV/AIDS interventions, programs and activities. It offers guidance on critical intervention areas, among them social and economic support for people living with HIV/AIDS (PLWAs); provision of care and support for treatment to achieve a better quality of life for Malawians living with HIV/AIDS; and protection of their human rights and freedoms.

PACT. **Home-based Care for People living with HIV/AIDS: Course Notebook for Participants**. Washington DC: U.S. Agency for International Development.

Link:

http://www.pactworld.org/reach/documents/HBC_training_participant_guide.pdf

The Course Notebook for Participants is a learning resource package to equip the caregiver, the supervisor and any home-based care participant with the skills to ensure that the

home-based care program works effectively. The components of the package include: medical care (both nursing and clinical), support and counseling, psychosocial support (including spiritual support), AIDS education, health education, nutrition, hygiene and sanitation.

South Africa. **National Guideline on Home-based Care and Community Based Care**.

This 14 page document provides information on general goals and principles of home-based care programs. It does not include any specific mention of water, sanitation or hygiene issues or practices.

Tanzania Ministry of Health. (2005) **Guidelines for Home Based Care Services**.

Dar Es Salaam: Ministry of Health.

Link:

<http://www.nacptz.org/publications/Guidelines%20for%20HBC%20Services%20Feb-2005.pdf>

These Guidelines were developed by Tanzania's Ministry of Health to support the effective implementation of the National Care & Treatment Plan for People Living with HIV/AIDS. As basic elements of a home-based care service it highlights: Identification and protection of water source and basic sanitation; Fetching, storage and utilization safe water; Proper utilization of sanitary facilities (latrines etc) and Community education on safe water and proper sanitation.

World Health Organization. (2002) **Community Home-based Care in Resource-limited Settings: A Framework for Action**. Geneva: World Health Organization.

Link:

http://www.who.int/chp/knowledge/publications/comm_home_based_care.pdf

This document provides a framework for establishing and maintaining community home-based care (CHBC) in resource-limited settings for people with HIV/AIDS and those with other chronic or disabling conditions. It is for governments, national and international donor agencies and community-based organizations (including nongovernmental organizations, faith-based organizations and community groups) in developing or expanding CHBC programs. This document targets three audiences: policy-makers and senior administrators, middle managers and those who develop and run CHBC programs.

World Health Organization. (2002). **Living Well with HIV/AIDS: A Manual on Nutritional Care and Support for People Living with HIV/AIDS**. Rome: Food and Agriculture Organization. Link: http://portal.unesco.org/education/en/file_download.php/69ac3b14bec384ed89414d26e57bde8enutrition-AIDS-people.pdf

This manual provides home care agents and local service providers with practical recommendations for a healthy and well-balanced diet for people living with HIV/AIDS. The manual was developed following an extensive review of existing guides from both developed and developing countries and includes sections on personal and food hygiene.

World Health Organization. (2006) **Guidelines for Drinking Water Quality**. Geneva: World Health Organization. Link: http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/index.html

Developments in the third edition of the Guidelines include significantly expanded guidance on ensuring the microbial safety of drinking-water. For the first time, reviews of many waterborne pathogens are provided. "A typical *Mycobacterium* spp. can cause a range of diseases involving the skeleton, lymph nodes, skin and soft tissues, as well as the respiratory, gastrointestinal and genitourinary tracts. These bacteria are a major cause of disseminated infections in immunocompromised patients and are a common cause of death in HIV-positive persons."

World Health Organization. **IASC Guidelines for HIV/AIDS interventions in emergency settings**. Geneva: World Health Organization. Link: http://www.who.int/3by5/publications/documents/en/iasc_guidelines.pdf

Guidelines for HIV/AIDS interventions in Emergency Settings is to help individuals and organizations in their efforts to address the special needs of HIV-infected and HIV-affected people living in emergency situations. The *Guidelines* are based on the experiences of organizations of the UN system and their NGO partners. It includes a section on HIV considerations when planning water supply and sanitation services.

Zambia National Food and Nutrition Commission. (2004). **Nutrition Guidelines for Care and Support of People Living with HIV/AIDS**. Lusaka: National Food and Nutrition Commission.

