

**HIV/AIDS MEDICAL ADHERENCE IN  
BEIRA, MOZAMBIQUE**

by

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A fundamental worldwide public health concern is the growth of HIV incidence rates and the fact that two thirds of this global pandemic is located in sub-Saharan Africa. A concerted effort to control the disease's prevalence within integrated comprehensive care frameworks for underserved populations remains a critical international priority. Integration of services to halt the spread of HIV is of significant international public health relevance and will require greater collaboration at local, national, and international policy levels. Comprehensive care is a simple concept that is profoundly complex to implement in countries that have previously established vertical tuberculosis treatment regimes and sexual and reproductive health programs. In resource poor countries such as Mozambique, there is a great deal more research and learning necessary to assure the efficacious delivery of anti-retroviral therapy as part of improved medical adherence follow-up programs. Evidence from the literature revealed that many HIV-infected persons are not responding to medication regimens due to a lack of medication adherence that includes "loss-to-follow-up" cases and a lack of access to health care services. For this applied research project, a pilot program was designed for the University of Pittsburgh, School of Medicine's Treatment and Care Initiative in Beira, Mozambique. This program's goal is to increase adherence to HIV treatment regimens within a comprehensive care model that recognizes the impact of social determinants of health. The proposed intervention has five intended outcomes: first, to develop a five-year plan with stakeholder input; second, to improve clinician, medical

student and patient communication regarding the barriers and solutions to HIV medical adherence; third, to develop a baseline for “loss to follow-up” cases through a health care worker outreach effort; fourth, to integrate medication treatment regimens for co-infected HIV/TB patients with Central Hospital of Beira; and fifth, to conduct an outcome evaluation assessing project impact on HIV/AIDS medical adherence. Mozambican cultural factors that may influence medical adherence behavior also were examined.

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## **PREFACE**

I dedicate this degree to my dear goddaughter, Susan R. Cossa, and her dream “to do something big in the world,” and to my beloved life-partner, Robert W. Kubacki. And a special thank you to Dr. Martha Terry for showing me how to make the most of this intellectual journey.

## 1.0 INTRODUCTION

In Mozambique, multiple social determinants of risk complicate the likelihood of medical adherence to human immune-deficiency virus (HIV) follow-up clinical treatment protocols. Daily, the majority of Mozambicans are impacted by entrenched poverty, significant levels of public stigma toward those with HIV, and limited availability and access to adequately equipped facilities with competently delivered health services. Cultural characteristics such as polygamy and indirect communication styles exacerbate efforts to stem HIV proliferation. High levels of illiteracy magnify the challenges individual Mozambicans encounter because of limited and varying levels of comprehension regarding treatment protocols. In addition, complicated stakeholder relations at provincial and national levels influence effective comprehensive health care service delivery (Johnston, 2008). Independently and collectively, these factors disrupt efforts to alleviate the devastating HIV infection rate and present barriers to increasing medical adherence to HIV treatment regimes. This paper centers on how to better understand inhibitors and facilitators to HIV medical adherence. It also presents a pilot project to overcome adherence impediments, thereby contributing to the reduction of HIV mortality rates as part of the University of Pittsburgh's Treatment and Care Initiative in Beira, Mozambique. Concurrently, this paper addresses the need for coordinated HIV care with tuberculosis treatment and sexual and reproductive health care programs.

The United Nations *Millennium Development Goal* (MDG) to combat HIV/AIDS, malaria and other diseases is the reference point for this paper. Targets within this goal include access to antiretroviral drugs for all those with advanced HIV infection by 2010, halting the spread of HIV/AIDS by 2015, and achieving universal access to treatment. According to the World Health Organization (WHO) and Joint United Nations Programme on HIV/AIDS (UNAIDS) Profile Statistics for Mozambique, the adult mortality rate estimate for people between the ages of 15 and 60 years is 627/549 per 1000 (m/f respectively). A significant reason for these premature deaths is opportunistic infections, often tuberculosis, that attack the compromised immune systems of HIV-infected persons. Of a total country population of 21,397,000 in Mozambique, an estimated 1,700,000 adults and children live with HIV and estimates suggest that antiretroviral therapy is reaching only about 94,000 of those who need it (WHO, UNAIDS, UNICEF, 2007) .

Assessing barriers to the challenge of HIV medical adherence in Mozambique must be viewed through a social determinants health lens as articulated by the WHO (2008) in order to make progress on this particular MDG:

Traditionally, society has looked to the health sector to deal with its concerns about health and disease. Certainly misdistribution of health care—not delivering care to those who most need it—is one of the social determinants of health. But the high burdens of illnesses responsible for the appalling premature loss of life arise in large part because of the conditions in which people are born, grow, live, work and age. In their turn, poor and unequal living conditions are the consequence of poor social policies and programs, unfair economic arrangements, and bad politics. Action on the social determinants of health must involve the whole of government, civil social and local communities, business, and international agencies (p. 1).

Supported by the WHO 2008 Commission on Social Determinants of Health, the social determinant perspective emphasizes the impact of structural determinants and the conditions of

daily life as central causes of health inequities between and within countries. This newly constructed intellectual approach to international development in less-developed countries provides the basis for this research paper and proposed pilot project.

The targeted population for this research project is the general Mozambican population living in the city of Beira and its surrounding neighborhoods within Sofala Province. Located on the coast in the center of the country, Beira is the second largest Mozambican city and is a main thoroughfare by both train and road to Zimbabwe, Zambia and Malawi. Sofala Province is one of Mozambique's ten provinces and has been identified with HIV incidence rates that approach 40% of the population.

In 2003, the leadership within the Division of Infectious Diseases at the University of Pittsburgh's School of Medicine (UPITT) in Pittsburgh, Pennsylvania, engaged in a treatment and care initiative in Beira, Mozambique. This initiative resulted from an unusual partnership opportunity that presented itself through a Mozambican medical colleague, Dr. Aurelio Gomes, who now works at the UPITT School of Medicine and holds a secondary faculty appointment at the Universidade Catolica de Mocambique (UCM). UCM is the largest Mozambican privately supported non-profit university in the city of Beira. A significant source of its funding comes from tuition and the Catholic Church in Italy.

A medical school established within UCM in 2000 has become UPITT's primary HIV international program site to achieve two project objectives: first, to train health care providers in HIV care and antiretroviral treatment (ART) management, and, second, to establish a modern health care facility to provide comprehensive care to indigent Mozambican patients. Supported by the United States Government (USG) President's Emergency Program for AIDS Relief (PEPFAR) and the Mozambican Ministry of Health (MOH), the site will serve primarily as a

clinical training site for MOH health care workers of Sofala Province and UCM medical students. Through a recently funded National Institutes of Health (NIH) Fogarty Grant to the University of Pittsburgh, known as the AIDS International Training and Research Program (AITRP), UPITT will work closely with UCM medical students, graduates and faculty to develop AIDS research capacity at UCM.

In 2007, the first class of medical students successfully completed the six-year medical school curriculum and graduated. And on June 12, 2009, the new and fully equipped health care center's (Center) doors were opened to patients. This Center is the result of a building renovation funded by the USG through the Centers for Disease Control and Prevention's (CDC) Mozambique Division as part of the PEPFAR program. Bordering the new Center, located on the UCM Medical School campus, are extremely poor and over-populated urban neighborhoods. The only major public hospital, the Central Hospital of Beira, is located ten minutes away from the Center by car. As with most projects in economically distressed countries, this project faces funding hurdles and has yet to secure funding for an HIV medical adherence component for the Center's treatment and care services.

The research effort for the applied project proposed in this thesis encompassed the following components: a literature review on HIV medical adherence in sub-Saharan Africa with attention given to articles addressing the impact of culture on adherence; participant observation in the UCM Medical School clinic site in Beira; a series of fourteen open-ended qualitative interviews with Mozambican medical students and HIV medical clinicians in the United States and in Beira. The result of this research was the design of a proposed intervention to increase HIV medical adherence utilizing the logic model method.

The next chapter provides background on HIV medical adherence in sub-Saharan Africa along with the rationale for coordinating HIV, tuberculosis and sexual and reproductive health care programs. Methods are described in Chapter Three, while Chapter Four presents the research results. Building upon this foundation, Chapter Five utilizes a logic model to present a pilot project design centered on how to increase the HIV medical adherence of patients who receive initial treatment and care at the Center. This section is presented in place of what is often titled the 'Discussion' section in a thesis. The conclusion, Chapter 6, summarizes certain limitations encountered in this work and also points to directions for future research and program development.

## 2.0 BACKGROUND

Mozambique is frequently described as a nation of humble and determined people who have not been recipients of life's largesse. The burdens of a colonized history, a sixteen-year war from 1976 to 1992, and natural disasters have undermined Mozambique's social and economic infrastructures. The devastating rate of HIV prevalence, estimated at 12.5% nationally, has magnified the already present development challenges (UNAIDS, 2008). As presented in Figure 1, HIV prevalence rates in the bordering countries of Tanzania, Malawi, Zambia, Zimbabwe and South Africa, are equally significant:

**Table 1: Country HIV Prevalence Data. Source: UNAIDS, 2008.**

Country	Population	People Living with HIV (Adults and Children)
Mozambique	21,397,000	1,700,000
Malawi	13,925,000	1,000,000
Tanzania	40,454,000	1,500,000
Zambia	11,922,000	1,200,000
Zimbabwe	13,349,000	1,400,000
South Africa	48,577,000	6,600,000

To better understand the current Mozambican environment, the following epidemiological assessment provides a review of essential HIV facts, defines HIV medical



adherence, and presents available health data about Mozambique. Data presented about Sofala Province, where the city of Beira and this research project site are located, were drawn from four main sources: WHO, UNAIDS, CDC and the Mozambican MOH.

## 2.1 HIV AND MEDICAL ADHERENCE

A devastatingly low CD4 count (<200 ml) is the primary killer of HIV-infected persons who cannot access or sustain treatment. Less well understood by the public and public health professionals is the fact that not adhering to treatment is the second leading cause of progression from HIV to AIDS and death (Amberbir, 2008). AIDS deaths are due to opportunistic infections that result from immune systems that have been weakened or destroyed by HIV.<sup>1</sup> As both a retrovirus and a lentivirus, HIV is the only virus that has reverse transcripters (where RNA converts to DNA) and is characterized also by a long and variable latent period. In the early stages of the infection, the HIV mainly infects macrophages but in later stages the HIV changes its cell tropism and infects T-lymphocytes. By infecting the key regulators of the immune response, CD4 and T-H cells, HIV destabilizes the whole immune system. The virus destroys the infected individual's CD4 count and becomes part of the DNA so its progression cannot be stopped. As a result, vaccine research has centered on how to halt the replication of the virus.

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<sup>1</sup> The Centers for Disease Control and Prevention's case definition of AIDS is the following, "*A disabling or life-threatening illness caused by HIV, characterized by HIV encephalopathy, HIV wasting syndrome, or certain diseases due to immunodeficiency in a person with laboratory evidence (<200 CD4+ T-lymphocytes/ml) for HIV infections or without certain other causes or immunodeficiency.*"

However, despite significant efforts over the last twenty years, there is no vaccine and none likely in the foreseeable future (Johnston, 2008).

HIV treatment usually means a significant lifestyle adjustment for an individual. Antiretroviral medications are used to control the reproduction of the HIV virus and to slow its progression. In the United States, generally a Highly Active Anti-Retroviral Therapy (HAART) treatment plan is specifically adjusted to each individual patient. HAART is a combination of anti-retroviral drugs that have proven to be more effective than single-drug therapies. Initial decreases in the viral loads of HIV-infected persons are usually temporary so the typical medical recommendation is for a new treatment regimen to be prescribed that combines three or more medications from different medical classification groups. HAART medication side effects can be quite severe and can include liver problems, diabetes, high cholesterol, lactic acidosis, lipodystrophy syndrome, decreased bone density, skin rashes, pancreatitis, nerve problems, and increased bleeding (NIH HIV Treatment, 2008). Over time, HIV medications can increase the levels of fat and glucose in the blood, which increases the risk of heart attack.

Ideally, HIV infected persons should get their viral loads tested every two to four weeks after treatment commences and every four to eight weeks thereafter until the virus is no longer detectable. Even with undetectable viral loads, an HIV-infected person is not cured and can pass the virus to others. In a well-resourced environment persons on a treatment course should have their viral loads tested every three to four months to ensure the anti-HIV medications are working. This monitoring schedule is important to watch for potential drug toxicity or treatment failure. Fever, nausea and fatigue frequently characterize some people's experiences of treatment courses or may signal that something is askew with the medication dosages. With regular and consistent contact between the clinician and the patient, side effect problems can be addressed.

Adverse effects of medication that may imply virologic failure, immunologic failure or clinical progression of the disease will be detected sooner. These issues can be monitored and corrected with drug adjustments. However, if medication or dosage-related problems are not detected, virologic failure, the most common type of failure found in the US, may occur. Virologic failure occurs if the virus is still detectable in a patient's blood 48 weeks after starting treatment (US Department of Health and Human Services, 2008). When the virus is still detectable the drug combination must be adjusted, otherwise, there is a greater likelihood the virus will mutate into a form unresponsive to medication. When this mutation takes place complete immunologic failure often occurs, followed by clinical progression of the disease and death.

Even in the best of circumstances, a person will encounter obstacles or discouraging periods during the administration of an HIV medical treatment regimen. For an HIV-infected person to achieve a level of sustained health, medical adherence means precise execution of a treatment plan. This precision requires taking the correct dose at the correct time on a daily basis exactly as the doctor has prescribed. The lack of availability of various drugs and limited transport systems for Mozambicans to make needed return visits to the Center are an obstacle for a person following a specific drug regimen.

