

Energy as a key variable in reducing child mortality: A gender and energy perspective on empirical evidence on MDG 6¹

Discussion Paper

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Key words

Gender, energy, HIV/AIDs, malaria, tuberculosis, poverty

1. Introduction

HIV AIDS malaria and tuberculosis- An overview

The Human Immunodeficiency Virus (HIV), the virus that causes Acquired Immune Deficiency Syndrome (AIDS), tuberculosis (TB) and malaria, collectively kill an estimated 6 million people annually (WHO, 2004). HIV/AIDS and TB themselves interact intimately and whilst an HIV-uninfected person has a 5-10% risk of contracting TB in their lifetime, in HIV/AIDS-infected persons, this risk rate increases from a lifetime risk to an annual risk (WHO, 2004). The prevalence of the HIV/AIDS, TB and malaria globally is however skewed, affecting poor countries the most.

About 95% of more than 45 million people infected with HIV globally live in developing countries (The globalfund, 2005). Annual death rate from HIV/AIDS related illnesses is about 3 million per annum and AIDS is now the fourth leading cause of death in the world. There about 8 million cases of TB and about 2 million TB related deaths annually, 90% of which occur in low- and lower-middle-income countries (those with an annual GNP per capita of less than US\$2,995) (The globalfund, 2005). South East Asia accounts for the highest number of TB cases; about 35% whilst Sub-Saharan Africa has the largest per capita case load, with 350 TB cases per 100 000 persons compared 190 TB cases per 100 000 persons in South East Asia. 300 to 500 million clinical cases of malaria are reported annually. About 59% of the world's clinical malaria cases occur in Africa, around 38% in Asia and around 3% in the Americas. Of the four kinds of malaria, the P. Falciparum causes the most disease and deaths and Africa bears the brunt of this form, accounting for 74% of all cases of P. Falciparum whilst Asia has 25% and the America, 1%. The HIV/AIDS, TB and malaria cluster of diseases interact with development in various ways. Malaria alone for example, causes an estimated 1.3% economic loss per annum in Africa (WHO, 2005).

Like most health issues, HIV/AIDS, malaria and TB have various gender impacts due to underlying gender inequalities. These gender inequalities then play a critical role in gender differences in disease prevalence rates, disease reporting, research and policy as well as clinical management of disease among other things. Prevalence rates for example may be affected by the occupations of men and women, which are in most cases, determined by gender issues and would then expose a particular gender to specific environmental or socio-economic factors that then put this particular gender at risk. Prevailing gender inequalities skewed in favour of men for example have been associated with increasing HIV/AIDS infection rates among women, particularly young women. Health-seeking behaviours as well as patient prescriptions have also been found to be affected by gender. Women for example are found to be more likely to delay seeking health care in some cases due to work burdens or the need to consult their husbands. Other studies have found that men are more likely to be prescribed TB testing than women, indicating gender disparities even in services provision. Whether men or women get sick, most cultures allocate care for sick persons to women. Similarly, in case of deaths of parents, orphans are more likely to be taken in by women headed households and women headed households tend to take in more

orphans. Thus, deaths and long term or chronic illnesses such as HIV/AIDS related illnesses, TB, malaria and others may have critical impacts on gender relationships in particular as well as the household environment, resource usage and allocation. This in turn, affects survival functions/responsibilities such as water and fuelwood collection and usage, food processing as well as division of labour. From one perspective, presence of sick persons or deaths of key productive persons in households can accentuate gender disparities by increasing workloads, especially for women and girls, due to reduced productivity from time taken out for care-giving and inability to contribute to household labour due to illness as well as diversion of financial resources to illness and funeral expenses (Mutangadura, ILO, UNAIDS). From the other side of the “disease coin”, since diseases such as HIV/AIDS suppresses immune system, the vulnerability of sick persons can be mitigated by reducing exposure to disease vectors and reducing exposure to harmful environments. From the energy perspective, this can be achieved through improving access to clean water to limit exposure to water borne disease vectors; improving access to cleaner fuels to improve air quality and reduce IAP related respiratory and other diseases; and reducing drudgery to ensure adequate time for respite and self care by providing labour saving energy technologies such as grain mills and easily accessible water pumps.

Goal number 5 of the millennium development goals (MDGs), agreed upon by about 191 countries in September 2000, is to combat HIV/AIDS, malaria and other major diseases (UN, 2001) which include TB. By 2015, countries that have signed to the MDGs hope to have halted and begin to reverse these diseases.

Energy enables various aspects everyday life, from economic, social and environmental aspects. In areas where modern energy services are unavailable, interactions of energy with livelihoods have particular gender impacts, which can be detrimental not only to economic development but also gender equality. This research aims therefore aims at assessing whether gender and energy is a key variable in combating HIV/AIDs, malaria, TB and other major diseases. It aims to answer the question: “Does empirical evidence show that the gender perspective of energy is a key variable in combating HIV/AIDs, malaria, TB and other major diseases?”

This paper reviews empirical evidence on the linkages between gender, energy and HIV/AIDs, malaria, TB and other major diseases. Firstly the study explores possible linkages between gender, energy and HIV/AIDs, malaria, TB and other major diseases. It then assesses whether there is empirical evidence, both quantitative and qualitative on the linkages explored. The study then assesses the available evidence to examine whether and energy and gender are critical to these linkages. There are two aspects from which energy and gender can be viewed in the debates surrounding the achieving of MDG 5. Firstly, the aspect of energy as an enabler of services vital for combating HIV/AIDs, malaria, TB and other major diseases. Secondly are the gender impacts of lack of modern energy services in the interactions of everyday life of human beings, both infected and affected by HIV/AIDs, malaria, TB and other major diseases.

The organization of the paper is follows. The first part of the assessment is a brief review of a brief overview that provides the picture of HIV/AIDs, malaria and TB from a global perspective in terms of the magnitude of the problem and geographical prevalence. The second section briefly explores the gender aspects of HIV/AIDs, malaria and TB, exploring the key factors in gender issues underlying these diseases. Section three discusses the scope and methodological issues and explored the possible

linkages between gender, energy and HIV/AIDS, malaria and TB. Section four provides the empirical evidence from reviewed literature, on the various linkages discussed in section three. It then discusses their implications within the constraints of the available evidence (for or against the possible linkages) or lack of evidence as well as gaps in knowledge. The discussion of the evidence is provided in the main text, with details of the studies assessed provided in annexes. Where data in the study is assessed by gender and where there is quantitative or qualitative data, this is made explicit in both the main text and annexes. Section five concludes the paper with a discussion on what the evidence so far shows, identifies the most important connections in the context of the available evidence and provides a summary of the research and actions needed in order to address knowledge gaps identified by the review. Section six is a set of recommendations made in accordance to the findings of the study. The study scope has been limited to developing countries, particularly focusing on Africa, Asia and Latin America where HIV/AIDS, malaria and TB exacts the highest human and economic price.