Chapter 8 of this Guideline is on Food Safety and Hygiene. It recommends that water for human consumption should come from protected sources such as boreholes or protected wells. If this is not possible, it states that water from rivers and streams should be treated. " PLWHA should always drink boiled or treated water." Regarding sanitation, the Guideline specifies that if flush toilets are not available, the use of clean, ventilated latrines and that handwashing facilities, soap and towels be provided within the latrine.

Zimbabwe Ministry of Health and Child Welfare. (2004). **National Community Home-based Standards**. Harare: Ministry of Health.

These standards are intended to give program managers and home-based care providers a foundation from which to identify gaps in their service and to seek the training and support they need. This guidebook presents the home-based care standards in five sections covering the following areas: Care and Support for Patient and Family; Team Service Provision; Governance and Management; Training, Information and Education; and Monitoring and Evaluation. Sample Data Collection Tools are included in the Annex. One of these, the Client Management Form, has a Safe Drinking Water category for monitoring a patient's environment.

Zimbabwe National Action Committee. (2004). **Zimbabwe water and sanitation sector HIV/AIDS response: programme, strategies and guidelines**.

Zimbabwe: National Action Committee, Government of Zimbabwe, UNICEF.

Link:

http://www.sarpn.org.za/documents/d0001030/Water_HIV_AIDS_Response_Guidelines_June2003.pdf

Zimbabwe's National Action Committee for the Rural Water Supply and Sanitation Programme, developed these guidelines. This booklet contains guidelines/strategies for the integration of HIV/AIDS awareness into the water and sanitation sector activities and approaches in prevention, care and mitigating measures against the spread of HIV/AIDS. It also provides suggestions for possible water and sanitation related research areas in Zimbabwe.

Summary of Existing Water and AIDS Research

Lead Author	Year	Type of Document	Intervention/Hypothesis Tested	Results/Comments	Comments
Ansari	1992	Peer-review	Presence of HIV-1	Presence of HIV-1 was investigated in 16 environmental samples, including raw wastewater, sludge, final effluent, soil, and pond water, collected from different locations.	HIV-1 and HIV-1-specific proviral DNA and viral RNA were detected in three wastewater samples.
Aragon	2003	Peer-review	Bottled water or treated tap water	-Drinking tap water was an independent risk factor for having cryptosporidiosis (OR 6.76 for water consumed in the home, OR 3.16 for water consumed outside the home)	-This study demonstrates that even in the relatively safe municipal water in developing countries, extra WSH measures can prevent water borne disease
Aronson	1999	Peer-review	Potable water is a source for <i>M. avium</i> infections.	The high number of <i>M. avium</i> isolates recovered from hospital water and their close relationship with clinical isolates suggests the potential threat of nosocomial spread.	
Ashton	2001	Report	Impacts of HIV/AIDS	This publication discusses the negative effects of the HIV/AIDS pandemic on the provision of water supply and efficient resource management.	
Badri	2006	Peer-review	HAART treatment at different CD4 count thresholds.	A cost-effectiveness analysis was conducted using primary treatment outcomes, healthcare utilization and cost data derived from the Cape Town AIDS Cohort.	HAART is reasonably cost-effective for HIV-infected patients in South Africa, and most effective if initiated when CD4 count >200/microl.