In Beira, the first line of treatment is typically comprised of nevirapine, stavudine and lamivudine. AZT is given as an option for pregnant women. One of these drugs, stavudine, is no longer recommended for use in the United States because of its high toxicity and severe side effects. Second line drug combinations are available but costly and in limited supply (McMahon, 2009; Kiboneka, 2009). The term "loss to follow-up" is used to describe individuals within the treated HIV-infected population who do not return for needed follow-up care and monitoring of their medication regimens. For the typical HIV-infected Mozambican in Beira, the lack of

accessible drug combination options, minimal repeat contacts with the clinician, and low literacy rates contribute to a lack of understanding of the HIV disease and create a wall of impediments difficult to overcome.

## **2.2 MOZAMBIQUE'S EPIDEMIOLOGICAL ENVIRONMENT**

According to WHO data, the top ten causes of death for all ages in Mozambique are HIV/AIDS, malaria, diarrheal disease, lower respiratory infections, prenatal conditions, measles, tuberculosis, cerebrovascular disease, ischemic heart disease, and protein-energy malnutrition. For people living with HIV, tuberculosis (TB) is the dominant cause of death in sub-Saharan Africa. TB prevalence in Mozambique is estimated at 635 per 100,000 with incidence at 460 per 100,000. People living with HIV are 20 to 30 times more likely to develop TB than those who are not living with HIV (WHO, 2009).

Life expectancies for men and women in Mozambique are 36 and 38 years, respectively, due to HIV and TB. This is half of the life expectancy of an average American. Another complicating and often confounding characteristic is health literacy, which is important for the average person to better understand consequences of medications. In contrast to the WHO African region baseline goal of 60% adult literacy levels across sub-Saharan countries, adult literacy in Mozambique is only 46.5% (WHO, 2006). Given this low literacy rate, health literacy cannot be assumed in Mozambique, especially as it relates to HIV and TB drug medication distribution and treatment plan coordination.

In spite of these alarming statistics, there has been progress in Mozambican health indicators over the last few years. The malaria-related mortality rate has declined, tuberculosis

treatment has expanded, and the numbers of people receiving antiretroviral treatment have increased significantly. Economic growth, national political stability and increased access to health care services are all important factors contributing to these modest improvements. Scale-up of antiretroviral therapy (ART) in Mozambique is having the intended impact but has yet to reach intended levels of penetration into the HIV-infected population.

### **2.3 SOFALA PROVINCE**

In Sofala Province, HIV prevalence is estimated at 40%, a stunning statistic given that the population total is estimated at 1.2 million (WHO, 2007). HIV/AIDS dominates the health action agenda because of its mortality impact and associated destruction of families and communities. The relentless progression of the disease has put basic survival at the core of life-functioning capabilities in this region. Youth are a subpopulation at special risk because of the effect on their lives of losing a parent (or parents) to AIDS and because of the limited availability of and access to health care and family planning services. Critical to reversing HIV incidence in any age cohort is an increased understanding about the dynamic interplay among the HIV virus, a person's level of understanding about how the disease is transmitted and her ability to prevent that transmission, and environmental factors that lead to its proliferation.

Another fundamental challenge in Sofala is the need to increase exponentially the numbers of competent health workers, to improve health services availability and access. To improve accessibility to health care services, health care workers must be available to deliver those services, especially in rural areas. Mozambique's MOH has embarked on a national effort to correct regional differences in terms of health care worker capacity, to improve the ratio of

health workers per population, and to improve the placement of health workers. In Sofala, there are an estimated 1200 health care workers for a population of 1.2 million (1:100,000). Within this health care worker capacity total of the Province, there is approximately one doctor for every 38,000 persons, and one nurse for every 4,000 persons. A second and equally important issue is the competency levels of health care workers. Currently, only 50% of non-clinical health care workers have completed even an auxiliary or elementary level of education (MOH National Plan, 2007). To address HIV medical adherence issues from a comprehensive care perspective, availability of competent and sufficiently trained health care workers is critical.

#### **2.4 HIV CO-INFECTION WITH TUBERCULOSIS**

Concurrent with understanding the urgency of improving medication adherence rates, rising rates of untreated or inadequately treated co-infection rates of TB and HIV must be addressed. Sub-Saharan Africa bears the brunt of the HIV-fueled TB epidemic, and TB is a major cause of death among people living with HIV/AIDS. Existing TB control strategies of case-finding and Modified Directly Observed Treatment (MDOT) of sputum smear-positive patients using short-course anti-tuberculosis treatment are proving inadequate in countries like Mozambique that carry a high burden of HIV cases (Lawn, 2005). HIV is the main reason for failure to meet TB control targets as set forth in the United Nations MDG. Increasingly high co-infection incidence rates have been observed in the under-resourced countries of sub-Saharan Africa, further accentuating the urgency to implement coordinated co-infection treatment plans (Bonnet, 2006). In Mozambique, an estimated 30% of new TB cases are co-infected with HIV (WHO, 2008).

## 2.5

## HIV AND SEXUAL REPRODUCTIVE HEALTH CARE

Another major shift has to occur beyond integrating health care treatment and follow-up services to adequately address co-infection of HIV and TB in Beira. A comprehensive approach that considers integrated management of adult health care a priority needs to ensure universal access to sexual reproductive health (SRH) services and HIV prevention, treatment, care and support. This health care programmatic bridge is widely recognized with increasing urgency as equally fundamental to secure a positive result to the MDG to halt HIV transmission not only in Beira, but worldwide.

The majority of HIV infections are sexually transmitted or associated with pregnancy, childbirth or breastfeeding, all of which are fundamental elements of sexual and reproductive health care. In addition, sexual and reproductive health problems share many of the same root causes as HIV/AIDS, such as poverty, gender inequality, stigma and discrimination, and marginalization of vulnerable groups. Despite this, services for sexual and reproductive health and for HIV/AIDS still largely exist as separate, vertical programs (WHO, 2008, p. 1).

In spite of this understanding, there is a lack of coordination internationally, nationally and locally among organizations that would result in the practical steps needed for linking SRH and HIV services. The consequences of not integrating services are severe because an uneducated HIV-infected person will continue to make reproductive choices with or without care and education. Further exacerbating HIV transmission in Mozambique is the cultural practice of having multiple spouses. Polygyny, the practice of one man having several wives at the same time, is commonly practiced in Sofala Province and it is not unusual for a man to have two or three wives. Mozambique is culturally unusual in that further north there are two provinces

where a more matrilineal structure dominates and polygny is not commonly practiced. For this reason, the term 'polygamy' is used more frequently and casually in Mozambican conversations and will be used in this thesis. Polygamy is a broader term referring to the habit of multiple partners whether you are male or female. The practice of polygamy in Sofala Province is an obvious and deadly pathway escalating HIV transmission because of increased number of sexual partners within one family unit. Addressing communication approaches with HIV-infected patients that integrate SRH cultural realities is important.



### 3.0 METHODS

This applied research study and proposed project design utilized four methods: data gathering about Mozambique's epidemiological situation, a literature review with a primary emphasis on HIV medical adherence but inclusive of cultural influences that may impact health behaviors, a field experience with a participant observation element that occurred in March 2009, and fourteen interviews conducted by telephone and in person in the United States and in Beira, Mozambique. The research project was reviewed and approved by University of Pittsburgh Institutional Review Board and the University of Pittsburgh, School of Medicine's Division of Infectious Diseases. Due to the applied nature of this project, external funding was sought from external sources to support its implementation.

There is a growing body of accessible and accurate data about Mozambique that can be drawn from sources such as the WHO, CDC, UNAIDS and the Mozambican MOH. However, gaps in data consistency exist and for this reason nongovernmental organization websites for groups working in central Mozambique were examined to cross-check facts and to read recent field reports.

In the field of public health, a strong literature review is selective, comprehensive, critical and current. A broad examination of sub-Saharan African research literature included an effort to identify relevant and credible research studies conducted specifically in Mozambique. PubMed, MESH, Google Scholar and Google Book Search were the primary databases used in

addition to relevant articles assigned during coursework over the study period of my two master degrees at the University of Pittsburgh, and resources discovered during previous consultant work projects in Mozambique over a twenty-year period. The following criteria were used for the literature search:

- date of study (within last decade 1998-2008);
- social cognitive theory, social support model or epidemiologic study;
- sub-Saharan Africa and/or developing country location and population focus (southern/eastern African regions were given priority); and,
- sample size.

Identifying the most useful search terms involved exploration of numerous synonyms until a final list of terms surfaced as providing the highest quality articles. As shown in Table 2, these synonym searches were organized into a literature review concept chart:

**Table 2: Literature Review Concept Chart**

Concepts:	Clinical Care	HIV AIDS & Tuberculosis	Community-Based	Mozambique
Synonyms:	"Clinical Follow-up" "Continuity of Care" "Adherence" "HIV Medication Adherence" "Follow-up" "Patient Compliance" "Treatment Monitoring" "Aftercare" "Clinical trials" "Patient care"	"Disease control" "Acquired Immunodeficiency syndrome" "Anti-Retroviral Therapy" "Human Immunodeficiency Virus" "Treatment" "Therapeutic Follow-up" "Drug therapy" "Tuberculosis Control"	"Services" "Community Health Services" "Social Support" "Antiretroviral Access Programs" "Sant' Egidio" "Health Alliance International" "Community Care" "women" "pregnant women" "youth" "young adults"	"Developing Country" "sub-Saharan"

Final search terms for the literature review were the following: "Antiretroviral Therapy Adherence OR HIV Medication Adherence" AND Tuberculosis Control AND "Clinical Follow-up OR Continuity of Care" AND sub-Saharan Africa. A separate search including 'Mozambique' as a

search term was conducted; however, the result was not productive. Overall, the literature review resulted in an examination of 24 articles drawn from a pool of 135 articles specifically about HIV medical adherence. Sample sizes ranged from 78 to 3151 study participants, depending on the study. One study was an outlier with a participant pool of only 12 HIV infected persons. However, the data collected appeared pertinent to understanding medical adherence in under-resourced environments in sub-Saharan Africa.

In terms of methodology, there was a lack of research studies available for the 15-24 age cohort in sub-Saharan Africa that described specifically-related experience of HIV medical adherence behaviors. As one expert in HIV/AIDS work informed me during an interview, “During my six years working for the CDC in Mozambique, the treatment focus remained on the ‘general’ population because the health needs are so urgent with regards to getting antiretroviral therapy treatment to as many people as possible. It is not possible to focus only on one segment of population” (Interview C1: March 2009). Some research in sub-Saharan Africa in Cote d’Ivoire, Uganda, and South Africa has begun to separate out pediatric cohorts for treatment and clinical follow-up care. At this point, the breadth of this research for specific cohorts is limited. Nongovernmental organizations, such as Pathfinder International, are working to track evidence about the SRH behaviors of the 15-24 age range. These data do not appear to have manifested themselves yet in scholarly peer-reviewed articles. However, research into the topic of medical adherence in sub-Saharan Africa is on the rise and this is a positive development. Unabated HIV infection rates and complications developing with failing or increasing numbers of multi-drug resistant tuberculosis treatment regimens also are contributing to this increased academic focus.

The following concepts were explored to identify additional literature related to the influence of culture on adherence behaviors: health knowledge, acquired immune-deficiency

syndrome, culture, polygamy and Mozambique. The search resulted in six articles that examined the potential impact of cultural influences on adherence behaviors. These articles were drawn from PubMed and MESH databases. In addition, eight articles from the medical adherence literature review directly addressed cultural influences on HIV medication regimens. Shared history, role definition and communication styles were noted as elements of a working definition of culture that would be relevant to Mozambique.

In addition to the literature review, research in Mozambique was conducted. My trip to Beira in March 2009 resulted from a request by the University of Pittsburgh's School of Medicine to explore how a medical adherence program might be designed and implemented as part of its Center's treatment and care activities in Beira. To better understand the dynamics with UCM as the host medical school site, participant observation was conducted on site at the UCM clinic. A small series of open-ended qualitative interviews with fourth-year medical students were carried out following the participant observation (see APPENDIX A for medical student interview transcripts). Prior to and during the Beira trip, ten interviews were conducted with HIV experts, medical doctors and administrators involved with this specific project or working in central Mozambique on similar types of efforts. A few of these interviews are referenced throughout the thesis and coded anonymously (for example, "Interview: B1"). To protect the confidentiality of the interviewees, the expert interview transcripts were not submitted as part of this thesis.

## **4.0 RESULTS**

A number of studies from the literature review arrived at similar conclusions regarding the critical importance of medical adherence strategies as essential to HIV/AIDS programs. Evidence was presented repeatedly asserting the need to make adherence programs an urgent priority equal in importance to treatment and care services. Articles explaining what factors inhibit or facilitate HIV medical adherence behaviors were the primary focus of the literature review. In addition, attention was given to cultural characteristics observed in research studies that influence adherence behaviors. Many of the cultural influences also were noted in the participant observation and commented upon in the interviews.

### **4.1 HIV MEDICAL ADHERENCE IN SUB-SAHARAN AFRICA**

Within the reviewed literature, environmental influences on behavior that could impact a programmatic intervention were emphasized. The social determinants of daily living were referenced frequently as having negative impacts on HIV treatment plans in developing countries. Many researchers focused on what occurs when a person leaves a health center and begins to make individual daily choices about following a prescribed HIV treatment plan. Abassa (2008), Amberbir (2008), and Steinbrook (2008) present a multitude of reasons for lack of medication adherence such as “ran out of medication,” “felt sick from the medication,” the

lack of quality lab and clinical support and outreach, inconsistent supplies of treatment drugs, poverty, stigma and inadequate health care systems. For many years, the social ecological impact of medical adherence was minimized as a significant force in terms of saving lives. This has now changed as evidenced by the growing body of research taking into account social ecological dynamics.