2. Background

Epidemiological studies have often shown differences in prevalence, detection and even clinical management of disease among women, men and children. This can be a result of gender issues underlying aspects of diseases, linked often to socio-economic inequalities or biological differences that make one group more susceptible to a particular disease. In the case of HIV/AIDS, studies show an acceleration of infection rates among women. In 1985 for example, 35% of those persons living with HIV/AIDS (PLWHA) were women and this figure rose to 41% in 1997. In 2000 alone, 45% of PLWHA were women and 41% of the newly infected persons were women (UNAIDS, 2000). It is now estimated that between 47% and 50% of those infected are women (AVERT, 2005; UNAIDS, 2004). In addition, although the percentage of women living with HIV/AIDS in 2000 was lower than that of men (45% compared to 51%), in terms of HIV/AIDS deaths, more women died from HIV/AIDS (41%) compared to men (39%). The changing face of HIV/AIDS is well illustrated by the case of Sub-Saharan Africa (SSA), which accounts for about 70% of HIV/AIDS cases world wide (Figure 1)

Figure 1: Feminization of HIV/AIDS epidemic, 1985–2002.



Source: United Nations Joint Programme on HIV/AIDS, World Health Organization. Estimates; 2002 in Lalasz, 2004

The SSA is currently the only region where the prevalence rate is higher among women than among men and up to 57% of PLWHA in Sub-Saharan Africa are women (UNAIDS, 2004). However, as HIV infection rates increase in other parts of the world, the feminizing face of AIDS seen in SSA is reappearing elsewhere. In the last two years, the number of women infected by HIV has increased by 56% in East Asia and by 48% in Eastern Europe and Central Asia (PRB, 2004). In The United States, AIDS is the leading cause of death among African-American women aged between 25 and 34 years, who make up 60% of those infected by HIV in this age group. In SSA, 75% of women infected by HIV are aged between 24 and 34 and infection rates among adolescent girls are 5 to 6 times higher than boys in the same age group (PRB, 2004). The feminizing face of HIV is mainly attributed to gender disparities that have increased the vulnerability of women. Factors at the heart of women's vulnerability to HIV/AIDS include socio-economic gender inequalities which reduce women's control over their sexuality and sexual relationships, poor reproductive and sexual health, delayed and neglected access to care and support for HIV/AIDS, clinical management based on research on men, various forms of coerced sex including violent rape and cultural/economic obligations to have sex, increases risk of micro-lesions and therefore of STI/HIV infection, among other things (WHO, 2000; IWHC, 2005).

For the Millennium Development Goals (MDGs), preventing infection, providing care and improving quality of life of PLWHA, alleviating suffering of AIDS orphans and care-givers among some of the issues that will have to be addressed in achieving the MDG 6

Apart from HIV/AIDS, the MDGs also aim at dealing with other life-threatening diseases such as malaria and tuberculosis. Currently literature shows that, in many countries there are more men infected with malaria than women and the assumption has been that men's occupations expose them to malaria vectors (WHO, 1998 citing Sims 1994). Research in a region of Thailand, however suggests that exposure, infection and illness among men, women and children are similar but time, mobility and other social constraints discouraged women from attending clinics (Sims 1994 in WHO, 1998). Also according to Holmes et al (1998) whilst official figures show that there are twice as many male cases of TB as female cases (at young ages, the prevalence of infection in boys and girls is similar, but a higher prevalence has been found in men of older ages), recent analyses comparing infection and disease rates, suggest that propensity to develop disease after infection with *Mycobacterium tuberculosis*, the bacteria that causes TB, is greater among women compared to men (WHO, 1998). Other reasons for lower TB cases in women include patient delay due to inequalities (women often seek approval for sputum tests), the fact that men with symptoms of prolonged coughing are significantly more often prescribed TB tests women and the fact that some screening procedures may be less sensitive for detecting TB in female patients than in men, resulting in more false negative results among women (WHO, 2004). WHO cites observations in Bangladesh (Begum et al., 2001) and India (Uplekar et al., 1999) and Vietnam (Thorson & Johansson, 2004) where men are more likely to be tested for TB than women. There is therefore persistent questions and debate on whether the male prevalence for TB (and malaria) stems more from sex (i.e. biological) differences or more from socio-cultural or gender-based differences between this disease and normative gender roles in this part of the world (Hudelson, 1996; Balasubramanian et al., 2004 in WHO, 2004).

Whether a disease such as HIV/AIDS, TB or malaria is borne by a woman, man or child, gender relations interact with disease and poverty to dictate a path of increased vulnerability or position of strength for coping with the illness. Improved energy services can then play a vital role in improving quality of life for both the victim and caregivers and hence reduce the burden of disease, particularly for vulnerable groups such as women and children.

3. The study

Scope of the review

The study considered evidence for and against interactions between gender, energy and HIV/AIDS, malaria and TB in order to gain an understanding of the role that modern energy services can play in combating HIV/AIDS, malaria and TB as well as understanding the role, if any, of energy poverty in exacerbating impacts and spread of HIV/AIDS, contraction of malaria and TB. It also assessed the availability or lack of evidence (i.e number of studies) for and against HIV/AIDS, malaria and TB in order to understand the gaps in knowledge.

This study focuses empirical evidence from developing countries on linkages between gender, energy and HIV/AIDS, malaria and TB since issues of energy poverty and gender, HIV/AIDS, malaria and TB have the most adverse effects in developing countries. Apart from garnering evidence that can support policy in developing countries and developed country policy towards developing countries, the research is also aimed at further building the capacity of developing country researchers, so as to build south-generated knowledge capacities for gender and energy policies for the south. It must however be noted that whilst efforts were made to cover developing countries as much as possible, the bulk of the data comes from Sub Sahara Africa. This is because this region accounts for the bulk of HIV/AIDS case loads (up to 75%) as well as the bulk of malaria cases (up to 74% of *P. Falciparum* and 59% of all clinical cases of malaria). In addition, more attention is focused on HIV/AIDS compared to malaria and TB firstly because of availability of data but also because of the fact that interactions between HIV/AIDS and the households are more complex and visible than malaria, perhaps because HIV/AIDS is still largely a terminal disease and chronic long term illness is often involved. TB is highly interactive with HIV/AIDS and often, most PLWHA become victims of TB. To avoid repetitions, where TB and HIV/AIDS have same impact, they have generally been dealt with as HIV/AIDS since it is often the condition of immuno-suppression associated with HIV/AIDS that triggers the onset of TB. The focus is on persons with any of the three diseases; HIV/AIDS, malaria and TB as well as persons affected by these diseases from the illness and deaths of infected persons. It should be noted that this paper is one of several papers on gender, energy and MDGs being compiled as part of a larger research effort of the CRG².

In the study, the term PLWHA denotes any person having the virus but not necessarily AIDS (not sick). Persons infected with HIV/AIDS is also used to denote any person having the virus but not necessarily AIDS (not sick) whilst persons affected with HIV/AIDS denote persons that are uninfected but whose lives are closely and negatively affected by relatives, friends or community members who are

² For more information of CRG, please visit www.energia.org/crgge

HIV positive. These include widows and widowers, parents of children with HIV/AIDS, foster parents of children orphaned by HIV/AIDS, home based care groups etc. It however does not include the global community of persons concerned about HIV/AIDS.

Methodology and methodological limitations

Literature search was mainly done using the internet based search engine; Google as well as by searching journal articles and reports available on databases on the internet. The search targeted English language publications and grey literature. Some key search words used in the search and key publications and websites used to source data are provided in Annex 1

The dependence on internet searches and journal papers was limiting since the study was done from Malawi where internet connection are slow, expensive and electricity is unreliable. In addition, some journal articles are inaccessible and/or expensive to access. To help mitigate this, a number of reports and papers were obtained from colleagues and through email requests to authors, whenever author addresses were available from accessed abstracts.