Bland	2007	Peer-review	Examined infant feeding intentions of HIV-infected and uninfected women.	Feeding intentions of pregnant women were compared against four resources that facilitate replacement feeding: clean water, adequate fuel, access to a refrigerator and regular maternal income.	A clean water supply and regular maternal income were independently associated with intention to replacement feed. Most HIV-infected women did not have the resources for safe replacement feeding, instead choosing to exclusively breastfeed.
Brink	2002	Peer-review	Relationships between diarrhea, CD4 cell counts and stool pathogens.	Forty-nine percent of diarrheal stools and 39% of stools from asymptomatic patients contained enteric pathogens. The most frequent isolates were helminths, followed by bacteria and then protozoa (8.9%). <i>Cryptosporidium parvum</i> infection alone was associated with low CD4 counts. Bacteria were frequently found, even in stools from asymptomatic individuals.	Over two-thirds of diarrheal episodes were undiagnosed, suggesting that unidentified agents or primary HIV enteropathy are important causes of diarrhoea in this population
Bushen	2004	Peer-review	Therapy with glutamine and alanyl-glutamine	The dose-related efficacy of alanyl-glutamine and glutamine in treating diarrhea and in increasing antiretroviral drug levels shows that these supplements may help to improve therapy for patients with AIDS who have diarrhea and/or wasting in developing, tropical areas.	
CDC	1999	Report/Fact Sheet	HIV transmission	This Fact Sheet discusses HIV transmission factors in the environment, households and business settings.	CDC recommends that gloves should be worn during contact with blood or other body fluids that could possibly contain visible blood, such as urine, feces, or vomit.
Clasen	2007	Peer-review	Water quality	Interventions to improve water quality are generally effective for preventing diarrhea in all ages.	
Colebunders	1987	Peer-review	Determine the predictive value of persistent diarrhea	128 at Mama Yemo Hospital with persistent diarrhea were tested for the presence of HIV antibodies. One-hundred seven (84%) of the 128 patients with diarrhea lasting at least 1 month were found to be HIV seropositive.	Presently, persistent diarrhea in adults in central Africa is strongly associated with HIV infection, but the pathophysiological mechanisms causing this diarrhea remain unclear.
Curtis	2003	Peer-review	Handwashing	On current evidence, washing hands with soap can reduce the risk of diarrheal diseases by 42-47% and interventions to promote handwashing might save a million lives.	More and better-designed trials are needed to measure the impact of washing hands on diarrhoea and acute respiratory infections in developing countries.
Doherty	2007	Peer-review	Guidelines on infant feeding for HIV-positive women	This was a study of 635 HIV-positive mother-infant pairs across three sites in South Africa to assess mother to child transmission of HIV. Three criteria were found to be associated with improved infant HIV-free survival amongst women choosing to formula feed: piped water; electricity, gas or paraffin for fuel; and disclosing HIV status.	The study concludes that counselling of mothers should include an assessment of individual and environmental criteria to support appropriate infant-feeding choices.
Fewtrell	2005	Peer-review	Water, sanitation,	Water quality interventions (point-of-use water treatment) were found to be more	