A social ecological model combined with an understanding of social cognitive theory and social support networks is important to increase medical adherence to protocol treatment regimes in sub-Saharan Africa. Any program intervention focused on medical adherence has to account for the interaction between the individual and the environment at multiple levels. The social ecological model creates a framework where behavior is determined by factors at the intrapersonal, interpersonal, institutional, community and public policy levels. Implicit in this analysis is the understanding that health promotion interventions are based on beliefs and determinants of behaviors. The majority of articles reviewed described multi-level factors as contributing in some way to poor medical adherence. These factors consist of funding to provide sustainable supplies of ART drugs, provision of high quality clinical and lab support and facilities, shortage of skilled health care workers, stigma in communities toward HIV-infected persons, lack of transport to refill medication prescriptions, low levels of health literacy that impact comprehension levels about daily adherence to HIV medication, patient and clinician communication and language issues, denial of HIV status, use of traditional medicines, perceived severity of side effects, long waiting lines at clinics, alcohol use, feeling better, indirect communication styles about SRH within the family and patient concerns about the consequences of being HIV within a polygamous households (Abassa, 2008; Amberbir, 2008; Bonnet, 2006;

Dahab, 2008; Gill, 2005; Harries, 2006; Kiboneka, 2009; Ncama, 2008; Pearson, 2006 & 2007; Rouet, 2006; Sevick, 2007; Sow, 2007; Steinbrook, 2008; Vermund, 2008).

Fundamentally, medical adherence is about individual behavior change. After an HIV diagnosis and if treatment is accessible, a person takes daily medication doses for the rest of her life. HIV medication combinations cause a person to not feel well, so supporting a person's self-efficacy efforts with a social support network is critical. This network can help a person overcome the negative social determinants that present barriers to the establishment of the necessary daily drug dose routine. Social Cognitive Theory and the Social Support Network Model are guides about how to support people who are HIV-infected (or co-infected with TB) in a way that escalates the chance of their sustained recovery (Bandura, 2004; Cohen, 2000). Several studies found that more attention must be given by the global health community, funders, governments, and health care providers to the importance of supporting social support networks. Twenty-four of the reviewed articles implied or directly stated that social support for an individual to sustain healthy HIV medication-taking behavior is critical to a successful clinical HIV follow-up treatment program.

Another reason for prioritizing adherence to HIV drug regimens is due to the increasing numbers of multi-drug resistant (MDR) and extreme drug resistant (XDR) strains of tuberculosis. Stabilizing a CD4 count, minimizing a viral load and prolonging life in the case of HIV/AIDS or curing tuberculosis is possible only with sustained coordinated treatment. Also, preventing MDR and XDR disease strains can be achieved only with consistent and sustained medical adherence behaviors (WHO, 2009). Halting MDR and XDR tuberculosis strains from arising worldwide that result from less than successful treatment regimens associated with co-infected

HIV persons is a growing international concern (Bonnet, 2006; Gil, 2005; Lawn, 2005; MacArthur, 2001; Pearson, 2007).

Social Support Network models are appearing in the literature with increasing frequency to better understand how social structures increase consistent adherence behaviors by individuals. Support integrated into regular clinical follow-up was repeatedly acknowledged and mentioned (Amberbir, 2008; Dahab, 2008; Johnston, 2008; Kiboneka, 2009; Ncama, 2009; Van Oosterhout, 2005). There is evidence that social relationships do help HIV-infected individuals adhere to their medication regimes. Pearson's (2007) study examined whether peer-supervised modified direct observed therapy (MDOT) used in tuberculosis treatment and care programs could be applied to the issue of how to provide support to HIV patients. Her study examined a pilot community-based program that used groups of HIV-infected individuals to provide peer support to newly diagnosed patients. The peer network Pearson describes acknowledges that different levels of social support, beyond family and neighborhood networks, could be established for patients to support increased attentiveness to strenuous HIV and/or TB courses of treatment.

Through his cross-sectional descriptive study of 149 HIV infected adult South Africans in Durban, South Africa, Ncama (2008) emphasizes the importance of a supportive social network for those living with HIV/AIDS. Social support, companionship, social influence, social undermining, and social capital are all factors that can motivate or discourage adherence to daily medication. Functioning within a Social Cognitive Theoretical framework with attention to Social Support Network models enhances the likelihood of a successful treatment experience for a patient. There is a significant amount of evidence-based research to justify the use of these particular approaches. Research in sub-Saharan Africa over the past decade has shown increased



interest in the influence of behavioral factors on drug adherence. Non-adherence to HAART medication treatment plans have been noted in the fieldwork of numerous HIV treatment and care projects in sub-Saharan Africa. These studies increasingly record descriptions of factors such as forgetfulness, lack of understanding of treatment benefits, severity of adverse events and the level of complexity of the drug regimes as reason for non-adherence (Abassa, 2008).

Two interesting program intervention ideas that surfaced during the literature review included one involving special “adherence counseling teams and database managers on motorcycles” described in the Kiboneka study (2009) and an intervention that applied tuberculosis MDOT peer-based support models to HIV medical adherence efforts. In the Kiboneka study, field adherence monitoring teams were responsible for active follow-up of HIV patients as part of a program in Northern Uganda. Using motorcycles, this team visited patients who failed to attend appointments or who were too ill and required home visits. For this project, field workers and clinicians used standardized forms detailing patients’ demographics as well as clinical, psychosocial and drug use data at each visit. These data were then hand-entered into the main clinic database, while preserving patient confidentiality. This study resulted in a significant minimization of ‘loss-to-follow-up’ cases.

The second intervention was designed by Pearson in her 2006 study, and presents the idea that activities creating collaborative mechanisms between TB and HIV/AIDS programs reduce the burden of TB among people living with HIV/AIDS and reduce the burden of HIV among TB patients. Pearson’s work provides an excellent example of how a social network within a specific cultural context and community can advance health outcomes. As Pearson asserts, little is known about the process of designing and implementing MDOT programs for HAART in resource-constrained environments like Mozambique. Her study took place from

2004 to 2006 and was composed of a sample size of 174 randomized Mozambican participants from a pool of 350 patients, including clinic staff at Central Hospital of Beira, MDOT peer support persons and patient participants. She examined components of support systems for TB patients in MDOT treatment networks that could be transferred and used to support HIV patients. Study outcomes emphasized using peers who were well-accepted by health clinic staff, training peers adequately and retaining them, adapting peer visits to requirements of patient participants' work schedules and physical conditions, and reimbursing transport costs. This innovative approach that draws on the success of TB MDOT support systems is necessary to address the challenges of long-term HIV medical adherence. The involvement of Mozambican HIV-infected persons as peers appeared to have a positive behavior influence on newly infected persons in terms of understanding medication regimens.

Integrating services was viewed by the majority of researchers as an absolute priority that must occur in sub-Saharan Africa to halt HIV incidence and to prevent drug resistant strains of TB. HIV and TB testing and diagnosis methods were examined as an important portal for service integration (Bonnet, 2006). Operational gaps were noted repeatedly in HIV and TB treatment and care programs that do not coordinate service delivery. The growing desire of international donors to scale-up funding for ART treatment was mentioned as an opportunity to coordinate services affecting co-infected HIV/TB patients (Harries, 2006). Important programmatic approaches to integrate HIV and TB services were mentioned by more than one third of the studies in the literature review. (Bonnet, 2006; Gill, 2005; Harries, 2006; Kiboneka, 2009; Lawn, 2005; MacArthur, 2001; Pearson, 2006 & 2007; Steinbrook, 2008; Vermund, 2008; Vio, 2006). There was repeated emphasis in all of the studies on how to increase attention on the practical implementation of integration-oriented processes.

## 4.2 CULTURAL INFLUENCES

Culture is generally understood to be a set of norms, values and behaviors utilized by communities for the purpose of establishing acceptable ways of interacting to achieve common goals. Culture is “the way in which a group of people solves problems and reconciles dilemmas” (Tompensaars, 1998, p. 6). Individuals within those groups internalize norms, standards, and values and then manifest them in behaviors. A social ecological model combined with social cognitive theory and social support network theory is presented frequently in the literature as a way to incorporate culture into programs. This is relevant to adherence because health promotion interventions are based on beliefs, understandings and determinants of behaviors based within a context and acceptance that interactions between individuals and their environment occur at multiple levels. Dahab’s work (2006) heavily emphasized described multi-level social factors as contributing in some way to poor medical adherence. Other researchers mentioned the importance of social support networks that engaged familiar cultural factors as the most impactful for positive adherence behaviors (Amberbir, 2008; Dahab, 2008; Gill, 2005; Johnston, 2008; Kiboneka, 2009; Ncama, 2008).

Cultural influences on medical adherence drawn from the literature review include the following: social practices such as polygamy; patterns of sexual behavior between men and women based on gender roles and ages; communication styles about issues of sexuality (and its impact on data gathering); and the importance of familial social support networks. Family life is very important to Mozambicans and a system that supports it is critical.

For example, a study conducted by Mathunjwa (2009) in Swaziland examines traditional cultural factors and practices that increase Swazi women’s vulnerability to HIV/AIDS. HIV prevalence in Swaziland is 42%, which tracks closely to the Beira area HIV prevalence rate.

Recommendations resulting from the study include allocating resources for health, education and social services to address the relative neglect of rural areas, and strengthening policies and programs to achieve the equal participation of women in all aspects of society's decisions. These conclusions are relevant for Beira because of their emphasis on women's participation as critical for improving and sustaining health conditions of a whole community.

In a rural African population of Northern Uganda, Schopper et al. (1993) examine the impact of sexual behaviors that may be related to HIV transmission. This particular study utilized the Global Program on AIDS sponsored WHO KAP (Knowledge, Attitudes and Practices) Survey to gather quantitative information on AIDS related sexual behaviors within a population sample of 1486. This survey examined patterns of sexual behavior, agreement of partner reports and concordance of number of sexual contacts across gender. Although tracking medical adherence was not the purpose of this study, the presence of polygamous relationships was noted as a significant fact of daily life and an influencing factor on HIV transmission.

The Schopper et al. (1993) study assessed the challenges of obtaining "truthful" data about something as private as the nature of a person's sexual behavior. This assessment does bring into question whether the KAP survey method is the most effective tool for examining sexual behaviors. This study revealed discordance between what women reported as the number of co-wives in polygamous situations and what men reported as the number of wives. The importance of study methodology is raised, as is the care necessary to conduct research on cultural influences on human sexuality behavior. Moreover, the study presented data pointing to flaws in using the KAP method. A study recommendation was for increased use of categorical classifications of individuals as a more effective method for tracking individual patterns of sexual behavior. This approach may lead to more consistent results across large survey

populations. Categorical collection of data provides a different way to confirm individual behavior patterns. Lessons can be learned from this study for designing future research studies that examine medical adherence choices within polygamous contexts.

Given the dearth of research specific to Mozambique on culture as it relates to HIV medical adherence, no causal associations can be determined from the evidence presented. The qualitative interviews conducted (many of which were interviews with Mozambicans living in Beira) during this research project shed more light on cultural issues specific to that area than many of the articles reviewed.

### **4.3 FIELDWORK: PARTICIPANT OBSERVATION AND INTERVIEWS**

The results of the fieldwork in Mozambique through participant observation and interviews provided an expanded perspective about the realities of the social and environmental context in Beira, the importance of clinician/patient communications and cultural influences on medical adherence.

The realities of the social and environmental context of Beira are profoundly affected by extreme poverty. The neighborhoods surrounding the Center are characterized by the presence of trash and garbage, a lack of sanitation services, and potable water. Securing regular meals and water on a daily basis is the main priority of most people. The prevalence of malaria-infected mosquitoes in the urban neighborhoods creates prime opportunities for the manifestation of many diseases mentioned in the epidemiologic assessment section of this thesis. As one HIV medical expert interviewee said, “People die here from the conditions of life. It is horrifying.”

From an institutional perspective, there are no funded community care follow-up programs. The big hospitals, like the Central Hospital of Beira, have no outreach programs.

Participant observation was useful in providing a preliminary description of the UCM medical school environment and how communication styles are manifested among foreign/expatriate clinicians, the Mozambican medical students and the Mozambican patients. The quiet, organized clinic environment presented an interesting contrast to the loud, chaotic neighborhood home environments of many patients. Communication styles between the Mozambicans and the expatriate clinicians were courteous and respectful. The Mozambican patients showed great courtesy to the doctors and also toward the Mozambican medical students. The medical students appeared to be functioning on a number of levels that are far beyond the typical role of a medical student. For example, due to the frequent language challenges, the students often take on the role of language interpreter between the clinician and patient (see APPENDIX A for participant observation notes).

Although few in number, the four medical student interviews revealed repeated comments about communication gaps between clinicians and patients. The majority of expatriate clinicians do not speak either Portuguese or the regional languages. Many patients do not speak Portuguese and cannot read. Frequently patients do not understand printed label instructions on their medicine bottles. Medical adherence was mentioned as another significant issue facing patients. Patients not responding to treatment become resistant in both mind and body. Getting healthy was referred to as both a psychological and a body issue (see APPENDIX A for Medical Student Interview Transcripts).

Another set of ten interviews were conducted with HIV experts, medical doctors and administrators some of whom are involved with this specific project or working in central

Mozambique on similar types of efforts. These open-ended qualitative interviews provided important glimpses into Beira's social and environmental context, clinician/patient communication challenges and cultural influences on medical adherence. There were repeated references to the lack of integrated care between infectious diseases and chronic care conditions; the lack of coordinated HIV/TB care; and the severe limitations posed by a lack of health care staffing capacity in the face of overwhelming health care needs. Addressing how to increase access to care especially for those Mozambicans living in rural areas was noted by a number of interviewees as an under-acknowledged barrier to HIV medication adherence. The distance from a health clinic or center to where a person lives presents a huge problem. Time and transport issues are major obstacles to adherence for many HIV-infected people.