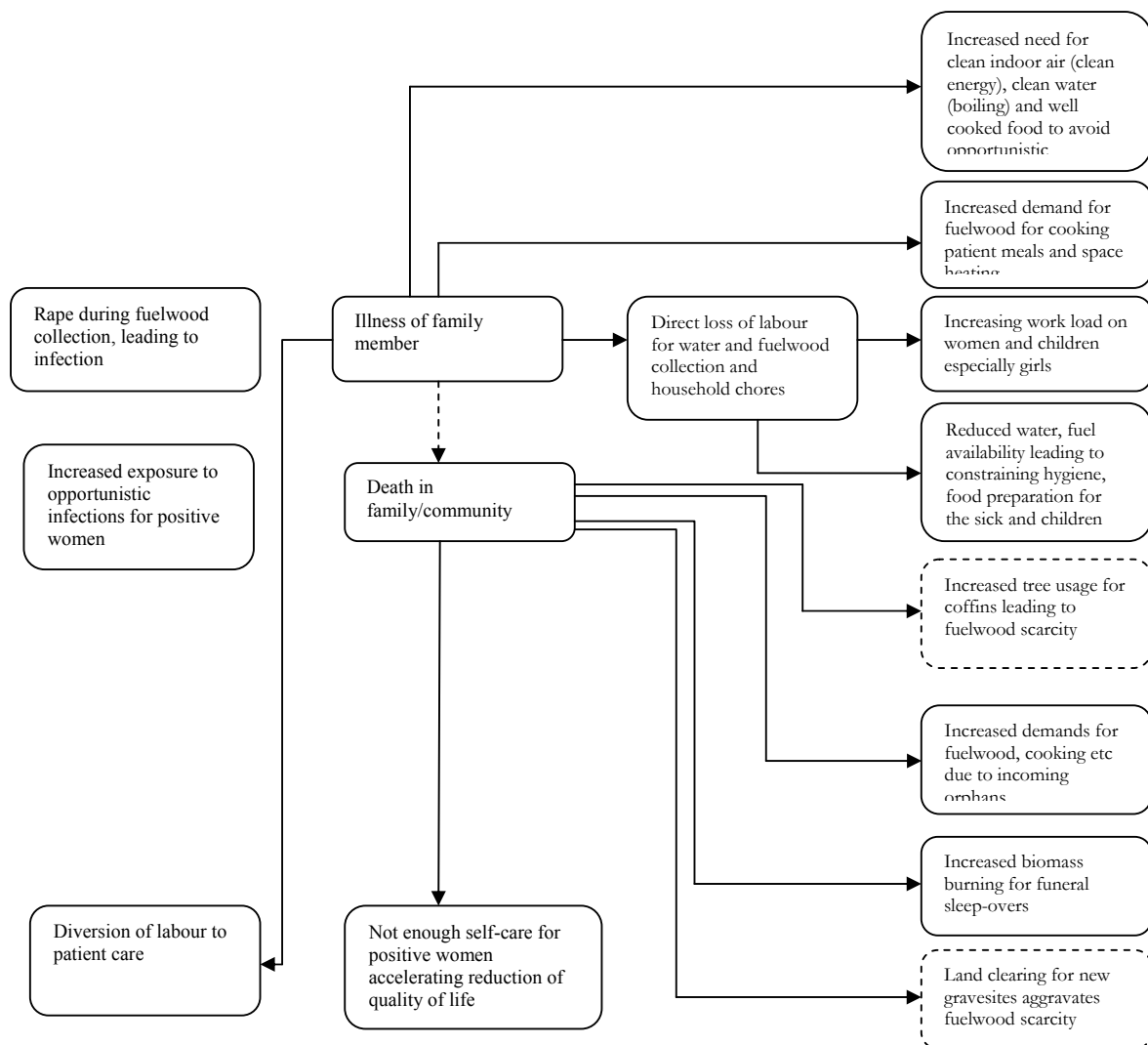
Another limitation is the fact that the study examined English language publications. This then excludes the bulk of publications in other languages, particularly French, Latin, Portuguese, Chinese and Arabic which are largely used in some parts of the developing world.

Possible linkages between gender, energy and HIV/AIDS, malaria and TB

Whilst gender and energy have no (known) causative linkages with HIV/AIDS, malaria and TB, they may interact with these diseases to either exacerbate or mitigate their impacts. For example, availability of modern energy services can play various mitigative roles including the provision of affordable and easily accessible energy resource to enable health behaviours such as sterilising utensils and beddings for preventing opportunistic infections, reducing time taken to undertake household chores allowing time for care of PLWHA as well as time for respite and self care of women living with HIV/AIDS. At usage level, inability to access cleaner fuels can be contribute to the acceleration of opportunistic infections due to indoor air pollution (IAP) which has a causative linkage to respiratory infection, inability to boil drinking water which can lead to diarrhoea and bathing contaminated water which can accelerate skin infections. At community level, energy services such as sterilising equipment in hospitals, thereby providing safer health care services and reducing iatrogenic infections (infections inadvertently introduced through medical procedure). Lack of modern energy services on the other hand can result exposure of women with HIV, to disease triggers, thereby compromising their health. Collecting fuelwood in unsafe environments can expose women to sexual assault, putting them at risk of contracting HIV. The linkages are not unidirectional. HIV/AIDS itself can interact with gender norms and natural resource management to impact women's roles as energy providers. Increasing illness can burden women with workloads due to increased need for cooking, bathing, sterilisation of utensils during care and increased demands of households taking in orphaned children. Whilst adding the workload, diseases such as HIV/AIDS, malaria and TB also divert labour from the household

chores such as fuelwood and water collection to care as well as removing key productive persons through death. Thus in this respect, HIV/AIDS, malaria and TB, can increase women's fuelwood and water collection burdens. Finally, as people die from HIV/AIDS, malaria and TB, forests are cleared to make new graves and trees are cut down at a faster rate for coffins, cremations as well as for funeral fires (rites). Figure 2 illustrates some of the possible linkages between gender, energy and HIV/AIDS.

Figure 2: Framework of selected linkages between gender, energy and HIV/AIDS



Currently however, there seem to be no empirical studies done on the impacts of modern energy or lack of it HIV/AIDS infected populations. There are also no studies on the connections between gender, energy and diseases such as malaria. There is however, emerging interest in linkages between gender, energy and respiratory infections (WHO, 2000; Smith, 1993), which are particularly deadly for PLWHA. The next sub-sections discuss some of these linkages with particular reference to HIV/AIDS, malaria and TB. Due to lack of empirical studies on linkages between gender, energy and HIV-AIDS, discussions in this paper are mainly on theoretical linkages.

4. Findings of the study: Empirical evidence on the linkage between gender, energy and child mortality

4.1 Improved energy services can help improve the quality of life for PLWHA by enabling recommended health behaviours for PLWHA

In order to improve quality of life for PLWHA, various organizations have developed some guidelines for care of food and drink which are vital for nutrition and in reducing exposure to infection. In its guidelines for PLWHA, the Centre for Disease Control (CDC) in the United States points out that food and water can carry germs that cause illness such as Salmonella, Campylobacter, Listeria and Cryptosporidium which cause diarrhea, upset stomach, vomiting, stomach cramps, fever, headache, muscle pain, bloodstream infection, meningitis, or encephalitis in people with HIV (CDC, 2003). Although these diseases can make anyone ill, they are much more common and life threatening in PLWHA due to suppressed immunity. The CDC then recommends a series of hygiene behaviors for PLWHA to prevent infection and illness. However, without adequate and affordable energy, poor persons may face constraints in conforming to these behaviors and may therefore have higher risks of contracting opportunistic infections. On the other hand, whilst energy can help the undertaking and conformity to recommended hygiene behaviours for PLWHA, where energy services are limited, women are likely to face the brunt of increased workloads in conforming to recommended behaviours as illustrated in Table 1.