			hygiene interventions	effective than previously thought, and multiple interventions (consisting of combined water, sanitation, and hygiene measures) were not more effective than interventions with a single focus.	
Goldie	2006	Peer-review	Use of diagnostic tests	This study assessed the cost-effectiveness of treatment strategies for adults in Côte d'Ivoire who were infected with the human immunodeficiency virus (HIV). Undiscounted gains in life expectancy ranged from 10.7 months with antiretroviral therapy and prophylaxis initiated on the basis of clinical criteria to 45.9 months with antiretroviral therapy and prophylaxis initiated on the basis of CD4 testing and clinical criteria, as compared with trimethoprim-sulfamethoxazole prophylaxis alone.	A strategy of trimethoprim-sulfamethoxazole prophylaxis and antiretroviral therapy, with the use of clinical criteria alone or in combination with CD4 testing to guide the timing of treatment, is an economically attractive health investment in settings with limited resources.
Grant	1997	Peer-review	Survival after an AIDS diagnosis	Survival after an AIDS diagnosis appears to be substantially shorter in African countries and this may be partly because of later diagnosis of AIDS in Africa, but may also be because of environmental factors such as increased exposure to pathogens of high virulence and lack of access to care. Tuberculosis and bacterial infections are the most important causes of morbidity and mortality among hospitalized patients.	More information is needed about gynaecological disease in HIV-infected women. The most important research questions concern the development and evaluation of cost-effective regimes for prophylaxis and treatment of opportunistic disease in order to prolong healthy life in HIV-infected individuals.
HABITAT	2007	Report	Project checklist	The HIV/AIDS checklist for water and Sanitation projects is a reference guide on how to deal with the issues raised by HIV/AIDS in the project cycle and to help practitioners in the water and sanitation sector design appropriate HIV/AIDS strategies, components and indicators to respond to the pandemic.	
Hillebrand-Haverkort	1999	Peer-review	M. genavense infection.	3 HIV-infected patients were examined with M. genavense infection. The use of corticosteroids possibly favored colonization and dissemination of atypical mycobacteria in these patients with low CD4 cell counts and may have masked symptoms of infection.	The fact that these patients were treated with highly active antiretroviral therapy (HAART) together with antimycobacterial therapy may explain that 1 patient was free from mycobacteria 16 months after the end of specific treatment.
van der Hoek	1995		Method for the detection of HIV-1 RNA from feces	The method was applied on fecal specimens from 18 HIV-1-infected individuals, among which were samples that had been stored for 9 years.	HIV-1 RNA is frequently present in the feces of HIV-1-infected individuals, and in some cases the HIV-1 subpopulation in feces differs from the HIV-1 subpopulation in serum.
Huang	2007	Peer-review	Handwashing	-Participants in intervention arm washed hands 1.75 times more than those in the control arm (7 vs 4 times a day) -Handwashing at higher levels reduced diarrheal episodes from 2.92 to 1.24 during the year of the study	-Study was performed with PLWHA on ART in a developed country -Participants were requested to wash hands before and after sex, which is not a message in most handwashing promotion programs or material
Hygiene Improvement Project (HIP)	2006	Report	Hygiene improvement	This report highlights discrete hygiene improvement activities that can be incorporated into HIV/AIDS programs in different settings.	
IRC Water & Sanitation Centre.	2007	Report/Newsletter	Water use	This article discusses a Mvula Trust survey of home-based caregivers in the peri-urban settlement Jeppe's Reef. HBC groups say that they need 200 litres of water a day to care properly for their patients – 75-100 litres for laundry and the rest for cooking, bathing and drinking.	
Joloba	2000	Peer-review	Mycobacterium tuberculosis	This study investigated the rate of initial drug resistance and transmission patterns of Mycobacterium tuberculosis in Kampala, Uganda. There were no significant differences in resistance rates between patients with and without HIV infection.	
Jones	2005	Report	Disabled/vulnerable populations	Based on three years of international research and collaboration with water and sanitation and disability sector organizations, this book's main focus is on facilities for families in rural and peri-urban areas of low- and middle-income countries.	
Kamminga	2006	Report	HIV/AIDS and water, sanitation, hygiene	This report discusses: 1 - Some basic facts about the HIV/AIDS epidemic; 2 - Linkages between HIV/AIDS and water, sanitation and hygiene from different perspectives: health, gender, community management, poverty alleviation and human rights, and 3 - The impact of HIV/AIDS on WSH organizations and service providers, etc.	
Kangamba	2006	Report	HBC assessment	CRS responded to an announcement by the World Health Organization to conduct	