Many of those interviewed commented on specific Mozambican cultural characteristics that need to be recognized when developing adherence strategies and programs. For example, overcoming "inherent skepticism" toward expatriate health care support by Mozambican professionals is important to increase the effectiveness of stakeholder collaboration efforts. Two interviewees elaborated on the complex issues of "understanding" in Mozambique. Many Mozambican patients do not have a concept of the meaning of "chronic" disease and how HIV fits into that category.

Understanding the impact of cultural taboos on a patient's choices is important. Medicine faith healers often will tell people to take actions that are in direct contrast to the prescribed modern medicine treatment protocol. In addition, there were repeated comments by interviewees about the patriarchal nature of the culture within which HIV treatment occurs in Mozambique. An example illustrating this issue was described as follows: "The doctor instructs the patient to adhere to a medication plan but the husband may have issues and tells his wife

otherwise. He may tell his wife, “Don’t take the pills. They are white doctors who gave them to you.” Or the husband may have multiple wives and he will no longer deal with the ill wife. This becomes a form of rejection for her (Interview B1). Further exacerbating this gender-based challenge is the culture of polygamous relationships that exist in Mozambique. Polygamy was mentioned as significant barrier to HIV/AIDS treatment protocols because of how it perpetuates a code of silence within the family structure.

Numerous statements were made by the interviewees about the challenge of confronting vertical funding streams that do not allow for horizontal integration of HIV, TB and SRH services. Integration of delivery of health care services was stated by all ten interviewees as a critical priority to increase efficacious medical adherence. Achieving long-term sustainability of clinical treatment programs with well-funded follow-up care programs was proposed as a solution to many of the aforementioned challenges by a number of the interviewees.



## **5.0 PROPOSED PROJECT DESIGN**

Based on the results of the literature search, fieldwork, participant observation and interviews, a logic model was used to develop a pilot program customized for implementation at the Center in Beira. The proposed pilot program addresses the lack of follow-up services available for HIV-infected patients and should be implemented as a priority component of the Center's HIV treatment and care services. As frequently occurs, the research base is ahead of program implementation reality on the ground in places like Mozambique where medical adherence is a programmatic afterthought. This applied research project is a concrete and all too relevant example of that reality. There are no committed funds or donors lined up to implement this proposed project. The funded component of the UPITT, UCM and Mozambican MOH Center supports efforts to treat HIV infection but includes no funded support for a behavioral science component that addresses HIV medical adherence.

The theoretical foundation for this project design is Social Cognitive Theory. The Social Cognitive Theory explicitly acknowledges the reciprocal interaction that exists among a person, her behavior and the environment. This theory focuses on four aspects of human behavior: intentionality, forethought, self-regulation and self-examination. Applying this theoretical approach to the proposed project in Beira allows for an examination of the probability a person will keep taking her prescribed medication on a daily basis after leaving her first appointment. Social Cognitive Theory presents a method for examination of the cognitive choices people

make with regards to their behavior and how much they are willing to change. The four aspects of this theory are particularly relevant in an environment like Beira because as Bandura (2004) articulates,

Social Cognitive Theory posits a multi-faceted causal structure in which self-efficacy beliefs operate together with goals, outcomes expectations and perceived environmental impediments and facilitators in the regulation of human motivation, behavior and well-being (p. 143).

To meet basic HIV medical adherence behavior expectations, a person must take medication intentionally on a daily basis at the same time for the rest of her life as directed by a clinician. This action requires forethought, self-regulation and self-examination. The Social Cognitive Theoretical approach allows for an integration of the impact of beliefs, the doctor's outcome expectations for the patient, and the environmental impediments into one programmatic approach. For example, in Sofala Province polygamy is highly prevalent (Pearson, 2007). This presents a complicated challenge for a woman, such as someone who is one of three wives, who has been diagnosed with HIV and who is returning home to her poor, urban neighborhood. There is a high likelihood she will not communicate her HIV status to her husband or the other wives because doing so could jeopardize her living status: the husband has options for other wives; the stigma of HIV may propel the other wives to reject her; she may be expelled from the home with nowhere to go and no means for a livelihood. Being confronted with this type of familial pressure decreases the likelihood of medical adherence.

Another example of daily life challenges that may complicate cognitive choices is how living conditions in Beira can impact something as simple as taking a daily dose of HIV medication. The majority of homes do not have electricity, and water is not readily available in most of Beira's urban neighborhoods. Homes are dark inside and finding items like a bottle of medication can be difficult. Many homes have no refrigeration and, in Mozambique,

temperatures can easily soar to 105 degrees Fahrenheit in the summer. Social Cognitive Theory allows for examination of these factors in a realistic way that will address the possibilities of self-efficacy and the link between knowledge and action, what is actually possible for a person to achieve in terms of their medication adherence. Central to this belief in personal efficacy is the understanding that a person can produce a desired effect by her action. This understanding is what causes a person to persevere in the face of difficulties (Bandura, 2004).

## **5.1 DESIGN OF PILOT PROGRAM**

The pilot project design proposes five outcomes that, when combined, would enhance the likelihood of an increased number of patients adhering to their prescribed HIV medication plans. These outcomes are to develop a five-year plan with stakeholder input; to improve clinician, medical student and patient communication regarding the barriers and solutions to HIV medical adherence; to develop a baseline for “loss-to-follow-up” cases through a health care worker outreach effort; to integrate medication treatment regimens for co-infected HIV/TB patients with Central Hospital of Beira; and, to conduct an outcome evaluation assessing the project’s impact on increasing medical adherence behaviors of patients who are treated at the Center. In this project, the health care worker provides a critical support role to the patient and is responsible for gathering the information necessary to build the baseline for “loss-to-follow-up” cases. In addition to performing a data-gathering function, the health worker is the communication link between the patient and the clinician. For a newly-diagnosed HIV-infected patient who is not

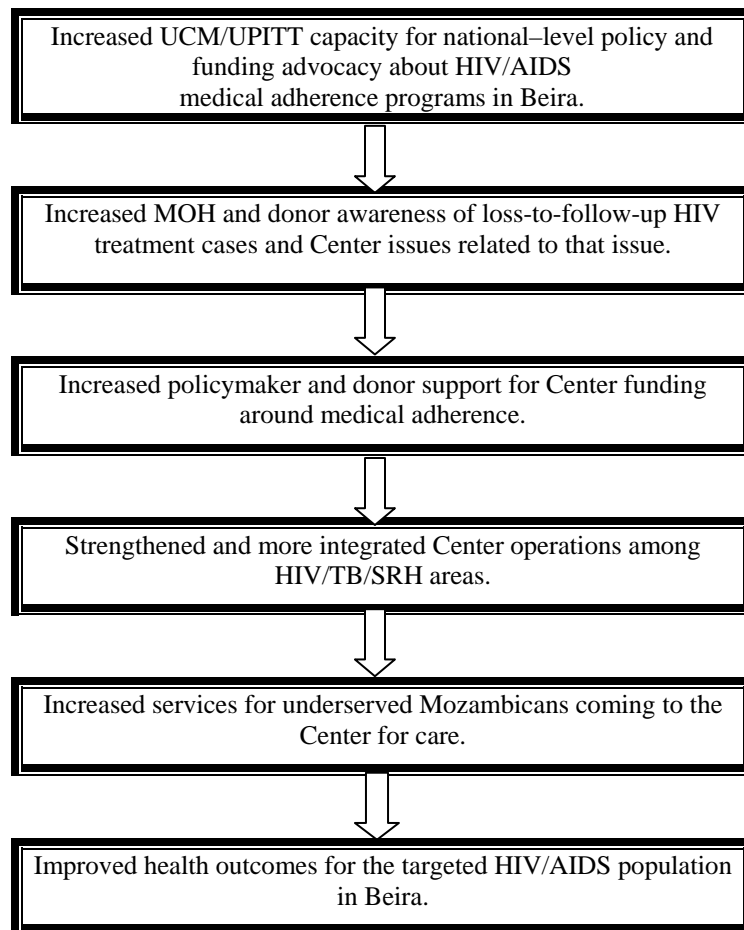
willing to disclose her status to her family members, the health worker may become the sole source of support for a period of time.

The setting for the project is the new Center located on the UCM Medical School campus. The Center's Medical Director will provide project oversight and integration with health services. The intervention will be led by one project person working for the University of Pittsburgh based in Beira for the duration of the project. Participants for the project will be drawn from HIV-infected patients who are treated at the Center, the majority of whom live in the surrounding neighborhoods. Three community-based health care workers will be trained to assume responsibilities that involve regular follow-up contact with patient. The individuals hired for these positions will be HIV-infected Mozambicans drawn from the pool of trained supervisors who were involved with researcher Pearson's (2007) project in Beira. The three health care worker positions will be funded by UPITT for the first 18 months of the project with a planned transfer to UCM funded accounts thereafter. The health care workers will not be expected to work as volunteers and will receive a living wage.

A pre-determined set of quality guidelines will be developed that place a significant emphasis on protecting patient confidentiality. Health care worker entrée into the neighboring communities is a highly sensitive issue that can be overcome, but will need patient input to identify 'safe' places that will not jeopardize their confidentiality. Nongovernmental organizations working in the neighborhoods surrounding the Center, such as World Vision, Health Alliance International and Sant' Egidio will provide insight into the development of community entrée strategies for the health care workers.

### 5.1.1 Logic Model

A logic model utilizes a theory of change to guide program implementation activity toward success. Through a step-by-step process, the logic model identifies factors that are likely to affect the planned program and creates a platform to anticipate data and resource needs for achieving targeted outcomes. For this project, a link between a macro-level logic model and an individualized model is needed to bring together research, capacity-building and advocacy. As presented in the Figure 1, the Macro-Level Program Logic Model outlines specific steps to bring the impact of a program level logic model to the level of policy impact. In contrast, the project logic model presents a pathway to increase the likelihood of success for a specific project.



**Figure 1: Macro-Level Logic Model of Proposed Pilot Project in Beira.**  
Adapted from Harvard Family Research Project, 2007.

The proposed pilot project will facilitate communication with policy makers such as the Mozambican MOH, dominant partners and donors invested in this project. The programmatic level logic model presents a concise plan for making a difference for the Center clinicians and for the HIV-infected Mozambicans they are serving in Beira (see APPENDIX B: Logic Model for Increasing HIV Medical Adherence in Beira, Mozambique). The theory underlying the attached logic model explains why change will occur by outlining a pathway to follow throughout the design of the program. The design presents an inputs phase that includes an assessment of capacity, an activities phase that describes the planned events of the program, an outputs section to identify the direct products of the activities, and an outcomes section to articulate the intended program effects that will work to achieve the desired impact of behavior change, in this case, to increase HIV medical adherence.

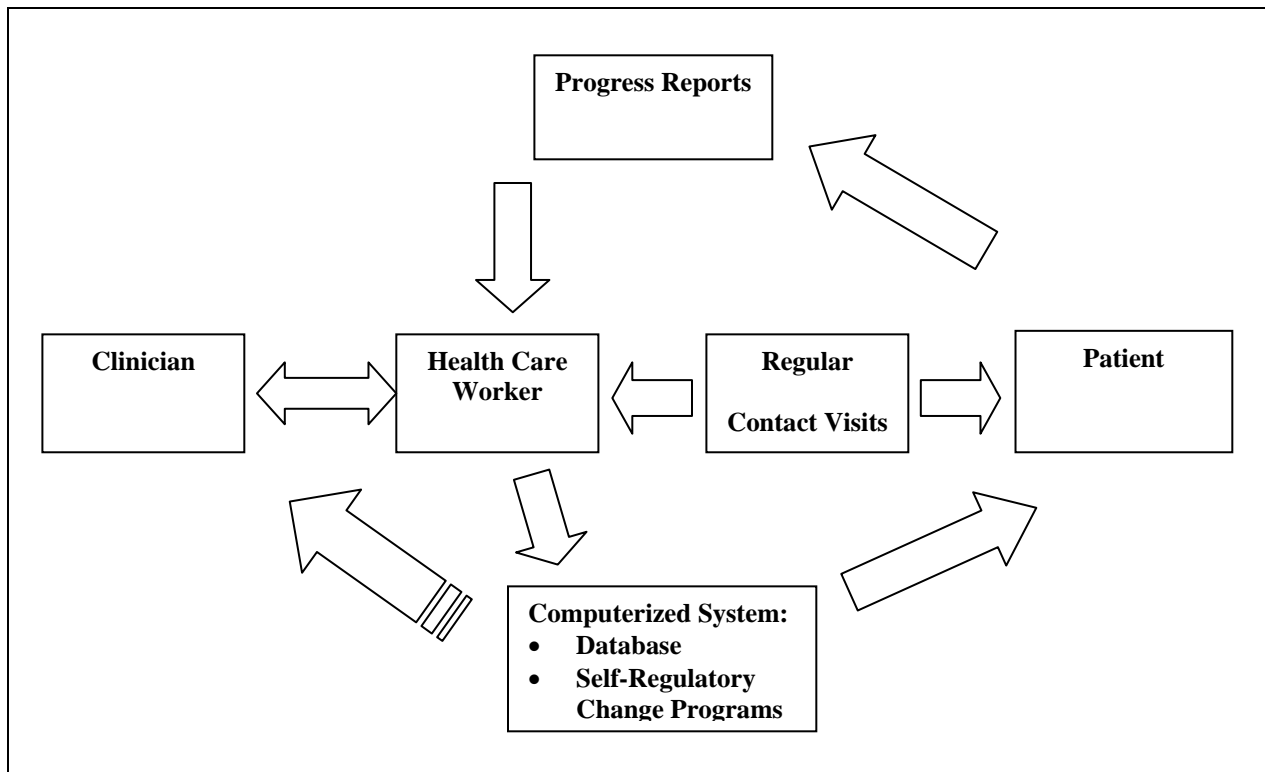
### **5.1.2 Project Activities**

Intervention activities will take place over 18 months and consist of the following:

1. Securing support from UCM, UPITT and nongovernmental partners by conducting meetings in which strategies to increase HIV medical adherence are discussed and agreed upon in order to advance a comprehensive care approach;
2. Designing a plan with UCM sixth year medical students to work side-by side with nongovernmental organizations in the area for three day-long separate community visits.
3. Training three health care workers to conduct bi-weekly follow-up visits with patients in their homes, neighborhoods, or other safe place while protecting patient confidentiality;

4. Promoting and communicating information about HIV/TB/SRH integrated care strategies to doctors, health care workers, patients and medical students at the Center. Orientation sessions will be designed for visiting clinicians emphasizing clinician/patient communications, cultural characteristics and environmental factors that influence HIV medical adherence behavior in Beira; and
5. Conducting a process evaluation that gathers data on loss-to-follow-up cases.