Table 1: Gender, energy and recommended health behaviours for PLWHA

Recommended health behaviours ³ for PLWHA	Gender and energy link potential	Modern energy potential for mitigation
Meat, poultry (such as chicken or turkey), and fish can make you sick if they are raw, undercooked, or spoiled.	In places where fuelwood is scarce, food may not always be well cooked in an effort to save fuel Women may have to head-load bigger loads or travel further to meet fuelwood demands for proper food preparation for PLWHA	Improved cookstoves, gas etc can help reduce need for frequent fuelwood collection trips etc
Raw fruits and vegetables are safe to eat if you wash them carefully first.	Water is traditionally collected by women and girls. To meet increased demand for PLWHA, women and girls may have to walk longer distances, collect more water (heavier loads) and increase frequency of water collection trips for washing fruit and vegetables	Solar water pumps, diesel pumps etc can reduce water demand burdens on women and improve water availability and reduce water collection burden (frequency, weight per headload, distance traveled and time taken
Eat cooked foods while they are still hot.	Women may be burdened with fuelwood collection to meet the increased need for thermal energy for cooking and reheating food	Hot bags and fireless cookers can keep food hot and hygienic, quick lighting ethanol and ethanol gelfuel, gas etc can enable quick cooking and reheating
Don't drink water straight from lakes, rivers, streams, or springs.	Women may have to collect water further from home, where cleaner water sources are, increasing the distance traveled time taken to collect water and frequency of water fetching	Provision of clean water through energy technologies such as solar pumps, wind pumps, diesel pumps etc can reduce the increased water collection burden
Boil all water before drinking it. Use only ice made from boiled water. Drink	Thermal energy is required for water boiling, where fuelwood is	Solar cookers for water boiling, efficient stoves for quicker

³ All recommended health behaviours are from the Centre for Disease Control (CDC)

only canned or bottled drinks or beverages made with boiled water. Boiling is the best way to kill germs in your water. Heat your water at a rolling boil for 1 minute. After the boiled water cools, put it in a clean bottle or pitcher with a lid and store it in the refrigerator. Use the water for drinking, cooking, or making ice.	scarce, women may have to travel longer distances to fuelwood to meet demand	boiling at a lower “cost ⁴ ”
After handling raw meat, poultry, and fish, wash your hands well with soap and water before you touch any other food.	Women may have to travel longer distances to collect clean water at water points	Provision of clean water through solar pumps, diesel pumps etc
Thoroughly wash cutting boards, cooking utensils, and countertops with soap and hot water after they have had contact with raw meat, poultry, or fish.	The need for adequate water for thorough cleaning may increase women’s need to collect more water, more frequently and fuel needed for boiling cleaning water may require women to collect more wood more frequently.	Provision of clean water through solar pumps, wind power, diesel pumps etc may reduce women’s water fetching burdens Provision of thermal energy for water boiling through affordable Solar cookers, efficient stoves, gas, ethanol based fuels etc may reduce women’s fuel collecting burdens
Do not let meat, poultry, or fish sit at room temperature for more than a few minutes. Keep them in the refrigerator until you are ready to cook them.	Need for power for refrigerators to preserve food	Solar and non-solar electrical refrigerators will help preserve food hygienically
Eat or drink only pasteurized milk or dairy products.	Need for thermal power for pasteurizing milk and dairy products	Efficient stoves, gas cookers etc can enable pasteurization

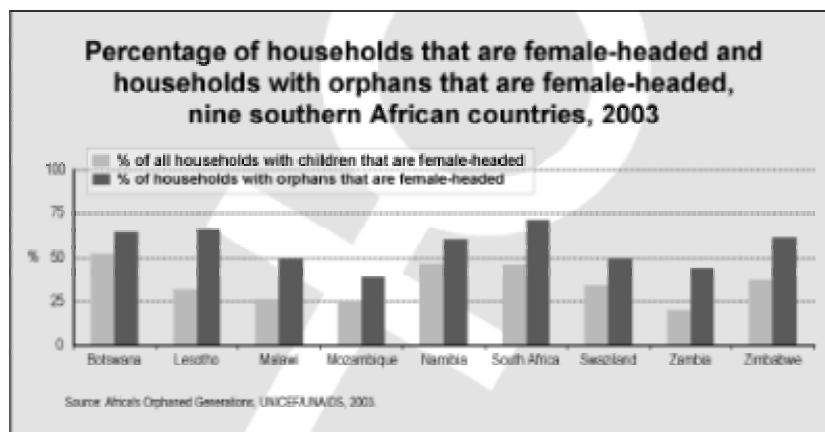
Source: Developed by author with health behaviour information advisory from CDC, 2003

4.2 Modern and improved energy services can reduce women’s burden of care for PLHWA

In terms of care and management of HIV/AIDS and other diseases, women bear the brunt of care and management of patients as well as orphans (UNAIDS, 2004). AIDS underscores and exacerbates the unequal gender divisions of labour and responsibilities that are already inherent in households, particularly poor households. A study in Thailand for example showed that women consistently took more care of PLHWAs than men (Kespichayawattana and Van Landingham, 2002). In Southern Africa, where the AIDS/HIV crisis is the worst in the world, the proportion of female headed households is also the highest – averaging 34%, in West and central Africa, female-headed constitute 18% whilst in East Africa they comprise 21% of all households (UNICEF and UNAIDS, 2003). Almost 90% of AIDS patient care occurs within the home in Sub-Saharan Africa, and the care responsibilities disproportionately burden women and girls (Ogden and Esim, 2003). According to the African Union, women in the region represent 95% of the care providers of those infected and affected by the disease (2003).

⁴ Time and monetary costs

Figure 3 Female headed households taking in orphans in selected SSA countries



Source: UNICEF, 2003

The situation is the same world over, but pronounced in developing countries. In Viet Nam, for example, women make up 75% of all caregivers for persons living with HIV, and are more likely to take in orphans (Ogden and Esim, 2003; Ogden et al, 2004). In South Africa, a three-province survey found that almost 75% of AIDS-affected households were female-headed, a significant proportion of whom were also battling AIDS-related illnesses themselves (Steinberg et al., 2002).

Two groups that are particularly affected are older women (grandmothers) and young orphans who become “parents” to their siblings.

Box 1: Older women and men in orphan care- A special look at gender, energy and HIV/AIDS

A study in South Africa showed that about 78 percent of care givers in homes with PLWHA are women and nearly 40 percent of the caregivers are 46 years or older, with 20 percent of these caregivers over 55 years of age. 43% percent of caregivers are in the 26 to 45 year age range, which corresponds to the most productive period of a person’s life, 18% of the household caregivers are less than 26 years old whilst 4 % were less than 16 years old (Homan, 2005). In Uganda a study group of 172 children LWHA with a median age of 87 months (7¼ years) found that caregivers were primarily women, with 48% of care-givers being mothers, 28% grandmothers and 18%, aunts whilst 5% were fathers (O’Hare et al, 2005).

