HARVARD MEDICAL SCHOOL

BRIGHAM AND WOMEN'S HOSPITAL

CASES IN GLOBAL HEALTH DELIVERY

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The Academic Model for the Prevention and Treatment of HIV/AIDS

"In Home-Based Counseling and Testing (HCT), I think we may have just found a way to finally bring HIV to its knees in Kenya. Through HCT, we'll know the HIV status of every person in AMPATH's catchment area, and we'll see them before they're even patients. We see a lot of widows now – it's such an uphill battle meeting them during such a late stage in their life and disease progression. But if we know their status before they're even sick, it also means we reach the husbands early while they're still alive. And if you don't let mom and dad die, you don't have orphans. It's an ethical imperative to stop the cascade of tragedy left behind by the pandemic. Moving 'upstream' with HCT will cost AMPATH far less to provide HIV care and achieve far greater outcomes. From there, if we can show it can be done with HIV, we can fundamentally change primary care at the village level in Kenya."

-Dr. Joe Mamlin, Field Director, IU-MU Partnership

The Academic Model for the Prevention and Treatment of HIV/AIDS (AMPATH) –the product of a partnership between Indiana University School of Medicine in the United States and Kenya's Moi University School of Medicine -- had been working to provide care and treatment for HIV/AIDS patients in Western Kenya since 2001, growing from 40 patients to a cumulative enrollment of over 68,000 by 2008. Yet, in 2007, 85% of patients in AMPATH's catchment area of 1.8 million still did not know their HIV status. In an effort to identify patients earlier and improve prevention, AMPATH began a HIV Home-Based Counseling and Testing (HCT) pilot project; community health workers went door-to-door offering HIV education, counseling, and testing to rural residents in Kosirai Division.

In April 2008, Dr. Sylvester Kimaiyo, AMPATH Program Manager, and Dr. Joe Mamlin, Field Director of the Indiana University-Moi University Partnership (IU-MU Partnership), reflected upon the results of AMPATH's recent HCT pilot project. In three months, the HCT team reached over 98% of the estimated 36,000 people in Kosirai Division. Over 90% of the 20,000 at risk for HIV infection got voluntary testing for HIV.

Kimaiyo and Mamlin were excited about the implications of the pilot's results for AMPATH and were planning to rollout HCT to AMPATH's entire catchment zone within two years. They were hopeful that

Peter Park, Arti Bhatt, and Joseph Rhatigan prepared this case with assistance from Julie Rosenberg and Maria May for the purposes of classroom discussion rather than to illustrate either effective or ineffective health care delivery practice.

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AMPATH's HCT program could be integrated into the Ministry of Health's broader primary care agenda. But, there were a number of issues to consider: As AMPATH's patient enrollment already approached 2,000 new patients per month, would HCT lead them to grow too quickly and sacrifice quality? AMPATH was Kenya's largest and fastest growing antiretroviral therapy (ART) provider; many considered AMPATH's core competency to be clinic-based HIV treatment. Did AMPATH have the human resources, funding, and technological expertise to provide field-based services? If so, how could AMPATH quickly and efficiently accomplish this shift?

Overview of Kenya

Kenya is located along the equator in East Africa (see **Exhibit 1** for map). Of the 40 ethnic groups that live in Kenya, the three largest groups comprise nearly half of its total population. There are almost 60 indigenous languages; Kiswahili, Kenya's national language, is widely spoken throughout most regions of the country.

Kenya gained independence from Great Britain in December 1963 under the leadership of Jomo Kenyatta, who served as Kenya's first president until his death in 1978. Vice president Daniel arap Moi succeeded Kenyatta and remained Kenya's president until 2002 when he was constitutionally banned from re-running for office. Mwai Kibaki became Kenya's third president in what was widely considered a free and democratic election. In December 2007, Kibaki was re-elected for a second term in a highly controversial election. Though Kenya was historically one of the more politically stable countries in the region, amidst allegations of vote-rigging and corruption, riots broke out across the country in the months following Kibaki's reelection, resulting in 1,300 deaths and over 600,000 internally displaced persons.[1]