For health care worker outreach into the community, a self-regulation delivery system for patients is recommended. Utilizing the new computer system installed at the Center, a program could be designed for health care workers to track patients' behaviors related to self-regulation specific to their HIV treatment regimens. Notes could be included in the database regarding erratic compliance and reasons why patients are not sustaining their prescribed anti-HIV medication doses. The following flow chart (Figure 3) presents a simple picture of a social cognitive approach for tracking patient health data and increasing communications between the patients and their clinicians.



**Figure 2: Social Cognitive Theory Self-Regulatory Delivery System. Bandura, 2004, p. 153.**

This information and communication flow allows for a continuous input system that gathers data while recognizing that clinicians are often overwhelmed by caseloads and cannot be the main point of contact for a patient on a regular basis. The health care worker’s role is central to supporting patients to develop the regimen necessary for medical adherence. Sant’ Egidio, Health Alliance International and World Vision are nongovernmental organizations working in Beira that utilize a similar approach. These organizations rely on health care workers known within the neighborhoods of Beira to contact patients and to provide follow-up health services visits when needed. The premise underlying this model is that community engagement results from trust in health workers who, over time, come to understand how a particular community functions. The relationship of the health worker with patients within their own community setting is believed to be the most effective avenue through which to manage case loads while strengthening a social support system for the patient. Communication with the HIV-infected



patient at the Center can affect motivational and cognitive processes underlying health-related behavior choices that will be made once the person leaves the Center. A pathway has to be built between the clinician and patient that will provide information about why adhering to the prescribed drug schedule is so important. In addition, this interaction lays the groundwork for the health worker's follow-up contact. Productive patient-centered communication incorporates fostering a healing relationship with the patient, exchanging information, providing a place to respond to emotions, providing an opportunity to discuss how to manage uncertainty, discussing decisions the patient may need to make, and encouraging patient self-management ideas (Glanz, 2008). In an environment like Beira, where the ratio of doctors to patients is extremely low, this clinical/patient communication objective is not easy to consistently implement, so the health care worker role is even more necessary. In addition, intrinsic moderators such as health literacy, social distance or discordance (referring to the number of dissimilarities between the doctor and the patient), clinician attitudes toward patients, and patient preferences for clinician and patient roles in care can influence the relationship (Glanz, 2008). In under-resourced environments like Beira, these moderators are even more influential in a clinician/patient relationship and contribute significantly to patient intentionality, forethought, self-regulation and self-examination cognitive processes about following medication treatment plans.

### **5.1.3 Stakeholders and Potential Partners**

The principal stakeholders for this project are UPITT, UCM, MOH, Mozambican medical students and Mozambican patients. An increasing number of international funders are becoming engaged in this treatment and care initiative and location in Mozambique. Nongovernmental organizations in the area, specifically World Vision, Health Alliance International, and Sant'

Egidio, can provide valuable guidance if formally invited to participate. Meetings with two of these organizations in March 2009, Health Alliance International and Sant' Egidio, concluded with statements of sincere interest to collaborate and identified a need for further discussions.

The elements needed for improved comprehensive care of HIV-infected patients are present at the Center in Beira and include the following:

- A funded Mozambican university partner, UCM, whose primary focus is to implement Mozambican MOH national health program priorities providing a medical school education and health care worker training program for Mozambicans, resulting in improved health care capacity throughout Sofala Province;
- Mozambican medical students who are engaged in an intensive medical school academic program and clinical treatment experience preparing them as future health care specialists in their own country;
- A highly skilled team of UPITT epidemiologists contributing to improved health service delivery in Mozambique with access to the University of Pittsburgh's resources and reputation as an internationally renowned epicenter for HIV/AIDS research;
- Well-known, respected and experienced nongovernmental organizations in the Mozambican communities of Beira viewed as trusted sources of support; and,
- Mozambicans themselves, many of whom are HIV-infected, who desire healthy lives and are willing to participate in solutions that draw upon their cultural experiences and knowledge.

Each of these stakeholders, both institutional and individual, has a set of priorities to meet in the form of a mission or personal interest that are not necessarily in alignment with UPITT and UCM objectives. However, the majority of stakeholders know that coordinating HIV

treatment adherence activities is crucial. Investing time in stakeholder relations and communications is necessary to sustain positive alignment of interests among all the stakeholders. This outlay of energy by UCM/UPITT leaders, who have invested significant resources in the Center, will create a solid platform to secure future funding. Collaborative projects that achieve agreed-upon objectives, in this case, increased HIV medical adherence in Beira, are considerably more attractive to funders. Funders are interested in how to invest dollars (or Meticaís) in projects with streamlined and competently delivered health care services that have an increased likelihood of achieving long-term sustainability.

#### **5.1.4 Outcomes and Impact**

In the logic model, outcomes are evidence of changes resulting from programmatic pathways that have been constructed from assumptions through to outputs. There are five projected outcomes of the logic model that will increase the evidence base about how to increase medical adherence for patients who come to the Center for treatment and care. These projected outcomes are:

- 1) A five-year plan compiled with stakeholders and nongovernmental partners for the Center's HIV medication adherence program;
- 2) Improved Center clinician, medical student and patient communications;
- 3) A baseline developed for "loss-to-follow-up" cases that will provide a foundation for accurate assessments about HIV care effectiveness;
- 4) An integrated treatment plan developed for co-infected HIV/TB patients coordinated with Central Hospital of Beira's TB clinic; and,

- 5) An outcome evaluation after 18 months that assesses the project's impact on HIV medical adherence and analyzes the effectiveness of the methodology used.

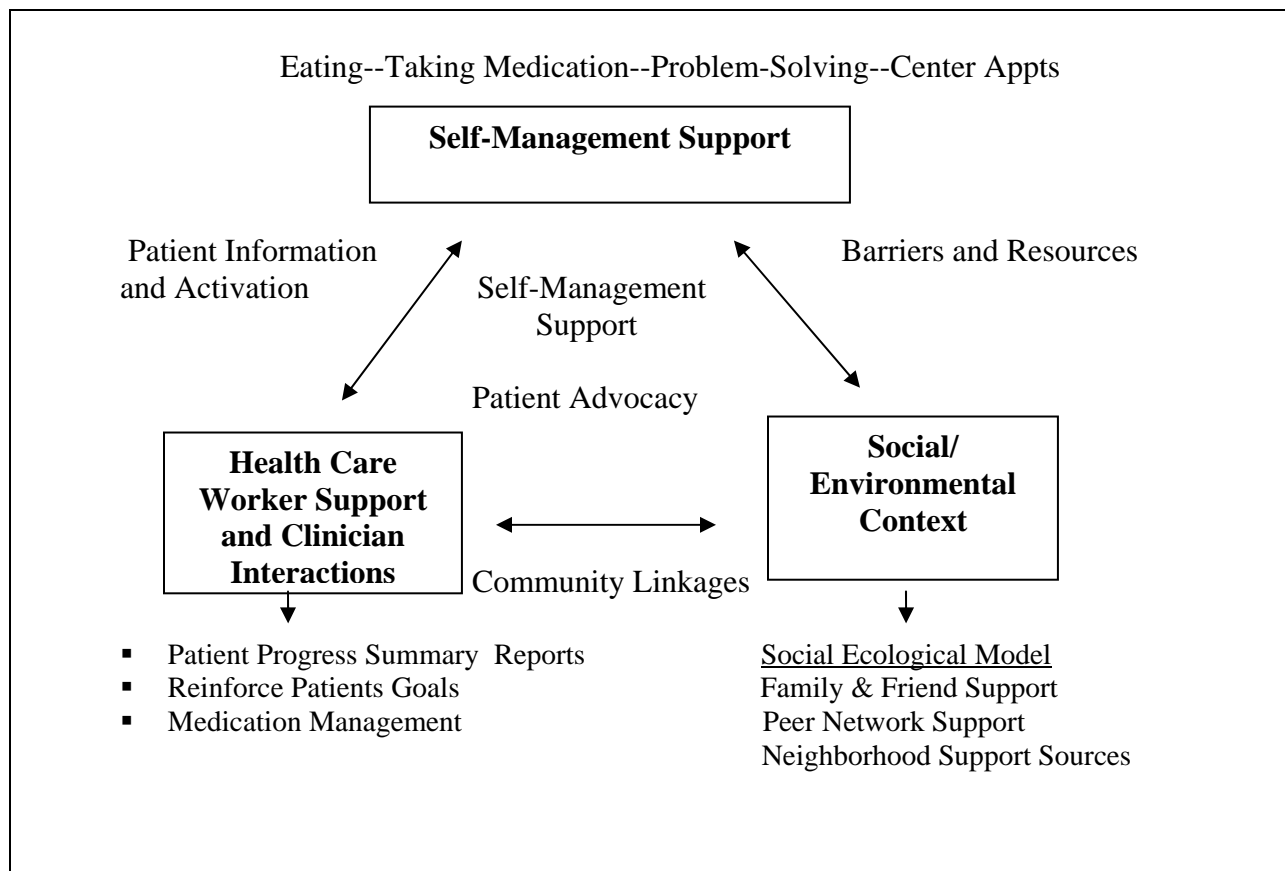
### **5.1.5 Process Evaluation**

The literature reviews and the Social Cognitive Theoretical approach strongly influenced the choice of a process evaluation as the appropriate vehicle for assessing the effectiveness of this pilot project. The process evaluation will monitor drug adherence patterns derived from data that have been gathered biweekly by the health care workers over 18 months. Data including a summation of specific behaviors that have facilitated or impeded positive health behaviors related to medication adherence will be assessed by the Center Medical Director. Measures of patient compliance to prescribed doctor directions will be monitored. Measures of patient viral loads will be tracked as part of follow-up visits at the Center with the patient's primary clinician.

The process evaluation will include health care worker observations and descriptions of support networks that are available (or not available) for patients in their home and neighborhood surroundings over 18 months. There will be a specific emphasis on how health worker outreach efforts in Mozambican communities are received and how trust between health care workers and HIV patients is developed (or not developed) and sustained over time.

### 5.1.6 Integrated Comprehensive Care

Glasgow (2007) presents a coherent model for coordinating patient self-management, medical care support and community resources to support a person within their life context. Recognizing the importance of environmental context and patient self-efficacy is at the core of the social ecological model shown in Figure 3. Encouraging consistent, daily medical adherence behaviors in individuals is the core objective of this model. This integrated self-management support model presents a framework that connects the components of self-management support, health care team support, and the social/environmental context.



**Figure 3: Integrated Self-Management Support.**  
Adapted from Glasgow, 2007, p. 426. Permission Granted.

The model above presents a multi-level approach to an adherence program that accounts for the interaction of numerous factors. The health care worker interacts regularly with the patient, encouraging and supporting her to follow the HIV drug regimen. Simultaneously, the health care worker interacts with the Center clinicians and facilitates communication with the patient as needed. This facilitation could be as simple as the increased understanding that comes from speaking the same language as the patient. The health care worker's sensitivity to the patient's social environmental context combined with awareness about how collaborations are working in the neighborhoods with local non-governmental partners will be helpful to better inform the clinician. The patient has an informed and competently trained support person in the health care worker, who acts as a link to the patient's medical doctor in between health visits to the Center. The discipline required by the logic model is crucial to help individuals maintain focus in an environment where daily stressors create pressing and competing demands on clinicians, medical students, health workers, and patients.

## **6.0 RECOMMENDATIONS, LIMITATIONS AND CONCLUSIONS**

An emphasis on HIV medical adherence provides a concrete orientation for recommended future directions for research and programming. Increased vigilance in future research efforts will be needed to overcome shortcomings experienced during the course of this applied research project.

### **6.1 RECOMMENDED DIRECTIONS FOR FUTURE RESEARCH**

#### **6.1.1 Culture and Social Determinants in Beira**

In the literature reviewed there was a limited breadth of evidenced-based research for drawing conclusive associations between cultural influence and medical adherence. More qualitative research studies are urgently needed to further explore behavioral and cultural reasons for patient non-adherence. Patterns emerged from the interviews conducted for this project such as the number of times polygamy was mentioned as an important factor impacting medical adherence challenges. Polygamy was never addressed in a direct question but arose unsolicited and frequently in the responses. However in the literature, polygamy was rarely emphasized as a confounding factor impacting HIV medication adherence. Sensitivity to confounding factors will need to be paramount in future research endeavors examining fundamental drivers underlying medical non-adherence.