				an assessment on the adequacy of water, sanitation and hygiene in relation to home-based care strategies for people living with HIV&AIDS in Zambia. One goal of the assessment was to provide evidence-based guidance on water and sanitation needs in home-based care strategies, particularly in resource-poor situations.	
Kaplan	1996	Peer-review	Opportunistic infections	Tuberculosis is the most common serious opportunistic infection (OI) in sub-Saharan Africa and is also more common in Latin America and in Asia than in the United States. Bacterial and parasitic infections are prevalent in Africa; protozoal infections such as toxoplasmosis, cryptosporidiosis, and isosporiasis are also common in Latin America. Fungal infections, including cryptococcosis and <i>Penicillium marneffeii</i> infection, appear to be prevalent in Southeast Asia.	Research is needed to determine the spectrum of OIs and the efficacy of various prevention measures in resource-poor nations, and health officials need to determine a minimum standard of care for HIV-infected persons.
Kgalushi	2004	Report/Case study	Water/sanitation services	This case study from South Africa recommends that the water sector strengthen multi-sectoral initiatives – notably with health and agricultural sectors and in schools.	
Kiongo	2005	Report/case study	MDG	This case study reviews the water supply and sanitation conditions in Kenya in relation to the Millennium Development Goals and with specific reference to the HIV/AIDS epidemic.	A major conclusion is that the National HIV/AIDS strategy does not address any of the water and sanitation related needs of HIV/AIDS affected families.
Laurent	2005	Report	Household water treatment systems	This report evaluates selected household water treatment systems and their potential impact on people with weakened immune systems. The water treatment options that were evaluated include: boiling, pasteurization (fuel, firewood, solar radiation or cooking), solar disinfection, UV lamps disinfection, chemical disinfection (chlorination, preceded or not by coagulation/floculation and/or filtration), and ceramic filters.	
Lockwood	2006	Report	HBC & water, sanitation, hygiene assessment	Catholic Relief Service conducted an assessment on the adequacy of water, sanitation and hygiene in relation to home-based care strategies for people living with HIV&AIDS in Malawi.	The assessment was commissioned by the World Health Organization with the goal of producing evidence-based guidance on water and sanitation needs in home-based care strategies, particularly in resource-poor situations.
Lule	2005	Peer-review	Household water chlorination, safe storage, and basic hygiene education versus basic hygiene education alone	-25% Reduction in diarrhea episodes, 33% fewer days with diarrhea. Reductions seen in HIV+ household members were equal or greater than that of HIV- members (23% and 18% reductions respectively) -28% less visible bloody stool. -Presence of a latrine was associate with fewer episodes of diarrhea (IRR 0.69) although the study had not been designed to test this -Presence of soap in the house was associated with fewer days with diarrhea (IRR 0.58) and fewer day s of work/school lost due to diarrhea (IRR 0.56) although the study had not been designed to test this	-Effects seen on both PLWHA taking cotrimoxazole prophylaxis and those not; -Benefits extended to HIV- household members -Handwashing and use of improved water sources increase in intervention arm compared to comparison arm and may explain some of the observed difference between the two groups.
Mata	1988	Peer-review	Gut colonization or invasion by common enteroviruses	Patients with acquired immunodeficiency syndrome (AIDS) are particularly susceptible to gut colonization or invasion by common enteroviruses, resulting in both acute and chronic diarrhea and in wasting.	Efforts to improve personal hygiene and environmental sanitation should be given a high priority in less developed countries.
Meier	2006	Peer-review	Genital hygiene	Men with higher genital hygiene levels were less likely to be HIV+ than men with lower genital hygiene levels (OR 0.41)	-The first finding of the protective factor of male genital hygiene was found coincidentally in a study by the same team designed to measure other factors in HIV transmission
Mermin	2005	Peer-review	Recommendations on preventive measures	There is a need for standardized, evidence-based recommendations on preventive measures. Potential components include cotrimoxazole prophylaxis, safe drinking water, isoniazid prophylaxis, insecticide-treated bed nets, micronutrients, and provision of HIV counseling and testing and condoms to family members of persons with HIV.	
Molose	2007	Report	Water quantity	Average reported water needs for home-based care including 100L for laundry and 100L for cooking, bathing, and drinking.	-Anecdotal evidence is supplied on hygiene improvement, but it is not quantified -Cases where not chosen at random from a pool -The study is more of an advocacy piece than a scientific study
Moore	1993	Peer-review	HIV survival in	This study focused on establishing the inactivation of HIV and productively	