Seventy-nine percent of all Kenyans lived in rural areas in 2007, the majority of whom derived their primary income from small-scale subsistence agriculture. Only an estimated 20,000 farmers participated in high value agriculture activities, and, as a result, approximately 47% of all Kenyans lived below the poverty line. Official unemployment rates hovered around 40% in 2007.[2] Food insecurity was a common occurrence in many Kenyan households. Overseas development assistance in 2004 contributed about 6%, USD 635 million, of Kenya's gross national income.[3]

In 2008, Kenya had 15 airports with paved runways, one national port, and a railway system linking Mombasa to inland cities such as Nairobi, Eldoret, and Kisumu. The majority of Kenya's roadways were in rural areas. Paved tarmac roads accounted for 14% of Kenya's total road infrastructure in 2004.[4]

Basic Socioeconomic and Demographic Indicators [1]

INDICATOR		YEAR
UN Human Development Index ranking	147 out of 182	2007
Population (thousands)	35,817	2005
Urban population (%)	20.7	2005
Drinking water coverage (%)	57	2006
Poverty rate (% living under USD 1.25 per day)	47	2005
Gini index	48	2005

[1] This data was comprised from the following sources: United Nations (UN), UNICEF, World Bank, United Nations Educational, Scientific, and Cultural Organization (UNESCO).

INDICATOR		YEAR
GDP per capita in PPP (constant 2005 international dollar)	1,470	2008
GDP per capita in constant 2000 USD	464	2008
Literacy (total, female, male)	73.6, 70.2, 77.7	2000

Health in Kenya

Kenyan life expectancy fell from a peak of 58 years in 1987 to 52 years in 2004, due in large part to increased AIDS-related adult mortality.[2] The leading cause of deaths among all persons in 2002 were HIV/AIDS (38%), diarrheal diseases (10%), tuberculosis (7%) and malaria (5%).[5]

AIDS was first documented in Kenya in 1984, and by 2007 between 1.5 and 2.0 million people were living with HIV/AIDS.[2] National prevalence rates were around 6.7% in 2005, having remained fairly constant since the early 1990s. HIV prevalence rates were highest in the westernmost areas of the country. Approximately 65% of Kenyan adults living with HIV/AIDS in 2003 were women, and over 70% lived in rural areas.[6] By 2000, over one million children had lost at least one parent to AIDS.[7]

Approximately 52% of new tuberculosis (TB) cases in Kenya were found in patients who were HIV-positive.[8] TB was the leading cause of death among HIV-infected persons worldwide, and like many high-burden countries, TB incidence in Kenya increased steadily with the rise of HIV/AIDS.[9] In 2006, Kenya ranked 10th among the 22 highest TB burden countries as designated by the World Health Organization.[10]

Health System and Epidemiologic Indicators [2]

INDICATOR		YEAR
Average life expectancy at birth (total, female, male)	54, 55, 53	2008
Maternal mortality ratio (per 100,000 live births)	560	2005
Under five mortality rate (per 1,000 live births)	128	2008
Infant mortality rate (per 1,000 live births)	81	2008
Vaccination rates (% of DTP3 coverage)	81	2007
Undernourished (%)	32	2004
Adult (15-49 years) HIV prevalence (per 100,000)	6,725	2005
HIV antiretroviral therapy coverage (%)	26	2006
Tuberculosis prevalence (per 100,000)	319	2007
DOTS coverage (%)	100	2007
Malaria cases (per 1,000)	310	2006
Government expenditure on health per capita (international dollar, USD)	30, 14	2007
Total health expenditure per capita (international dollar, USD)	72, 34	2007

[2] This data was comprised from the following sources: World Health Organization, UNICEF, UN.

INDICATOR		YEAR
Government expenditure on health as a % of total government expenditure	9.7	2007
Physician density (per 10,000)	1	2002
Nursing and midwifery density (per 10,000)	12	2002
Number of hospital beds (per 10,000)	14	2006

Health System

The Kenyan Ministry of Health (MOH) directed public health activities in the country, managing approximately 52% of all health facilities, with private and non-profit entities managing the remainder. Two-thirds of Kenyan health facilities had an on-site water source, but only 25% had year-round access to water.[11] Fifty percent of health facilities had a regular supply of electricity or a backup generator; among hospitals, the percentage was almost 90%.[12]

Approximately 90% of Kenyan health facilities charged user fees for adult curative services.[13] An estimated 40% of rural households had no access to health services in 2000.[6]

Kenyan health providers were comprised of medical officers (MOs), equivalent to MDs in the US; clinical officers (COs), health practitioners with three years of medical training, qualified to attend to patients and conduct minor surgeries; and nurses (see **Exhibit 2** for more on composition of health care workers in Kenya). Only 12% of the registered physicians residing in Kenya worked in the public sector in 2000, and over 80% of all physicians practiced in urban areas.[11] Kenya had a shortage of qualified medical professionals as many local health workers left for opportunities abroad.