In this respect, older women seem to be at pronounced disadvantage since HIV/AIDS affects the most productive age groups between 20 and 44, in most developing countries (UNAIDS, 2004) and elderly women (and to a lower extent, men) are assuming the majority of care?. In Botswana, for example, care for roughly half the children who have lost a mother or father (UNICEF and Ministry of Local Government Botswana, 2003) is provided by grandparent.

Apart from older women, children also take on responsibilities in care giving and raising of orphans. Whilst these responsibilities are taken on by both boys and girls, girls tend to take on larger reproductive roles, becoming “mothers” to their sibling.

Box 2: Young girls become as providers⁵

My names are Kevina Lubowa. I am 14 years old. I have 4 brothers and 3 sisters younger than me. I come from Uganda. I am studying in Primary Six. I have come here to say something about AIDS and its problems. AIDS means acquired immune-deficiency syndrome. It's a terrible disease. It killed both my mother and my father in 1992. It killed all brothers and sisters of my father. It has killed many men and women in Uganda. Some houses have been closed. But our house was not closed because my father and mother left me with four brothers and two sisters. I look after them. I also look after my grandfather who lives near us, because his wife died and nobody was there to look after him. He is 84 years old. He lost his wife in 1992. The grandfather does not see. He has eye problems. It is me who looks after the family.

From school, I go to bring water from the well. I take a jerrican on my head. I tell my brothers and sisters to go in the bush and collect firewood. Sometimes, when we don't have fire, we go and get it from our neighbours. We cook potatoes, matooke, pumpkins and cassava. But my brothers do not want cassava; they want only matooke. Our banana plantation is now a forest.

.... Because I am a girl people think I am weak. So they come home and steal our cassava and fire wood. Because I am a girl even when I see them I can do nothing. My friends, I am concluding by saying that the life of an orphan in Uganda is bad. Some people want us to work as their house girls and house boys. Now we want good food, blankets, education and many other things. We also want to live in good houses. So orphans need help. We need to grow and to be proud and happy people. Let me stop here. Thank you very much. Merci beaucoup.

Kevina

Source: Cohen, 2000

Box 3: Care responsibilities that girls assume are harder without modern energy services⁶

Each day I fetch water. I put the barrel of water on my head. I also fetch firewood; and I have to lift my aunt. I give my aunt baths, and after school I also work in the houses of the neighbours or on their plots and they pay me whatever they can. Besides, the physical work, I cook for the family – that is when we have food to cook. A twelve year old girl and care giver from Mozambique

Source: Ayisi, 2005

HIV/AIDS reduces available possibilities and advantage of sharing household tasks as key labour contributors become care givers or victims themselves. As households loose key members of the family⁷, and households, primarily women and girls experience increased workloads, not only in caring for the sick, but also in assuming tasks previously undertaken by ill or dead family members. Women can become more burdened by fuelwood collection, water fetching and household tasks as well as taking care of new family members, comprising orphans of dead neighbours and relatives as Hammarskjöld, 2003 points out:

“Due to the necessity of providing care, the amount of time that other members of the family can spend on farming and other activities decreases. To compensate for this, the workload of the healthy members of the family increases, particularly that of women

⁵ Edited

⁶ Edited

⁷ HIV/AIDS has had the largest impact of women and men of the reproductive and productive age groups between 14/20 and 40

and girls. Child labour increases when children (primarily girls) are taken out of school to nurse the sick, help with the farming and do the household work". In rural areas where there is no electricity, household work would include fuelwood collection and water collection.

In rural areas where there is no electricity, household work, including fuelwood collection and fetching water are an extra burden. The care-giving of patients adds to the reproductive work burdens, particularly fuelwood collection for keeping indoors warm and for the frequent cooking of a variety of foods and food warming/reheating required for patients, boiling water for drinking and sterilisation, heating bathwater and there is increased need for water for hygiene purposes which would then increase water fetching needs. Clean water and fuel for boiling water are particularly important in reducing cross-infections and opportunistic infections through hygienic practices such as washing hands, genital hygiene⁸, washing and sanitizing beddings and surroundings, taking baths (vital for preventing fungal infections) and killing pathogens by boiling drinking water adequately. Care burdens are well articulated by women consulting with UNIFEM on the burdens of women and households:

Box 4:

Noeleen Heyzer, executive director of UNIFEM, listened to participants describing an "endemic levels of exhaustion, grief and depression" amongst care-givers, Ms Heyzer recalls.

They told of women who are expected to cook and clean for their families, wash soiled laundry, bathe and feed the sick, take ill family members to hospital, wait in queues to get medicine for those who are too weak to do it on their own, collect firewood and traditional herbs, and, on top of this, are still expected to tend to children, farm the land, bring in money, and participate in community activities.

A unanimous plea was for more assistance from men. "The potential of men to heal and care for their family members is yet untapped. Women need their help. Domestic work can no longer be only women's work. We need men to help clean, cook and care. The load is too heavy not to share," said Sisonke Msimang, regional coordinator of the Youth Against AIDS Network.

Source: Sahims.net

In addition, fuelwood scarcity and water collection responsibilities make the care-giving burden more pronounced and can subject caregivers, who are predominantly women, to difficult choices between fetching firewood from distant places and care-giving. Caregivers may reduce care-giving time and attend to fuelwood collection demands or take care of the patient and use strategies such as reducing number meals cooked or forego water boiling to save on fuel usage and its related labour demands. Either way, the "energy-health costs" are quite high. The same opportunity costs have to be considered when deciding for example, whether to spend more time collecting water from a distant water source or staying home to take care of a sick person. Where energy scarcity or time constraints can negatively affect crucial tasks such as boil drinking water and further increase vulnerability of HIV positive persons to opportunistic infections such as diarrhoeal diseases, fungal infections (internal and external) and other diseases, energy efficient biomass technologies can play a marginal role in reducing fuelwood scarcity and its inherent burden on care-givers as

⁸ WLWHA are particularly susceptible to urino-genital infections such as candida

expressed by women participants in a focus group discussion to assess their experiences during a pilot field tests on an ethanol stove in Malawi (Box 5)

Box 5: Energy efficient cooking technologies can reduce patient care burdens

Not all of us may be able to afford this for our homes. But some of us are part of the community's home based care group. For the home based care group, we will want to buy it because it is fast and portable. We can carry it to homes with PLWHA, ask them what they need whilst we are boiling bath water, cook and quickly move to the next house. At the moment, we ask what the patients want to eat then come back to cook. Even when we have a patient at the hospital, we can quickly cook cleanly and avoid the smoky shelter where women cook in. It makes us cough and we end up two patients instead of one. When this stove comes on the market, we must be the first to know because AIDS takes up all your times as a woman. There is no end to cooking and boiling water for bathing and hot compresses.

Robinson, 2005

Additionally, households take in AIDS orphans, and this results in increased demands for fuelwood, increased cooking (for a larger family) and increased demand on women's time (child or orphan care) from the new family members.