			sewers	infected lymphocytes in dechlorinated tap water. In addition, HIV survival was compared with that of poliovirus. Results indicated that either free HIV or cell-associated HIV was rapidly inactivated. In comparison, poliovirus showed no loss of infectivity over 24 h.	
Nyenya	2006	Report	Reduced water availability adversely affects home-based care	During times of water shortage, carers relied on poorer quality water sources and reduced bathing of patients from twice a day to 1 or 0. 20-80 additional liters of water are needed per day, depending on PLHWA symptoms, especially diarrhea.	-Solid quantification of change in behavior in a randomly selected sample
Obi	2006	Report	HIV estimates/impacts	In rural areas of South Africa that lack electricity and potable water, the impact on HIV/AIDS is more profound because of the role of water in cooking, drinking, consumption of anti-retrovirals and in the preparation of milk supplements for infants.	
Onadeko	1992	Peer-review	Toxoplasmosis	The seroprevalence of toxoplasmosis in pregnant women from the inner area of Ibadan was determined. Two hundred and seventy-three of the 352 women (78%) had dye test titres of 1/16 or greater with 165 (47%) having titres of 1/128 or greater.	Social and environmental conditions indicate that the source of infection is contact with cat feces.
Potgieter	2007	Peer-review	Assessment	A short-term assessment of water, sanitation, hygiene and home-based care services in two rural and two peri-urban communities in South Africa was made using specially designed questionnaires. The results from this assessment indicated the shortcomings of various sections in the service provision to people affected and living with HIV/AIDS in South Africa.	
Potter	2007	Report	Planning & implementing water, sanitation services	This report is intended to assist local government water services and environmental health officials with planning and implementing water and sanitation services, together with health and hygiene education, in order to reduce the impact of HIV/AIDS.	
Schuler	2005	Report	Urban water projects	This study gives an overview of HIV/AIDS interventions in the World Bank's African urban portfolio and reviews the challenges and lessons learned from 13 urban /water projects in Benin, Burundi, Lesotho, Mozambique and several other African countries.	
Short	2006	Peer-review	Prevention methods	Five new methods are discussed to prevent HIV infection. (i) A natural microbicide; intravaginal lime or lemon juice. (ii) Intravaginal oestrogen. (iii) Male circumcision. (iv) Post-coital penile hygiene. (v) PhotoVoice.	
Shrestha	2006	Peer-review	Cost effectiveness of household water chlorination and safe storage	\$5.21/diarrhea episode averted (representing separate infections), \$0.62/diarrhea-day averted, and \$1,252/DALY gained	-This data is from the same study as the Lule paper. -The lack of change in mortality may be explained by the fact that the study was done in the setting of a program that rapidly diagnosed and treated diarrhea. A study in Kenya by the same team found significant mortality reductions among users (HIV status was not known) and if the mortality reduction in this study had been similar, the cost would have been \$11/DAILY gained. Note that costs were that of the program, which required start-up, not the costs to the household or the costs of maintaining an ongoing program, both of which would be considerably more affordable.
Sorvillo	1994	Peer-review	Municipal filtering of water	HIV+ people living in sections of the city provided with filtered tap water were 32% less likely to have cryptosporidiosis than those living in sections of the city provided with unfiltered tap water (4.2% compared to 6.2%)	-Natural experiment was possible because until 1986, Los Angeles had two municipal water suppliers, one that filtered water and one that did not.
Taylor	2000	Peer-review	Mycobacterium avium	Environmental and patient isolates of Mycobacterium avium were resistant to chlorine, monochloramine, chlorine dioxide, and ozone. For chlorine, the product of the disinfectant concentration (in parts per million) and the time (in minutes) to 99.9% inactivation for five M. avium strains ranged from 51 to 204.	Disinfectant resistance may be one factor promoting the persistence of M. avium in drinking water.
UNICEF	2002	Report/Fact Sheet	Infant feeding	The Fact Sheet provides facts on breastfeeding and replacement feeding to protect	