National Tuberculosis Control Program The Kenyan MOH's Department of Leprosy, Tuberculosis, and Lung Disease (DLTLD) coordinated all TB treatment, monitoring, and drug procurement activities with support from international agencies such as the Global Fund for TB, AIDS, and Malaria. The DLTLD managed the only laboratory with drug susceptibility testing for multidrug-resistant tuberculosis (MDR-TB) and extremely drug-resistant tuberculosis (XDR-TB) in the country and analyzed TB cultures at no charge for care providers. Few providers, however, accessed these services due to transportation and tracking limitations. Kenya followed Directly Observed Treatment Short-course (DOTS) protocols, and 100% of the population had access to DOTS since 1996. In 2006, the DOTS treatment success rate was 82.4%.[14] TB medications were provided at no charge to patients.

National HIV Program The government's early response to HIV included screening blood donations and distributing condoms. For many years, however, highly visible religious leaders maintained that AIDS was a result of immorality and divine punishment for the promiscuous, and it was not until 1997 that the Parliament approved a national policy supporting programs preventing the transmission of HIV and services for those affected by the virus. The number of condoms distributed increased from 18 million in 1991 to over 60 million in 2000. In a 1998 survey, 40% of men reported using a condom in their last extramarital sexual encounter.

Starting in 1999, the National AIDS Control Council (NACC), a department under the MOH, coordinated all HIV care activities in Kenya. The NACC's goals included reducing HIV prevalence by 20-30% by 2005, increasing access to care and support for people living with HIV/AIDS (PLWHA), and strengthening institutional capacity and coordination at all levels.[7] In 2001, the government was providing treatment for over 50,000 cases of sexually transmitted infections (STIs) each month in the hopes of decreasing HIV transmission.

The President's Emergency Plan for AIDS Relief (PEPFAR), the US government program for international HIV control, was a major funder of HIV care providers in Kenya. PEPFAR allocations to Kenya's HIV prevention, treatment and care programs almost quadrupled from the original USD 92.5 million in 2004 to USD 368.1 million in 2007.[15] PEPFAR-funding recipients provided services in their respective catchment areas according to PEPFAR guidelines.

The Indiana University–Moi University Partnership

The Indiana University–Moi University Partnership (IU-MU Partnership)—an academic medical partnership between US-based Indiana University School of Medicine (IUSM) and Kenya's Moi University School of Medicine (MUSM)—was founded in 1989. Moi Teaching and Referral Hospital (MTRH)—a government teaching hospital--- served as the site of most of the partnership's clinical activities. In 2001, the partnership established the Academic Model for the Prevention and Treatment of HIV/AIDS (AMPATH).

Moi University School of Medicine

MUSM was founded in 1985 as Kenya's second medical school. The Government of Kenya asked Dr. Haroun Mengech, who was a professor at the University of Nairobi at the time, to be the Founding Dean. Mengech accepted the offer under two conditions. He wanted to secure the facilities for MUSM's campus in Eldoret, Kenya's fifth-largest city, prior to admitting students, and he requested permission to implement a new, problem-based curriculum.

Following an assessment of the District Hospital in Eldoret, a grossly underfunded institution with few written patient records, the Kenyan government designated the hospital a National Teaching and Referral Hospital, a status that would provide more federal funding and allow MUSM more autonomy in its work there. The hospital was renamed the Moi Teaching and Referral Hospital (MTRH). Mengech's request for the problem-based teaching within a Community-Based Education and Service curriculum drew considerable debate, but the government eventually agreed, and the first class of students arrived on campus in October 1990