### **6.1.2 Social Support Networks in Beira**

Research about social support networks in Sofala Province needs to be conducted to further examine what forces facilitate or impede an HIV-infected person's process to regain health stability. Potential areas for qualitative research could address the following questions: How is social support defined in Beira? How is family defined in Sofala Province? Who are the most influential persons in determining whether or not a person sustains an HIV medication regimen? Does it make a difference to patients to have access to HIV-infected individuals or an HIV peer network for support? What does it mean to address medical adherence within a polygamous context? How do Mozambicans communicate about sexual reproductive health? Is there a difference between how someone living in the city of Beira views a support network versus someone who lives further outside the city? Identifying methods such as conducting focus groups or qualitative interviews to gather responses to questions like those listed above would be useful to gain a greater understanding of social support networks that specifically characterize communities in Beira.

### **6.1.3 Epidemiologic Studies in Sofala Province**

Plans for epidemiologic research studies are in development; however more are needed. The UPITT research team is planning to develop an 800-patient cohort that will be tracked and studied over time. The participants will be drawn from the patients treated at the Center. In addition, a recently funded UPITT research training program will provide Mozambican medical researchers with the multi-disciplinary tools needed to conduct cutting-edge HIV prevention



research in Beira. In addition, I recommend a research study focused on increasing the number of available ART drug combinations and monitoring the resulting impact on patient medication adherence behavior. The known toxicity of certain drugs, such as stavudine are part of the limited drugs choices available and prescribed in places like Beira, Mozambique, to treat HIV. Also, further cohort studies are needed to determine whether incidence rates of TB and HIV continue to decrease beyond five years of a HAART treatment regimen (Lawn, 2005). Lawn's study in South Africa showed that the incidence of TB continued to decrease during the first five years of HAART. The results suggested that HAART may contribute to more TB control in countries than was previously estimated. Given the increasing concern over XDR TB in Mozambique this area of research deserves more attention. Investing resources in longer studies that are rigorous in terms of identifying potential study biases, confounding factors and misclassification influences would build a needed research resource base in Mozambique.

## **6.2 RECOMMENDED DIRECTIONS FOR FUTURE PROGRAMMING**

### **6.2.1 Integrate Delivery of Health Care Services**

Additional findings of this paper reinforce the necessity of integration with existing TB and SRH programs to achieve the desired outcome of increasing life expectancies for Mozambicans. Increasing HIV medical adherence in Beira requires an integrated approach that is grounded in the reality of daily life for the average Mozambican. Ignoring situational differences that come from living in an under-resourced environment will limit achieving targeted goals of stemming severe illness and death from HIV. The pilot project design shifts emphasis away from a

clinician-to-patient hierarchical dynamic toward a broader understanding of the interconnectedness of factors at the individual, social and environmental levels. An integrated management approach to the cases of HIV-infected Mozambicans who are entering the doors of the Center is essential.

Data reveal the consequences of ignoring evidence about mismanaged or undertreated co-infected HIV and TB individuals. As part of social support strategies, an adherence intervention must address as a priority the operational issues related to TB diagnosis and treatment of TB/HIV co-infected patients. For example, the treatment protocol of the TB Clinic at Central Hospital of Beira has to be coordinated with the HIV regimen recommended at the Center for each co-infected patient. In Beira, this coordination will require a patient to make separate trips by foot or bus to each location.

In order to control TB rates in high prevalence HIV settings, the MDOT strategy should be complemented with additional collaborative TB/HIV activities. At the very least, every HIV service provider in Beira must implement the three “I’s” within program design, monitoring and evaluation plans: Isoniazid Preventive Therapy, Intensified TB Case Finding, and Infection Control. Isoniazid, a drug given to people with latent TB infection to prevent progression to active disease, can be administered simultaneously with ART. Pro-active screening for TB signs and symptoms in places like Beira where HIV prevalence is so high increases the chances of survival. This action, diagnosis and prompt treatment are what define “Intensified TB Case Finding.” Also, TB infection control in health care and congregate settings has to be integrated into the plans for new health centers (WHO, 2009). Transmission of TB occurs when people with HIV and TB are in proximity to each other in places like health centers, hospitals, prisons, neighborhood markets and the military. Protection measures to reduce transmission must be

transmission must be developed and implemented. In some ways the third “I,” “Infection Control,” may be the most difficult to secure given the constraints in a fragile infrastructure environment like Mozambique. Capital building plans and building funds must make accommodations to improve infection control within facilities before health care buildings are constructed. In existing buildings, modifications need to be made, both physical and programmatic, to minimize infection transmission. By extension, existing HIV treatment and care providers must address the importance of integrating services regardless of the challenges to be overcome from established vertical funding streams.

Concurrently, strengthening policy and program linkages for HIV/AIDS and SRH has to become a core health service delivery goal. The most basic step would be to require that at the national policy level, all HIV health care centers and programs (new and existing) provide universal access to sexual and reproductive health information and services. Table 3 presents factors strengthening or inhibiting linkages between HIV and SRH services.

**Table 3: Factors Impacting HIV/SRH Linkages. Source: WHO, 2008.**

<i>Strengthening Linkages</i>	<i>Inhibiting Linkages</i>
<ul style="list-style-type: none"> <li>• Positive attitudes and good practices among providers and staff</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of commitment from stakeholders</li> </ul>
<ul style="list-style-type: none"> <li>• On-going capacity building</li> </ul>	<ul style="list-style-type: none"> <li>• Non-sustainable funding</li> </ul>
<ul style="list-style-type: none"> <li>• Involvement of the community and government during planning and implementation</li> </ul>	<ul style="list-style-type: none"> <li>• Clinics understaffed/low morale/high turnover/inadequate training</li> </ul>
<ul style="list-style-type: none"> <li>• Simple, easily applied additional services which add no costs to existing services</li> </ul>	<ul style="list-style-type: none"> <li>• Inadequate infrastructure, equipment and commodities</li> </ul>
<ul style="list-style-type: none"> <li>• Non-stigmatizing services</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of male partner participation</li> </ul>
<ul style="list-style-type: none"> <li>• Male partner inclusion</li> </ul>	<ul style="list-style-type: none"> <li>• Women not sufficiently empowered to make SRH decisions</li> </ul>
<ul style="list-style-type: none"> <li>• Engagement of key populations</li> </ul>	<ul style="list-style-type: none"> <li>• Cultural and literacy issues</li> </ul>
	<ul style="list-style-type: none"> <li>• Adverse social events/domestic violence incidence</li> </ul>
	<ul style="list-style-type: none"> <li>• Poor program management and supervision</li> </ul>
	<ul style="list-style-type: none"> <li>• Stigma preventing clients from utilizing services</li> </ul>

Increasing medical adherence to HIV treatment to include SRH services makes sense within a comprehensive care approach. The bridge between HIV/SRH services is even more critical in the case of Mozambique, where polygamy is prevalent and common to the social structure in and around Beira. New health care program interventions must include evaluation components to determine the most cost-effective and programmatically effective approaches to measuring adherence in places like Beira, Mozambique (Gill, 2005). More funds must be restricted for advancing research and programming purposes focused on integration of health care delivery services.

The HIV medical adherence challenge increases the urgency for a shift to occur regarding horizontal funding and programmatic integration of HIV/TB co-infection situations and also the need to link HIV/SRH programmatic services. Vertical “stove-pipe” approaches described by Laura Garret (2007) that treat either HIV/AIDS or tuberculosis need to be adjusted to become inclusive of both treatment regimens. Instead of vertical treatment approaches, comprehensive and horizontal-focused health care prevention, treatment, and clinical follow-up program strategies need to be established.

### **6.2.2 Develop Social Support Networks for Patients**

Innovative and integrated strategies attending to the needs of patients managing difficult drug treatment regimens within the realities of their culture and environments are central to improving HIV medical adherence. Contributing to positive health outcomes that reduce HIV mortality rates by minimizing excessive losses-to-follow-up that frequently characterize the story of HIV/AIDS prevalence rates in places like Beira, Mozambique, is crucial. If a patient does not appear to have a social support network, options as to how best to provide support need to be

further explored. In some cases, a health care worker or an HIV peer group may be the only source of support and information for a patient.

### **6.2.3 Expand Evaluation Capacity**

Process evaluation encourages regular monitoring of what is working and what is not working to support self-regulatory behaviors of patients related to their HIV medication plans. This form of evaluation allows for adjustments to be made as needed throughout the project's implementation not only with patients but also with clinicians, medical students, stakeholders and nongovernmental partners. The five outcome areas outlined in the logic model can be regularly reviewed to examine program quality. After 18 months, an outcome evaluation assessing the project's impact on increasing medical adherence behaviors of the Center's HIV patients. Both of these evaluation mechanisms will support evidenced-based decisions regarding future programmatic directions. Developing a comprehensive utilization-focused program evaluation would be particularly relevant for a project of this nature. Utilization-focused evaluations are developed with the idea that they will be used by the practitioners within the program being evaluated. More work will need to be done to build an evaluation mechanism for the future that will integrate the strengths of process, outcome and utilization approaches.

## **6.3 LIMITATIONS**

A shortcoming encountered in the literature review was "consistency" relative to the research available for examination. In general, it is not a good idea to base practice or design of a new

program on a single study no matter how large or well done. Repetition of evidence-based findings for different populations with different study designs and different researchers supports causal associations in a more substantive way than a single study ever could. In sub-Saharan Africa, there is progress in this area, but all too frequently there is one small team of researchers doing all the work in a particular region. While this is significant progress over the past when little or no research on the topic of medication adherence was being conducted, there is room for more work that will increase the validity of existing studies.

Limitations of this applied research project should be considered when interpreting the final proposed project design. The literature review did not include articles beyond sub-Saharan Africa. Due to the breadth of HIV medical adherence as a topic and the fact this effort was not a full dissertation, it was necessary to keep the focus on key issues that were raised by researchers as potential influencers in Sub-Saharan Africa that may be relevant to Mozambique. It would be useful to expand the literature review of medical adherence to other developing country regions of the world such as Asia where HIV prevalence is high.

The number of interviews conducted for this project was limited. This small sample narrowed the opportunity to draw conclusions or to observe patterns. The interviews with the medical students and the outside experts provided a glimpse of what may be learned from utilizing this method of data collection. In an environment where so much data are lacking, combined quantitative and qualitative approaches could be helpful to increase understanding about inhibitors and facilitators of HIV medical adherence.

Addressing the intersection between the natural sciences and behavioral sciences by addressing a concrete issue like HIV medical adherence at a particular site is challenging. To

satisfy two different scientific audiences with information and a project design that will be deemed relevant for both is a hurdle that I strived to overcome.

## **6.4 CONCLUSION**

This paper and proposed pilot project sought to develop an evidenced-based solution to the inevitable problem of HIV/AIDS medical adherence in Beira, Mozambique for patients treated at the UCM/UPITT Health Center. Toward that goal, I reviewed literature on HIV medical adherence in sub-Saharan Africa and also, examined articles about cultural influences on adherence behaviors. I analyzed the literature and laid the theoretical foundation for the proposed project using the Social Ecologic Model, Social Cognitive Theory and Social Support Network Model. With this intellectual base, I used a social determinants health perspective to provide an expanded understanding of the structural determinants and conditions of daily living that impact choices made by an HIV-infected Mozambican living in Beira. Data and information gathered from the fieldwork, participant observation and interviews on my March 2009 trip to Beira enhanced this foundation for better understanding what realities may be confronting a Mozambican receiving treatment at the Center. The proposed pilot project is the culmination of my learning from the above research methods and from my experience in Mozambique. This learning has been placed into a simple logic model structure focused on one ultimate goal: to save Mozambican adult and children's lives by increasing HIV medical adherence.

Access to health care and competently delivered treatment services is half of the solution to halt HIV mortality rates. However, developing integrated, culturally sensitive, and environmentally aware approaches to HIV medical adherence programming is the other half of

the solution. Every single health care delivery program in Beira must address HIV medical adherence programmatically as part of comprehensive treatment and care. Overlooking, or not funding, this component of HIV care is counterproductive. If the Center incorporates the proposed pilot project then the comprehensive health care approach it currently espouses will be truly actualized. If this comprehensive care approach is expanded to a national scale, then perhaps Mozambique will be one sub-Saharan African country that will have a realistic chance of halting the spread of HIV by 2015.



## **APPENDIX A:**

### **PARTICIPANT OBSERVATION & MEDICAL STUDENT INTERVIEWS**

Participant  
Observer: Susan White  
Date/Time: Tuesday, March 10, 2009. From 9:30 a.m. to 12 noon (two and half hours).  
Location: This Health Clinic is located on the campus of Universidade Catolica de Mocambique (UCM) Medical School in Beira, Mozambique.  
Purpose: The following document has two components: first, a participant observation of the UCM Health Clinic. This is not the newly opened health center on campus referred to in the body of this paper. The purpose of presenting this participant observation is to describe the environment and some of the more transparent dynamics among medical students, doctors and patients. The second component is a series of open-ended qualitative half hour interviews with four medical students on rotation the same morning of the observation. The purpose of these short interviews was to gain a better understanding from a student perspective which Mozambican cultural and environmental factors may influence HIV medication treatment regimens.

The process of site selection and gaining entrée into the field for this participant observation resulted from two factors. First, I have been involved with projects in Mozambique for over 25 years which in addition to speaking Portuguese increases my credibility when opportunities arise. And second, I am engaged with the University of Pittsburgh's School of Medicine's project located in Beira that is working as a partner to the Universidade Catolica de Mocambique (UCM) Medical School. I was previously at this site in May 2008 as a consultant. My status on this project is as a researcher from the University of Pittsburgh who is investigating and

developing a program to increase medical adherence of underserved Mozambicans to HIV/AIDS treatment regimes.