				infants and a brief overview of UNICEF infant feeding activities and projects.	
UNICEF	2001	Report/teacher's guide	HIV/AIDS education in schools	The guide covers the following themes: personal, water, food and community hygiene as well as HIV/AIDS facts, prevention, support, and care for those with HIV/AIDS. It includes participatory activities such as role-play, guessing games, case studies, surveys, mime, etc.	
Voss	2007	Peer-review	HIV-related fatigue	Fatigue severity in Southern Africa was moderate, and the factors contributing to the perceived fatigue were most likely related to symptoms of acute HIV disease (such as fever and gastrointestinal problems). In conclusion, fatigue severity is less impacted by demographic or environmental variables but much more by co-occurring symptoms and HIV disease severity.	The results of this study imply the need for more research to understand if improvements in water quality and access to food would prevent infection and diarrhea and whether sufficient access to antiretroviral treatments to manage the HIV infection would improve fatigue and co-occurring symptom profiles.
Walensky	2007	Peer-review	ART regimens	The purpose of this study was to examine the value of resistance surveillance in influencing recommendations toward effective and cost-effective sequencing of antiretroviral (ART) regimens. Drug costs and treatment efficacies, but not non-nucleoside reverse transcriptase inhibitor (NNRTI)-based resistance levels, were most influential in determining optimal HIV drug sequencing in Côte d'Ivoire.	Results of surveillance for NNRTI resistance should not be used as a major guide to treatment policy in resource-limited settings.
Water and Sanitation Program	2007	Report/Field Note	HIV/AIDS & water, sanitation & hygiene	This WSP study was conducted among people living with HIV and AIDS and a section of the population in selected areas of the Indian states of Tamil Nadu and Andhra Pradesh. It discusses the need for mainstreaming water, sanitation, and hygiene safety messages in care and support programs for people living with HIV and AIDS, and identifying further strategies.	
WaterAid	n.d.	Report	HIV/AIDS research	This report makes recommendations for research that needs to be conducted such as: 1 - How many HIV/AIDS sufferers are contracting (and eventually dying from) hygiene and sanitation related illnesses? 2 - What is the nature of the link between levels of infection of HIV/AIDS and the provision of hygiene and sanitation facilities? 3 - What is the relative importance of hygiene and sanitation compared to nutrition, medical care, etc?	
WaterAid	2006	Report/Case study	Assessment of water, sanitation and hygiene facilities	This study was conducted in 36 communities in six of Nigeria's 36 states. The study revealed that PLWHAs did not have adequate access to water and sanitation. Stigma and discrimination against PLWHAs is a significant factor affecting access to water supply. Access to sanitation among PLWHAs was low.	
Water Environment Federation	1997	Report/Fact sheet	HIV transmission in biosolids	Research has refuted links between contact with wastewater or biosolids and HIV transmission.	
Wegelin-Schuringa	2006	Report/article	Water, sanitation access	This article reviews the linkages between water and sanitation and HIV/AIDS from a rights perspective.	
Wegelin-Schuringa	2004	Report/toolkit	Planning HIV/AIDS programs	This toolkit documents experiences of communities around the world in dealing with HIV/AIDS. The practices are grouped into four categories: prevention, care and treatment, support and mitigation, and partnership and coordination.	
Wegelin-Schuringa	2003	Report/Conference paper	HIV/AIDS and water, sanitation, hygiene	This conference paper has a section on Home Based Care and concludes that: "caregivers need to be trained in safe water handling and sanitation practices, personal hygiene, domestic hygiene, food hygiene and safe waste water disposal and drainage to effectively reduce the exposure to water and sanitation related diseases of their patients. The advice that most care givers give to households with people living with HIV/AIDS (PLWHA) is to boil water for drinking. This is not always realistic."	
WELL Project	2004	Report/Briefing Note	HIV/AIDS & water, sanitation, hygiene	This Briefing Note states that even if there is no direct evidence of the impact of water, sanitation and hygiene on the care of HIV/AIDS patients, it is clear that water, sanitation and hygiene makes care of the sick within the home easier.	
van Wijk	2003	Report/Fact Sheet	HIV/AIDS & water, sanitation, hygiene	An overview of the impacts of HIV/AIDS on families and households is discussed and a section on recommendations for the water sector is provided.	It recommends that more attention to home systems, including home treatment of drinking water, would make communities and households less dependent on outside support.