4.3 Modern energy services can enable respite and self care for women living with HIV/AIDS by reducing the need to collect water, fuelwood and undertake arduous tasks

Persons with immune systems that have been compromised by HIV and other diseases need appropriate care and rest to optimize health. Poverty and gender norms often require HIV/AIDS infected and sick women⁹, to continue undertaking arduous household work such as walking long distances to collect firewood and water, manual food processing and continued management of the home¹⁰, thereby missing out on rest which is vital for PLWHA, as fatigue and body pains are among the syndromes¹¹ of HIV/AIDS. Strenuous work for PLWHA can further stress the immune system and accelerate the onset of opportunistic infection. An important point is that studies on PLWHAs and work have largely concentrated on the formal economy (defending rights of PLWHA in the work place) and so the impacts and constraints of PLWHAs working in and around the household and informal sector, which comprises the majority of poor women (and poor men and children) are not well documented and are largely based on anecdotal evidence. In particular, studies on gender, energy related arduous tasks such as fuel collection, processing, use (and exposure) or water collection, (use and treatment by boiling) and exposure to water borne vectors and HIV/AIDS are not available.

However, providing clean and within reach water using energy technologies such solar pumps, wind pumps, diesel gensets can be especially helpful in reducing the drudgery of water collection for women living with HIV/AIDS whilst helping them provide clean drinking water for themselves and their families. Similarly, provision of

⁹ HIV/AIDS infected means they have the various but are not necessarily ill from it

¹⁰ Work is permissible for infected persons but this should not be overly stressful as this can further compromise their immunity

¹¹ Syndromes are a group of symptoms and signs characterizing abnormality or disease. In this case they refer to the various symptoms experienced by PLWHA

gas, electricity can help reduce fuelwood collection burdens whilst energy technologies such as grain mills can reduce the need to undertake arduous task such as manual food grinding and processing, particularly for poor rural women.

4.4 Improved energy services can reduce exposure of women living with HIV/AIDS to disease vectors and triggers, thereby delaying the onset and acceleration of opportunistic infections

For PLWHA, exposure to diseases vectors or triggers that can normally be fought off by the immune system can trigger serious illnesses due to weakened immune systems. More than men, poor rural women are more directly exposed to environmental hazards such as water-borne diseases, polluted rivers and ponds and indoor smoke because of the nature of the tasks they perform, which are in accordance to gendered norms (Panjwani, 2005). Modern energy services can however reduce the exposure to disease vectors and triggers and play a vital role in delaying the onset and acceleration of opportunistic infections.

In terms of reducing disease triggers, a health living environments is crucial. Research has shown that use of traditional biomass has a casual relationship with a range of Acute Respiratory Infections (ARIs). It must be noted that this research has concentrated on healthy women. Since women LWHA are especially susceptible to infection, it seems reasonable to extrapolate that IAP would be detrimental to the health of women LWHA. The weakening of lungs from biomass smoke may also make persons with inactive TB to progress to active TB. Mishra (1999) found statistically significant increased prevalence of TB among biomass users (woodfuels and dung) than those who use cleaner fuels. Even after controlling for 10 confounding factors, TB among biomass users was found to be 2.6 more prevalent than among cleaner fuels users. TB was also 2.7 times more common among women biomass users compared to cleaner fuels users and 2.4 times for common among men from biomass using households compared to those in cleaner fuels household. Mishra et al (1999) conclude that about 51% of active TB is attributable to biomass usage. Since tuberculosis remains the most common opportunistic infection and cause of death among PLWHA (WHO, 2001 cited in Rowe et al, 2005), accounting about a third of the estimated AIDS-related deaths (WRI, 1998; Anderson and Maher, 2001), reducing women's exposure to polluting biomass fuels by substituting traditional fuel usage with cleaner fuels such as gas or ethanol based fuels, efficient biomass stoves and others may reduce adverse impacts of IAP on women living with HIV/AIDS since they are the primary cooks in almost all developing nations. Studies have also shown casual linkages between coal burning emissions and lung cancer. IAP which disproportionately affects women in their roles as primary cooks can then play a role in accelerating the onset of opportunistic infections as well as non-AIDS defining cancers. Reducing exposure to biomass smoke through provision of cleaner energy can also help combat TB and other respiratory diseases in persons who are HIV positive, particularly women.

4.5 Electrified clinics can provide better and safer health services

Clinics that have electricity can more easily provide emergency services and undertake certain functions such as safe surgical procedures and sterilisation of equipment more efficiently than clinics that do not have electricity. Currently, there are emerging studies that indicate iatrogenic transmissions of HIV/AIDS, particularly

among women (Gisselquist et al, 2002). Some other studies also suggest that health care for pregnant women may be a risk factor for HIV. In Congo, among 1,770 women at an antenatal clinic in 1987-88, 17 of 282 with a history of induced abortions were HIV-positive. A crude population attributable fraction of HIV associated with induced abortions was estimated at 10%; complications from abortions were a common cause of hospitalization (Gisselquist, 2002?). According to Gisselquist et al, 2002, at least 15 large studies of risk factors for HIV prevalence or incidence in a general population sample in Africa have reported sufficient data to calculate crude PAFs associated with one or more vs. no injections over some period ranging from 4 months to lifetime. In addition, they found high rates of unexplained HIV infection in African women during the period surrounding childbirth. Some studies estimated that as many as 40% of HIV infections in African adults were linked to injections. Although disposable syringes are widely available in certain parts, in remote areas they are often in short supply and medical professionals often have to resort to sterilisation and reuse. This is also true for other reusable equipment such as scalpels. Without electricity, sterilisation is poor. Women are especially victims of iatrogenic infections during child birth and when accessing reproductive health care such as family planning injections (intravenous contraceptives).

4.6 Infection risk associated with fuelwood collection

In order to meet fuelwood needs for their families, women leave the safety of homes and communities and travel to isolated areas such as forests which exposes them to criminal elements. Incidences of rape have been reported in various areas and situations. In forest reserves demarcated for conservation, women have even been known to be sexually assaulted by forest wardens for trespassing government land yet many forest conservation programs have failed to provide alternatives for household energy needs, forcing women to take fuelwood illegally in spite of the sexual assault and HIV/AIDS. In Kenya, women reported violent, often gang rapes by British soldiers on training over a period of 35 years (Day and Leigh, 2003). In some cases the women were attacked and gang raped by a number of British soldiers, whilst the women their way to collect firewood or water (Day and Leigh, 2003; Amnesty International, 2003; BBC, 2005). In Darfur, several individuals and organizations involved in humanitarian work and journalists have reported incidences of rape when women go to fetch fuelwood (UNFPA, 2004; Refugees International, 2004; Peacewomen, 2004; MSF, 2005).

Box 6: Dying to survive – Collecting firewood in Darfur exposes women to violent rape everyday

More than two years after the genocide in Darfur began, the women of Kalma Camp-- a teeming squatter's camp of 110,000 people driven from their burned villages--still face the risk of gang rape every single day as they go out looking for firewood. Nemat, a 21-year-old, told me that she left the camp with three friends to get firewood to cook with. In the early afternoon a group of men in uniforms caught and gang-raped her.

Source: Kristof, 2005

Between October 2004 and the first half of February 2005, doctors from Doctors Without Borders/Médecins Sans Frontières (MSF) treated almost 500 rape victims in numerous locations in South and West Darfur;

Families, in order to sustain themselves, have to continue collecting wood, fetching water or working their fields. In

doing so, women have to make a terrible choice, putting themselves or their children at risk of rape, beatings or death as soon as they are outside the camps, towns or villages.