I was an obvious presence at the UCM health clinic for this participant observation experience. To increase my access to the medical students interning at the clinic and their comfort level with me, I sat in on a class seminar the day before. My intention was to better understand how and what material they were learning in the classroom and to increase their comfort level with my presence. In addition, I had been seen around the medical school for a couple days and used that as an opportunity to be present where students hang out (in the library and the cafeteria). Also, the doctors working at the clinic knew me and introduced me to the students and requested the students to please speak with me if they had time.

I am sensitive to the ethical implications of information gathering both from having participated in the intensive institutional review process (IRB) process at the University of Pittsburg; and also as someone who has been exposed to Mozambican culture for a long time. I was comfortable taking notes while I observed the clinic and its activities but I choose not to take any pictures of the medical students. Power relations are complex as they are in any country. I am an American, middle-aged, white female who speaks Portuguese well and is familiar with Mozambican ways however, I automatically gain an authority by my “outsiderness.”

The UCM health clinic is located on the first floor at the end of a long hallway. There are two ways to access the location. One way is from the back of the building through a path that cuts through to a neighborhood and the other way is through the main entrance of the UCM Medical School Building. If you come in the main entrance there are three doors on the left side that make up the clinic area. There are about 12 chairs against the wall in front of these doors. The other side is an open air space. Generally it is quite hot in Mozambique so buildings often

are built with a one-sided open design to capture breezes. The architecture has a bit of the old Portuguese colonial feel to it with tall pillars although I believe the building was built within the past 25 years. The clinic is based within a three story medical school building and the whole area has a “university feel” with high ceilings and lots of windows set up in an “H” design: two long three story buildings connected with a large wide staircase in the center connecting the long sides.

This health clinic is free to the public if they are willing to be seen by a medical student which is then followed up with a consult with the doctor. If they want to pay 30 Meticaais (about 25 cents) then they can be seen by doctor in private. A follow-up visit alone with the doctor costs 5 Meticaais. There were 5 medical students working the morning of my observation with one head doctor and two other doctors observing. All the doctors were ex-patriots. By ex-patriots, I am referring to highly trained medical specialists who are not Mozambican and arrive from other countries to work for short or long term periods in Mozambique.

This is a teaching clinic. Third and fourth year medical students have clinic rotations with the supervising doctor. The students have opportunities to examine patients, take their medical histories, and diagnose the problem under the supervision and guidance of the medical doctor in charge. The weather was hot although it is autumn in Mozambique (if there is such a thing!) There was a gentle breeze. A big container of water sits on a small table with glass covered by a cloth to protect them from the flies—this is available to the patients in this outside waiting room. Most of the doctors and medical students have stethoscopes hanging around their necks and wear Teva-type sandals that you can see below their white coats. The Mozambicans tend to wear closed shoes if they have them. I felt relaxed and comfortable sitting in one of the waiting area chairs. Arriving early and just sitting in the waiting area appeared to increase the

comfort of others with my presence. There was more of a curiosity than concern, in the faces of those who noticed me sitting there with a notebook.

At the clinic there was a steady stream of patients. About 10-15 patients are seen per day from 8 a.m. to 12 noon. Some have appointments and some do not. There is a system and organization to the process of patients checking in and then waiting to be seen by a medical student who takes the history and does an initial exam which is then followed up with the doctor in charge for the morning. The morning of my observation the patients who came were mostly mothers and young children. There was one father who came with someone who I suspect was his wife and child. Confidentiality was something I thought about a great deal during this observation. This is a clinic based in a Catholic University. The other issue that arose during my interactions with medical students was how they themselves do not feel comfortable using this clinic for health services. They do not come here if they think they might be HIV positive. They take the time and make the effort to go to the Central Hospital of Beira to get tested somewhere else. The students also told me that they do not discuss their HIV status among themselves. There remains a significant silence around the issue of HIV status and they believe there might be negative consequences if it was revealed they were HIV positive. There is a concern of being stigmatized within this medical school. The confidentiality of the clinic patients is highly protected and the medical students are highly articulate and aware of the importance of confidentiality for them although they do not feel their own confidentiality would be protected.

The area has a friendly, quiet atmosphere. It is a calm and easy-going place although there is an air of authority when doctors walk by. This may be an impact of the “white coat effect”. I also suspect this place may be quiet because there is no emergency care at this clinic

and results of tests are not given here. My interactions with four different medical students occurred as they walked out of their exam sessions with the doctor and patients.

I asked one student how Mozambicans described a good doctor. He said, “There is never a description given but only a name.” The implication is that a good doctor is like the person the Mozambican patient names. I felt gently humored by this story because it is so Mozambican. A Mozambican will often talk around something while giving you quite a clear answer. You just have to listen carefully. Another student described the importance of “making everything horizontal in the doctor patient relationship and not vertical whether or not you are working in rural or urban areas. Mozambicans like to ask questions but the doctor has to make a significant effort to share information in a non-authoritative way.” This comment also reveals a Mozambican cultural attribute. Mozambicans are community-oriented. This perspective may have developed over the years of hardship nationally that ranged from war to floods to relentless and severe poverty for the majority of its 20 million people.

Another student mentioned that it is important for expat doctors “not to be restrictive with Mozambicans because it shuts them down.” I interpreted this to mean that is important to have open relationships with patients. Another student talked about the impact of polygamy and how different it is in their village when they go home. People know about HIV but the wife will not tell her husband if she is infected because of a deep-seated fear that she will be rejected by her husband. If that means not taking her medication then she won’t take her medication. Hiding the disease becomes paramount because the personal consequences of revealing HIV status are too great.

I thought about how young and optimistic these young Mozambican medical students were throughout our interactions. The students are immersed in six years of medical school that

will be followed by two years of mandatory rural medical practice and then the process of securing a field specialization begins. The students were very focused on service and how best to make a difference in spite of the overwhelming medical needs prevalent in the surrounding community. This attitude exists in spite of the tremendous challenges they face as students and in their chosen career path. There are not enough medical school books nor are they affordable so the students share textbooks regularly in groups and copy pages they need at the library. In addition, the students are expected to learn English, on their own time and to attain a high level of medical terminology proficiency. There are no English courses or tutors at UCM and most of the expat doctors who come and work at the health clinic speak limited or no Portuguese. Frequently the students take on the additional role of translator during patient-doctor communications while they themselves are active in a learning apprentice role.

Cultural factors that impact a Mozambican's health choices are deep and complex. In the current environment the majority of Mozambicans in Beira are confronted daily by the realities of HIV/AIDS compounded by severe poverty and a lack of regular access to adequate health care resources and services. "It is," as one doctor commented, "always a matter of survival here."

### **INTERVIEWS WITH MEDICAL STUDENTS**

**Purpose:** For this set of interviews, I asked open-ended qualitative questions to stimulate a dialogue and comments that would focus on Mozambican culture factors that may impact medical adherence. Four UCM medical students were interviewed. They were all fourth year students. I interviewed them on site during their UCM Health Clinic training rotations. They work at the Clinic one morning per week during their third and fourth years of medical school.

The students attend medical school for six years followed by two years of medical service in a rural area required by the Mozambican Government. This rural service period is followed by a period when the medical practitioner can choose a medical specialization.

The purpose of these interviews was to solicit perspectives thus not all questions are answered directly in the following set of condensed interviewee responses. A composite of responses categorized by question is attached at the end of the document as an additional resource.

### **Interview Questions:**

1. Describe the work at the clinic? What is the extent of the patient service area? How would you describe the population to whom you provide medical care?
2. Given the prevalence of HIV/AIDS and tuberculosis cases in Beira, Mozambique what do you think is the most effective approach to simultaneously managing chronic and infectious diseases?
3. What are the challenges to working with this population with regards to clinical follow-up care? How do you think these challenges need to be addressed?
4. Some researchers believe HIV/AIDS and tuberculosis clinical follow-up care needs to be integrated? Others do not share this perspective. What is your opinion?
5. In your opinion what are some of the barriers to HIV drug treatment adherence?
6. What do you think matters most to the patients you see at the clinic?
7. How do people in this area articulate the cause of their sickness if they have been diagnosed with HIV or TB?

### **Interview: B1**

“Our responsibilities include being at the training clinic one half day every week. We do the physical exams and take the history of the patient. Then we do a diagnostic differential and present the case to the Dr. Kevyn Comstock. Then we go in and see the patient together. I like the whole process. The patients have problems and we help them. Sometimes it is difficult to be certain what their problem is. It takes a lot of practice. A good history helps us understand the situation and their condition. With SIDA (AIDS) there is no discrimination with the doctor although it may be different for the patient at home. When a patient only has Stage 2 HIV infection it is hard to diagnose since we do not do lab tests here. If we suspect something, we will send the patient to Beira Central Hospital to get an HIV tested.”

“There are challenges culturally. In the families we see there are issues such as illiteracy and polygamy. The man or woman may not be able to read the directions on the medication bottle. There is a lot of silence in the family about these health issues. The husband will not tell the wife if he has been diagnosed with HIV. The issue is the lack of verbal communication. People around here generally understand that it is OK to touch someone with HIV/AIDs but they won't talk about it at home. We need to push people around here to encourage talking about these things. Even at the medical school here, there is a code of silence. No student would ever share if they are HIV positive. They would go elsewhere to be tested. Confidentiality is an issue for us.”

### **Interview: B2**

“There is so much time here at the clinic which makes a difference. It is not typical to have so much time at a health clinic. There is excellent interaction with the doctors here. We have time to



discuss situations with the doctors. There is a language issue unfortunately. Most of the doctors here do not speak Portuguese or are only beginning to learn the language. The doctors do their best to teach us. How do the patients define a 'good' doctor? Mozambicans will not list characteristics but will only say the name of a doctor they like. That is the person they want you to see as a model. No characteristics will be described. What they mean is that doctors should try to be like the doctor they name."

"If I had a chance to give a lecture to a group of foreign doctors that were going to come here to practice and teach for awhile I would encourage them to have an 'open relationship' with the patients. Dr. Millard is a good example. I would tell them "Don't be restrictive. Don't be authoritative. It shuts Mozambicans down. Be on the same level as them. To increase medication adherence it will be important to have both an urban focus like we do here and a rural focus. We have to focus on both. It is important to make everything horizontal and accessible. Not vertical. Mozambicans here need to be educated. And the doctor has a chance to educate. People then will like asking the doctors questions."

### **Interview: B3**

"Work is normal here. There is a steady flow of patients. Communication at home is more difficult for patients because communication is more closed in the house than here with us about health troubles. It can be hard to get the whole story out of a patient but this is very important for complete analysis and understanding of the patient. For example a patient may come in and talk about discomfort in their abdomen but the problem is really in their pelvic area. The city of Beira is different than Maputo where I come from. In Maputo most doctors, medical students and

patients I know talk about chronic disease like hypertension, diabetes and heart conditions. Here in Beira, people ask a lot of questions about TB and HIV.”

“If I was going to talk to foreign doctors who were planning to work here for a while, I would ask them to learn Portuguese so that communication could be improved with the patients.”

#### **Interview: B4**

“Medical adherence is very important. If people we treat do not respond to treatment then resistance in both the body and the mind can develop. Getting healthy is both a psychological and a body issue.”

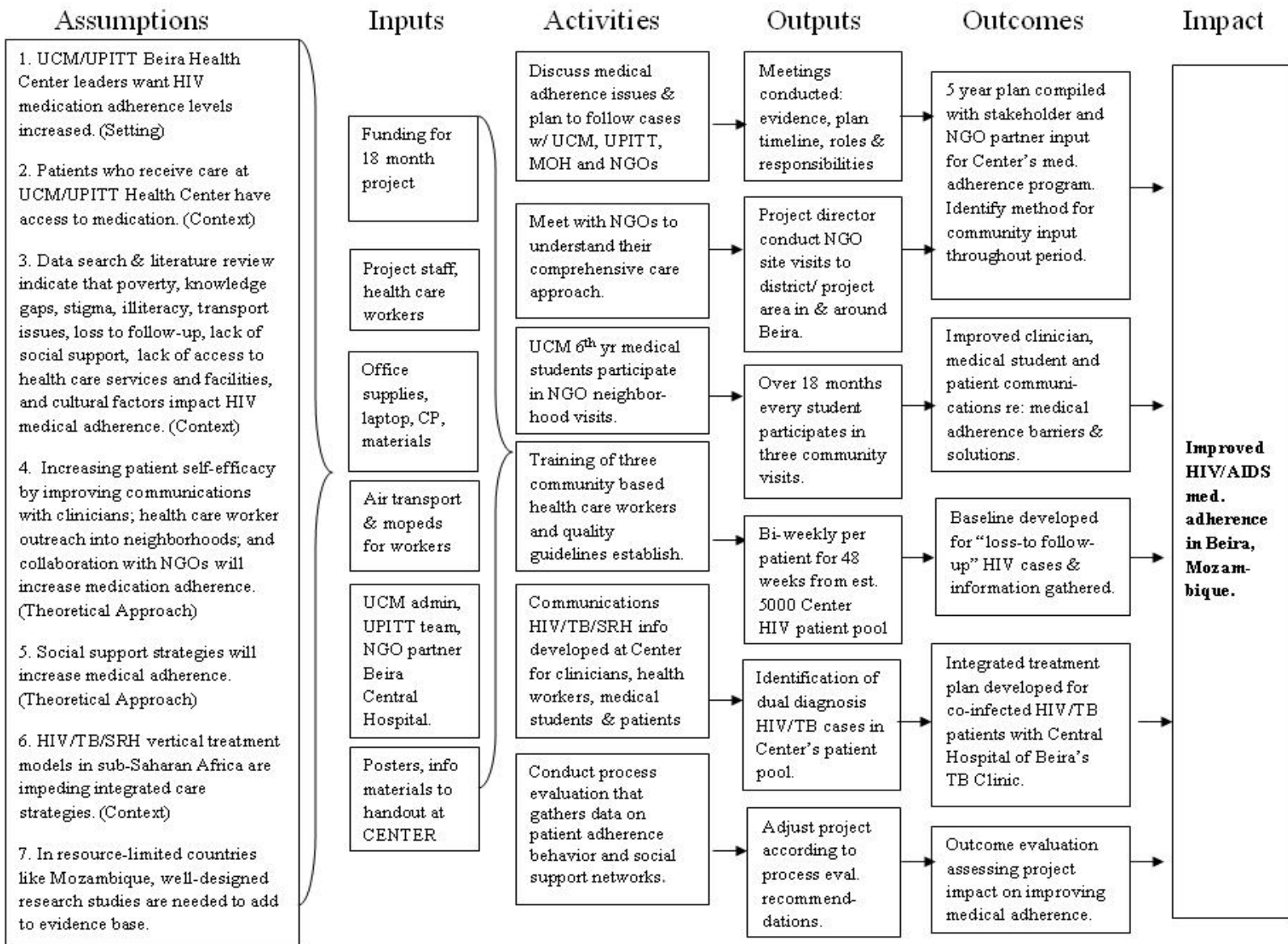
“One year ago, a woman we treated was not responding well to treatment. And I began to understand it was stress that was deeply affecting her. She had too much work, studying and parenting. They were not the usual issues associated with poverty that we usually see but these other stress factors. Issues we see here are often related to caring for children, teen pregnancy and HIV positive situations. Teen pregnancy is a big problem. We need to teach young girls. Educate them. We need to increase the level of education in Beira so that people will learn how important their treatment is to help them know better why to take their medications every day.”