WHO	2003	Report	Water contamination	This WHO report provides an overview of HIV/AIDS and other infectious diseases that are spread by contaminated water supplies.	
WSSCC	2004	Report	Role of women	This report provides key messages and recommendations to promote the role of women in water, sanitation and hygiene (WASH) interventions.	

Table X: Summary of Existing Water and AIDS Guidelines and Manuals

Lead Author	Year	Document Type	Target Audience	Topic/Content Areas	Potential Use
Colton	2006	Handbook	Community Health Workers	Using the experience from Pathfinder's Community Home-based Care programs, this document emphasizes community mobilization for prevention and care. Has diagrams and instructions for purifying water and sections on personal and food hygiene.	Plan home based care programs at the community level
Colton	2006	Trainers' Guide	Trainers who are training community health workers	Community Home-based Care for People and Communities Affected by HIV/AIDS. A comprehensive training course for community health workers	Global model for community home-based care.
Family Health International	2004	Training module	Community home-based care program managers	This training module teaches the components of community home-based care that need to be monitored, how to develop home-based care-specific process indicators and to identify appropriate monitoring and evaluation approaches and tools	Develop monitoring and evaluation indicators. Identify process for monitoring.
Lamprey	nd	Handbook	HIV/AIDS Program planners and managers	This comprehensive manual provides guidelines on planning, implementing and evaluating HIV/AIDS programs. It mentions boiling and filters to improve household water quality and states that "improvements in water and sanitation reduce labor demands on affected families and community members who want to help, thus giving them more time to do so."	
Hsi	2005	Guidelines	HIV/AIDS Program planners and managers	The guidelines present costing principles that can be applied to HBC interventions at community level, to allow for determinations of the cost of HBC approaches. They then take users through a 10-step process in which they define the boundaries of an existing, expanding, or proposed HBC program; identify and quantify the resource requirements of that program; collect needed cost and other data; analyze the data in terms of total and unit costs; and apply the results.	
Kenya National AIDS Control Programme	2002	National Home-based Care Guidelines	Home based care program managers/trainers/caregivers	These guidelines call for the use of "clean boiled water for cooking and drinking to prevent diarrhea." Recommends using protective material when cleaning soiled garments or people.	
Malawi Ministry of Gender and Community Services	2003	National Policy on Orphans and Vulnerable Children	Program managers addressing orphan issues	This policy does not address water, sanitation or hygiene issues. This document emphasizes that orphans and vulnerable children remain the responsibility of families and communities. Community based approaches have proven to be highly sustainable and institutional care should be considered the last resort.	Used to address issues of children affected by HIV/AIDS. Potential entry point for WaSH messages.
Malawi Ministry of Health	2005	National Home-based Care Guideline	Home based care program managers/trainers/caregivers	The section on nutrition support specifies that "water shall be obtained from a protected source and safety measures taken to avoid contamination."	
Malawi National AIDS Commission	n.d.	Handbook		The handbook provides information about the organization of Malawi's national home-based care program and includes chapters on counseling, communication, treatment and other topics.	
Malawi National AIDS Commission	2003	National HIV/AIDS Policy	HIV/AIDS program planners, managers, implementers	This document provides technical and administrative guidelines for designing, implementing and managing HIV/AIDS interventions, programs and activities. It provides guidance on critical intervention areas: social and economic support for PLHA, care and support for treatment, and human rights protection and freedoms.	
PACT	n.d.	Course Notebook	Caregivers, Home-based care supervisors	The course notebook is a learning resource package that covers medical care (nursing and clinical), support and counseling, psychosocial support, AIDS education, health education, nutrition, hygiene and sanitation.	Training guide to ensure that home-based programs work efficiently.
South Africa	n.d.	National Home-based Care	Home based care program	This 14-page document outlines general goals and principles of home-based care programs. It does not include any specific mention of water, sanitation,	

		Guideline	managers/trainers/ caregivers	hygiene issues or practices.	
Tanzania Ministry of Health	2005	National Home- based Care Guideline	Caregivers, Home- based care supervisors	These guidelines support the effective implementation of the National Care and Treatment Plan for PLHA. Basic elements of home-based care include identifying and protecting water source and basic sanitation, fetching, storing and using safe water, proper use of sanitary facilities, and community education on safe water and proper sanitation.	
World Health Organization	2002	Framework for Action	Policy makers, senior administrators, program managers	This document provides a framework for establishing and maintaining community home-based care in resource limited setting for PLHA.	Governments, donors, and NGOs can use this document to help develop or expand community home based care programs.
World Health Organization	2002	Manual	Home care agents Local service providers	This manual gives practical recommendations for a healthy and well-balanced diet for PLHA. The manual evolved from an extensive review of existing guides and includes sections on personal and food hygiene.	
World Health Organization	2006	Guidelines		This third edition of the guidelines for safe drinking water specifically mentions the risk immune compromised people for contracting water-borne infections that can be serious and sometimes fatal.	
World Health Organization		Guidelines	HIV programs managers and caregivers in emergency situations	This guide outlines the special needs of HIV-infected and HIV-affected people living in emergency situations. It includes a section on HIV considerations when planning water supply and sanitation services.	
Zimbabwe Ministry of Health and Child Welfare	2004	National Community Home-based Standards	Program managers Home based care providers	This guidebook presents the home-based care standards in five sections covering: care and support of PLHA and family; team service provision; governance and management; training, information and education; monitoring and evaluation. One tool has a safe drinking water category for monitoring the PLHA's environment.	
Zimbabwe National Action Committee.	2004	Guidelines	Water and sanitation sector program managers	This booklet contains guidelines/strategies for the integration of HIV/AIDS awareness into the water and sanitation sector activities and approaches in prevention, care and mitigating measures against the spread of HIV/AIDS. It also provides suggestions for possible water and sanitation related research areas in Zimbabwe.	
Zambia National Food and Nutrition Commission	2004	Nutrition Guidelines for PLHA	PLHA Caregivers	Nutrition is an important part of the treatment and care of PLHA. Chapter 8 on food safety and hygiene gives recommendations on water, sanitation, hygiene, food hygiene and vector control.	Guidance on water, sanitation, hygiene and food safety to improve nutrition in PLHA.