- MSF, 2005

Incidences of rape during fuelwood collection have been reported by the Wickramasinghe, 2003, Haile, 1985 cited in Haile 1991, AI, 2003 and Abebe, 2004. Incidences of rape during fuel collection trips however remain “cursorily” reported and have not been dealt with in energy research and hence the extent of the problems remains undefined. Moreover, since sexual violation is a taboo subject in most cultures, the reporting is likely to be far less than the incidences. Meanwhile, there have been no new efforts to quantify the extent of HIV/AIDS transmissions resulting from sexual violence.

4.7 Forest resources can be threatened by higher fuel needs to deal with the consequences of HIV/AIDS, exacerbating gender based poverty burdens through fuelwood scarcity and its related issues

HIV/AIDS threatens livelihoods and interacts with the biomass system in ways that can exacerbate gender inequalities. Increases in death rates increase the need for new gravesites. In developing countries, notably in Africa, gravesites are created from forests by land clearing and demarcating forests for gravesites. Once designated as gravesites, fuelwood collection in these areas ceases as it culturally inappropriate. Also in areas such as southern Africa, funeral rites take place over a number of days and as people often sleep outside, a fire is kept burning throughout the night (Mika, 2003, Matinga, 2004). According to Mika (2001), in Malawi and Zimbabwe, mourning lasts 2 to 3 days and a lot of wood logs are used to provide warmth and cooking fuel for the mourners.

Additionally, AIDS impoverishes households (either through death of key income earners or diversions of resources to care and funerals) and natural resources are exploited to compensate for loss and increased income demands. In some areas, charcoal production has become the income generating activity of choice since it is not capital intensive. One chief in Nsanje district in Malawi explains that to come with impacts of AIDS/HIV and food security, some families in the district have resorted to making charcoal or collect firewood for sale (IRIN, 2005). Charcoal production itself is highly inefficient in Malawi, with 7 tons of wood being burnt to produce 1 ton of charcoal.

Box 7: Increasingly, selling firewood is a way of coping with economic impacts of HIV/AIDS

A few metres from Maria's home, two young girls, aged 10 and 11, and their 18-year-old brother have been forced to fend for themselves. Zion, the youngest, and her sister, Marianna, have relied on whatever income their brother, Masauko, is able to earn from selling firewood and thatching for homes. Although the family has a field for cropping, Masauko admitted that he knew very little about farming. "My best hope is to collect wood [for sale]," he said.

- Masauko, 18 year old Malawian boy who has become household head following the death of his parents

Source: IRIN, 2005

Thus as deaths become more common due to high HIV/AIDS prevalence rates,

deforestation is likely to be more pronounced (i.e new source of deforestation) as Maumbeta points out,

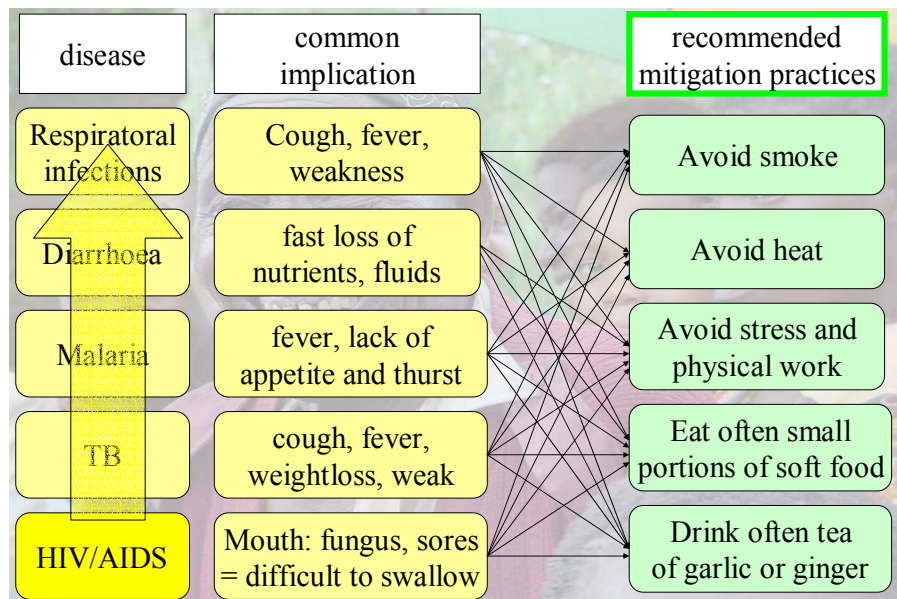
“while poverty, lack of alternative energy sources, high tariffs for electricity and importing electrical cooking appliances, and other factors are the major driving causes of deforestation, the effects of HIV/AIDS are escalating the problem. Families which are affected by the pandemic will look for quick means of generating income and charcoal production from indigenous trees offer that alternative. There is also increased utilization of charcoal, firewood as a result of frequent fevers and increased funeral occasions, an observation that requires more field research”.

A related issue that in terms of deforestation is the need for wood for coffins (Matinga, 2004, Hammarskjöld, 2003). According to Mauambeta, in Malawi, coffins are now made in advance to meet demand and Village Elders stockpile logs and planks in anticipation of a funeral. This observation was made in over twenty four villages in Blantyre and in some villages in Mchinji District (Mauambeta et al 2003). In Kenya, the African Biodiversity Collaborative Group (ABCG) report that there has been an increase in unsustainable timber consumption for coffins such as in Kisumu, Kenya, which is seriously affecting the Kakamega Forest, and reduced wood supply for timber and firewood in trans-boundary sites in South Africa and Mozambique (ABCG, 2002). This suggests increased competition in tree usage “to service the AIDS pandemic” which can aggravate fuelwood scarcity, which can increase women’s fuel collection burden as they may have to travel further in search of firewood.

In recognition of the inter-linkages between HIV/AIDS and the biomass system, GTZ’s Program for Biomass Energy Conservation (ProBEC) in Malawi has implemented a fuel saving program that uses an integrated framework to help alleviate impacts of HIV/AIDS on households and women in particular. In their mainstreaming approach, they identify HIV/AIDS, TB, Malaria, Diarrhea and respiratory infections as major health issues in Malawi (and the Southern African region). They then complications related to these diseases and recommended practices as they relate to energy (Figure 4). Using this framework, ProBEC Malawi has developed an energy intervention program that includes dissemination of locally made improved cookstove to reduce IAP and cooking times, and Hot Bags (fireless cookers) for keeping food warm for patients. The hot bags, which in the program area are locally available weaved baskets insulated with banana leaves can vary in size, allowing women in home based care groups to carry them around during patient visits if such a need arises. In addition, trainings on production and use of these energy technology, food security and nutrition for PLWHA are discussed. Men are also encouraged to participate but the majority of participants are women. So far, the program is showing promising results and the National Association for Persons Living with HIV/AIDS in Malawi (NAPHAM) has consulted the project Managers on possibilities for expanding the program to other areas. Apart from reducing health issues, the energy technologies, especially the “hot bags” are considered vital for facilitating the involvement of women in meetings of PLWHA. In the past, women have been constrained by among other things, the need to organize food for the group or cook at home. With the “hot bags” foods such as rice or beans can be par boiled

and left to continue cooking with minimal heat loss whilst the women attend meeting. Additionally, the food is still hot (and safe to eat) during the break.