“If I had a chance to speak to a group of foreign doctors, I would tell them to be ‘sensitive and sensible.’ And that ‘intervention shocking’ doesn’t work. It is important to ease into a culture.”

**APPENDIX B:**

**LOGIC MODEL: HIV/AIDS MEDICAL ADHERENCE IN BEIRA**

**APPENDIX B: Logic Model Pilot Project Design to Increase HIV/AIDS Medication Adherence in Beira, Mozambique.**



## BIBLIOGRAPHY

- Abassa AM, Todd J et al. (2008). "Good Adherence to HAART and Improved Survival in a Community HIV/AIDS Treatment and Care Programme." *BMC Health Serv Res.* Nov 20;8:24.
- Amberbir et al. (2008). "Predictors of Adherence to ART among HIV-Infected Persons: A Prospective Study in South West Ethiopia." *BMC Public Health*, Jul30;8:265.
- Bandura, Albert. (2004). "Health and Promotion by Social Cognitive Means." *Health Education and Behavior*, Vol.31 (2): 143-164.
- Bandura, Albert. (2004). "Swimming against the Mainstream: The Early Years from Chilly Tributary to Transformative Mainstream." *Behaviour Research and Therapy* 42: 613-630.
- Bandura, Albert and Bussey, Kate. (1999). "Social Cognitive Theory of Gender Development and Differentiation." *Psychological Review*, Vol. 106, No.4: 676-713.
- Bonnet MM, Pinogies LL et al. (2006). "Tuberculosis after HAART Initiation in HIV-Positive Patients from Five Countries with High TB Burden." *AIDS*. Jun12;20(9):1275-9.
- Buseh, AG, Glass, LK, McElmurray, BJ. (2002). "Culture and Gender Issues Related to HIV/AIDS Prevention in Rural Swaziland." *Health Care Women Int.* 23(2):173-84.
- Center for Disease Control. (2008). "CDC Global HIV/AIDS Activities – Mozambique," *Global AIDS Program*.
- Cohen, Sheldon et al. (2000). "Social Support Measurement and Intervention." Oxford University Press. p. 2-135.
- CSDH (2008). "Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health." Final Report of the Commission on Social Determinants of Health. Geneva, World Health Organization, 2005-2008.
- Dahab M, Charalambous S. (2008). "That is Why I Stopped the ART." *BMC Public Health* Feb 18;8:63.

- Diego, Luisa. (2007). "The Role of International Development Assistance: The Case of Mozambique." Presentation by Mozambican Prime Minister. IDA-15 Replenishment Meeting, Maputo Mozambique.
- Garrett L. 2007. "The Challenge of Global Health." Council on Foreign Relations.
- Gill CJ, Hamer DH et al. (2005). "No Room for Complacency about Adherence to ART in Sub-Saharan Africa." *AIDS*. Aug 12;19(12):1243-9
- Glanz, Karen et al. Eds. (2008). *Health Behavior and Health Education: Theory, Research and Practice*. "Key Interpersonal Functions and Health Outcomes." p. 237-264.
- Glasgow, Russell E. and Emmons, Karen M. (2007). "How Can We Increase Translation of Research into Practice? Types of Evidence Needed." *Annu. Rev. Public Health*. 28:413-33.
- Glass T. A, McAtee, M. J. (2006). "Behavioral Sciences at the Crossroads in Public Health. *Journal of Social Science and Medicine*." 62; 1650-1671.
- Gregson S. et al. (2002). "Sexual Mixing Patterns and Sex-Differentials in Teenage Exposure to HIV Infections in Rural Zimbabwe." *Lancet*. Vol. 359:9321):1896-903.
- Harries Ad, Boxshall M et al. (2006). "Providing HIV Care for Tuberculosis Patients in Sub-Saharan Africa." *Int J Tuber Lung Dis*. Dec;10(12):1306-11.
- Harvard Family Research Project. (2007). "Working with Logic Models to Evaluate a Policy and Advocacy Program." *The Evaluation Exchange XII*:1. p.9-15.
- International Planned Parenthood Federation (IPPF), University of California San Francisco, UNAIDS, UNFPA, WHO. (2009) "Sexual and Reproductive Health and HIV Linkages: Evidence Review and Recommendations" Report.
- Johnston M and Fauci A. (2008). "An HIV Vaccine: Challenges and Prospects." *N Eng J Med* 359;9.
- Kiboneka A, Nyatia R. (2009). "Combination Antiretroviral Therapy in Population Affected by Conflict: Outcomes for Large Cohort in Northern Uganda." *BMJ*. Feb 17; 338:b201.doi: 10.1136/bmj.b201.
- Lawn SD, Badri M, Wood R. (2005). "Tuberculosis among HIV-Infected Patients Receiving HAART: Long-Term Incidence and Risk Factors in a South African Cohort." *AIDS*. Dec 2;19(18);2109-16.
- MacArthur A. et al. (2001). "Characteristics of Drug Resistance and HIV among Tuberculosis Patients in Mozambique." *Int J Tuberc Lung Dis*. Oct;5(10);894-902.

- Mathunjwa, TR, Gary FA. (2006). "Women and HIV/AIDS in the Kingdom of Swaziland: Culture and Risks." *J Natl. Black Nurses Assoc.* 17(2):39-46.
- McMahon, Deborah. Associate Professor of Medicine, Medical Director of Pitt Evaluation Unit, Principle Project Director for UCM/Pitt Beira, Mozambique Project, School of Medicine, University of Pittsburgh.
- Ministerio da Saude de Mocambique. (2009). "Programa da Tratamento Antiretorviral (TARV).
- Mozambican Ministry of Health, National Directorate of Human Resources, National Plan for Health Human Resources Development, "Sufficient and Competent Health Workers for Expanded and Improved Health Services for the Mozambican People," (2008).
- National Institute of Allergy and Infectious Disease, National Institutes of Health. (2008). "Treatment of HIV Infection."
- National Institute of Allergy and Infectious Disease, National Institutes of Health. (2008). "AZT and AIDS."
- Ncama BP, McInerney PA et al. (2008). "Social Support and Medication Adherence in HIV Disease in KwaZulu-Natal, South Africa." *Int J Nurs Stud.* Dec;45(12):1757-63. Epub Jul 24.
- Nhacolo, Ariel et al. (2006). "Levels and Trends of Demographic Indices in Rural Mozambique." *BMC Public Health*, 6:291/1471-2458-6-291
- Patton, Michael Q. (2008). *Utilization-Focused Evaluation.* Sage Publications.
- Pearson C. R., Kurth A. E. et al. (2007). "Modeling HIV Transmission Risk among Mozambicans Prior to Their Initiating Highly Active Antiretroviral Therapy." *AIDS Care.* May; 19(5):594-604.
- Pearson C. R., Micek M et al. (2006). "Modified Directly Observed Therapy to Facilitate HAART Adherence in Beira, Mozambique." *J Acquired Immune Defic Syndrome.* Dec 1;43 Suppl 1:S134-41.
- Pearson C.R., Micek MA et al. (2007). "Randomized Control Trial of Peer-Delivered Modified Directly Observed Therapy for HAART in Mozambique." *J Acquir Immune Defic Syndr.* Oct 1;46 (2);238-44.
- Resnicow, Kenneth and Page, Scott E. (2008). "Embracing Chaos and Complexity: A Quantum Change for Public Health." *American Journal of Public Health.* Vol. 98, No.8.:1382-1388.

- Rouet F, Fassinou P et al. (2006). "Long-Term Survival and Immuno-Virological Responses of African HIV-1 Infected Children to HAART Treatment Regimes." *AIDS*, Nov 28;20(18);1315-9.
- Sevick, Maray Ann et al. (2007). "Self-Management of Complex Chronic Diseases." *Society of General Internal Medicine*.
- Schopper, D., Doussantousse S, Oray J. (1993). "Sexual Behaviors Relevant to HIV Transmission in a Rural African Population." *Soc. Sci. Med*; 37(3):401-12.
- Sohail, Agha et al. (2001). "The Promotion of Condom Use in Non-Regular Sexual Partnerships in Urban Mozambique." *Health Policy and Planning*. 16(2): 144-151.
- Sow PS, Otineo LF et al. (2007). "Implementation of Antiretroviral Access Program for HIV-1 Infected Individuals in Resource-Limited Settings: Clinical Results from 4 African Countries." *J Acquire Immune Defic Syndr*. Mar.1;44(3):362-7.
- Steinbrook, R. (2008). "The AIDS Epidemic: A Progress Report from Mexico City." *N Engl J Med*. 359;9.
- Trompenaars, Fons and Hampden-Turner, Charles. (1998) *Riding the Waves of Culture, Understanding Diversity in Global Business*, Second Ed. McGraw-Hill Companies.
- UNAIDS/WHO Epidemiological Fact Sheets on HIV and AIDS Update. (2008). WHO/Second Generation Surveillance on HIV/AIDS, Contract No. SANTE/2004/089-735.
- UNAIDS. (2008). *Country Responses, HIV and AIDS Estimates*.
- UNAIDS. (2008). *Country Response, HIV and AIDS Estimate: Mozambique*.
- U.S. Department of Health and Human Services.(2008). "Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents."
- Van Oosterhout JJ, Bodasing et al. (2005). "Evaluation of ART Results in a Resource-Poor Setting in Blantyre, Malawi." *Trop Med Int. Health*. May;10(5):464-70.
- Vermund et al. (2008). "Building Global Health." *Academic Medicine*. Vol. 83, No. 2.
- Vio F. (2006). "Management of Expatriate Medical Assistance in Mozambique." *Human Resource Health*. 2;4:26.
- World Health Organization, UNAIDS, UNICEF. (2008). *Epidemiological Fact Sheet on HIV and AIDS: Core data on Epidemiological Response*. Geneva: World Health Organization.
- World Health Organization. (2008). *Country Collaboration Strategy, Republic of Mozambique*. Geneva: World Health Organization.



World Health Organization, UNFPA, UNAIDS, IPPF. (2008). *Linking Sexual and Reproductive Health and HIV/AIDS- Gateways to Integration: A Case Study from Kenya*. Geneva: World health Organization.

World Health Organization. (2008). *Global Tuberculosis Control Report*. Geneva: World Health Organization.

World Health Organization. (2009). *Policy on Collaborative TB/HIV Activities*. Geneva: World Health Organization.

**KEY SEARCH TERMS:**

Acquired Immune-Deficiency, Developing Country, Clinical Follow-up, Continuity of Care, Sub-Saharan Africa, Mozambique, HIV Medication Adherence, Antiretroviral Therapy Adherence, tuberculosis, TB Control, Polygamy, Culture, Social Support

**RELEVANT WEBSITES:****HIV/AIDS and TB Co-Infection Resource List:**

<http://www.cdc.gov/tb>

<http://www.umdj.edu/globaltb/home.htm>

<http://www.aidsetc.org> (AETC National Resource Center)

[http://www.cdc.gov/tb/TB\\_HIV\\_Drugs/default.htm](http://www.cdc.gov/tb/TB_HIV_Drugs/default.htm)

<http://www.who.int/tb/challenges/hiv/en>

<http://www.aidsinfo.nih.gov/Guidelines/GuidelineDetail.aspx?MenuItem=Guidelines&Search=O&GuidelineID=211&ClassID=4>

<http://www.misau.gov.mz>

**Nongovernmental Organizations in working in central Mozambique:**

[www.columbia-icap.org](http://www.columbia-icap.org) (Columbia University)

[www.depts.washington.edu/haiuw/hai](http://www.depts.washington.edu/haiuw/hai) (Health Alliance International)

[www.fhi.org](http://www.fhi.org) (Family Health International)

[www.pathfind.org](http://www.pathfind.org) (Pathfinder International)

[www.santegidio.org](http://www.santegidio.org) (Sant' Egidio)

[www.globalhealth.vanderbilt.edu](http://www.globalhealth.vanderbilt.edu) (Vanderbilt University Institute for Global Health)

[www.wvi.org](http://www.wvi.org) (World Vision International)