Figure 4: Sectoral mainstreaming on health and fuel: A ProBEC Approach in Malawi



Source: Messinger, 2005

4.8 Other diseases

With regards to other diseases, poor water sources remain significant transmission media for water-borne diseases in many poor countries. Provision of clean and readily available water (through solar pumps for example) and the boiling of drinking water are elements that are critical to combating most of these water borne diseases. Improved and affordable energy services can therefore play a vital role in combating water borne diseases such as diarrhoea which is among the top five deadly diseases in developing countries.

In terms of other sanitation related diseases, waste disposal and management is essential to eliminating breeding grounds for mosquitoes. However, in both poor urban areas and rural areas of developing countries, waste management services are virtually non-existent. Biogas in rural areas and landfill gas, can greatly improve disposal of organic waste whilst providing clean energy (as well as organic fertiliser). This can help reduce the incidences of diseases transmitted through poor disposal of faecal material and reduce unsanitary conditions that create breeding grounds for mosquito.

5. Conclusion

We found no studies that have been conducted to assess linkages between gender and energy HIV/AIDS and malaria. Energy can play a critical role in enabling health behaviours by making available thermal fuels for recommended protective behaviours such as boiling drinking water, washing hands, fruits and vegetables and refrigerating meat. We however did not find any studies exploring these linkages. It must also be noted that availability of affordable thermal fuels themselves will not automatically

trigger conformity to health behaviours as experience has shown in other health sectors. A simplistic connection that making available fuels will enable health behaviours can therefore not be made without further research. Experiences shows that women are burdened by reproductive roles and care of PLWHA can divert labour. This can burden other females in the household with work that was previously shared. HIV/AIDS care itself adds to the work burden. Although no studies are available on the gender energy linkages, various discussions on the burden of care cite cooking, fuelwood collection and water collection as burdens. Thus it seems that energy saving technologies can play an alleviatory role in the care of sick persons. There is evidence that certain energy technologies, such as the Multifunctional Platform, Hot bags and cookstoves contribute to time savings. Assuming that time saved will be reallocated efficiently within the context of HIV/AIDS, energy technologies can reduce care burdens and also help increase possible respite time for PLWHA. ProBEC's experiences in Malawi are especially worth assessing to learn lessons from it. Time savings would also be important for alleviating the labour impacts of HIV/AIDS on young women and men and ageing grandparents who have become foster parents. Only one study has made linkages between biomass use and TB and has found significant correlations, identifying use of solid biomass as a risk factor in development of TB among women. There is however evidence on linkages between acute respiratory infections and biomass use in women as well as linkages between coal usage and cancer in women. These are likely to interact with HIV/AIDS, exacerbating the progression of opportunistic infections. There is evidence that lack of electricity in clinics can prevent proper sterilisation of equipment. This evidence is however scanty. Furthermore, there is no supporting evidence on the contribution this makes to HIV infection rates. Only one study finds that injections may be responsible for 5% of HIV/AIDS infections whilst another estimates this may be as large as 40%. It can however be argued that this is an issue of access to single use disposable syringes. In any case, even inability to sterilise re-usable equipment such as forceps and others still present a risk that can not be ignored as being "statistically insignificant" because the infection of one mother at child birth who can end up infecting her husband and possibly newborn can have domino effect on the household and community. There is evidence that the search of biomass resources can expose women to rape, a risk factor in HIV/AIDS infection. This is especially true in conflict areas but is also true in non-conflict areas. Whilst providing energy in the home or in camps is not a key solution, it can be part of an integrated solution to reduce exposure to unsafe environments. Whilst it may be argued that this is enslaving women by binding them inside the "home", it may be a valid short-term part of addressing women's safety in conflict areas. There is also emerging evidence that as people die from HIV/AIDS related diseases, there is an increase in pressure on natural resources from income generation, funeral rites, need for new gravesites and need for coffins. There is however an inadequate number of studies to estimate the level of significance.

Whilst energy poverty itself has no causative and correlative relationship with HIV/AIDS, gender norms prevailing in developing countries and lack of access to modern energy services interact with disease, imposing heavy burdens on various women groups. These interactions are bidirectional, lack of energy services exacerbating the work, health and psycho-social burdens of women and HIV/AIDS adding to the work burdens of women.

6. Recommendations

In view of the findings of the study, we make the following recommendations;

1. There is need to conduct research on the various linkages between gender, energy and HIV/AIDS and TB. In particular, the following areas are of interest and need to be investigated:
 - Availability of affordable energy services (or lack there of) and health protecting behaviours for PLWHA and caregivers
 - Impacts of energy technologies on respite. Self care and care of PLWHA and persons affected by HIV/AIDS, notably, caregivers, adolescent orphans, child household heads and grandparents
 - Health impacts of fuels on PLWHA
 - Assess and quantify the risk factors associated with lack of energy in hospitals and iatrogenic infections related to inability to sterilise equipment
 - Assess impacts of HIV/AIDS on natural resources and women's resource care and use functions
2. There is need for collaboration between gender experts, energy professionals and the health sector in knowledge generation, policy formulation and joint action
3. Advocacy on the need to provide energy solutions to complement other solutions in increasing safety of women in refugee camps and other risk situations
4. Energy program should be designed to help contribute to the alleviation of the adverse impacts of HIV/AIDS and TB, particularly to reduce work burdens of women and provide cleaner indoor environments for PLWHA. The lack of a large number of studies should not be reason for inaction. Knowledge generation can be done in parallel with action from emerging evidence.

Table 2: Some linkages between energy and HIV/AIDS, malaria and TB

Stage in fuel cycle	Aspect	Potential health risks
Acquisition	Collection of fuelwood	<ul style="list-style-type: none"> ▪ Risk of rape in during fuelwood and water collection, especially in conflict areas ▪ Risk of exhaustion which can further suppress the immune system of PLWHA ▪ Time burden for care givers, most of whom are women, young girls and the elderly
	Effects of scarcity	<ul style="list-style-type: none"> ▪ Risk of exposure to rape as women walk further to isolated areas, hence risk of infection ▪ Increased labour burdens for PLWHA, caregivers and foster parents including child household heads and the elderly ▪ Reductions in food cooked and water boiling as well as skimping on health behaviours as a coping strategy. Risk of opportunistic infections and cross infections
Processing and Preparation	Preparing dung cakes – for combustion including preparations for biogas plants and dung cakes	<ul style="list-style-type: none"> ▪ Faecal/oral/enteric infections, skin infections and fatigue can trigger opportunistic ▪ Fatigue and back injuries (water and dung collection)
	Charcoal production	<ul style="list-style-type: none"> ▪ Smoke inhalation can trigger infections or weaken lungs
	Wood splitting	<ul style="list-style-type: none"> ▪ Fatigue and back injuries
	Firewood/charcoal smoke exposure	<ul style="list-style-type: none"> ▪ IAP can trigger a range of respiratory infections including TB, Upper respiratory, inflammation, ARIs, Chronic Obstructive Pulmonary Disease (COPD), Lung and nasal cancer, which are particularly detrimental to the health of PLWHA
Usage	Ergonomic effect of crouching over stove	<ul style="list-style-type: none"> ▪ Fatigue and backache

Source: Adapted from frameworks by Batliwala and Reddy (2003), Wickramasinghe, 2003, Matinga (Experience and observation)

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