Indiana University School of Medicine

IUSM was founded in 1903, "to advance health in the State of Indiana and beyond by promoting innovation and excellence in education, research, and patient care.". In 1988, three IUSM professors, Drs. Bob Einterz, Charlie Kelley, and Joe Mamlin, began talking about starting an academic partnership between IUSM and an internationally-based medical institution. Each had an international experience early in his career that had impacted him profoundly. Speaking of his year in Croix Fer, Haiti, Einterz said:

> That year was a huge baptism by fire for me….I learned first-hand about the concept of primary health care, a physician's role in the community, and the role of economics and culture in health care. We worked on income generation, family planning, and creating mothers' groups. I learned about the critically important role of women in development. Overall, the experience working side-by-side in the community taught me both about the complexity of delivering quality public health and about the importance of community to tackle these problems, both in Haiti and in our own communities. These were things not covered in med school, and they hit me in the face in rural Haiti.

The doctors spoke with the IUSM dean about getting their students involved. But, "I think it is fair to say that our primary motivations for getting involved had relatively little to do with creating opportunities

for our students," Mamlin explained. "Rather, we were about doing our part to use our gifts, talents, and positions of privilege as physicians and teachers to improve health for the human family."

Forming the Partnership

Mengech, Mamlin, Kelley, and Einterz first met in 1988 when MUSM was preparing for its first cohort of medical students. "We were very purposeful in seeking a government sponsored medical school and health system like MUSM and MTRH (as opposed to a mission hospital or other NGO)," Mamlin explained. As MUSM was a newly established medical school, the IUSM physicians saw a unique opportunity to build a medical system "from the ground up" in Kenya. IUSM's role was "to be a cog in the wheel to help start out Kenya's second medical school," while MUSM's role would be to provide a pathway to help develop IUSM's international health footprint.

IUSM and MUSM formalized the IU-MU Partnership in 1989 with a memorandum of understanding that included their tripartite mission to (1) develop leaders in health care for the US and Africa, (2) foster the values of the medical profession, and (3) promote health for the human family through education, care, and research. Above all, the group agreed to "lead with care." Mengech, Mamlin, Kelley, and Einterz led the Partnership. With a USD 25,000 grant from a private donor, Einterz arrived in Eldoret in July 1990 and joined the small group of faculty members at MUSM.[16]

Activities 1990-2000

In its first decade, the IU-MU Partnership focused primarily on building primary care capacity (see **Exhibit 3** for chronology of infrastructure and capital development). Activities ranged from physical infrastructure improvements to advances in clinical care processes. The Partnership developed and implemented sub-Saharan Africa's first electronic health record in a rural health center; trained numerous health workers and leaders, including two former Deans of the Moi School of Public Health; helped develop MUSM's residency training programs in Medicine, Pediatrics, and Family Medicine; developed a core of clinical and health services researchers and a research infrastructure to manage grants and assure ethical research; bolstered the health services capacity of several hospitals and health centers; and enhanced community-based services, including Kenya's immunization program, in Northern and Western Kenya. The IU-MU Partnership's surgery efforts included the construction of a number of operating suites at Moi Teaching and Referral Hospital (MTRH), faculty development programs between each school's respective surgery divisions, and support for complex surgeries to be done abroad. By 1997, the MTRH was offering tertiary referral services for the almost two million people living in the western part of the country.

The organization of the IU-MU Partnership model rested upon counterpart relationships. At the faculty level, though research made up a relatively small component of the partnership, papers were co-authored by faculty of both schools. IUSM faculty visiting Kenya worked under the direction of the MUSM department head and shared clinical care, teaching, and research responsibilities with their Kenyan counterparts. Visiting MUSM faculty to the US had similar responsibilities with their counterpart departments at IUSM. At the departmental level, the Division of General Internal Medicine at IUSM encouraged its faculty to participate in the program by providing year-long paid sabbaticals for one faculty member per year to serve as "Team Leader" in Eldoret. Team Leaders lived in Kenya and were responsible for maintaining IUSM's operations in Eldoret in addition to performing their care, teaching, and research duties. Of the 120 faculty participating in the IU-MU Partnership's faculty exchange programs in 2000, 40 were Kenyan nationals.

Within a few years of its founding, when MUSM students reached their clinical years, the IU-MU Partnership began student exchange programs. Students from both IUSM and MUSM travelled to their counterpart school for one to six months, staying in dormitories. Beginning in 1997, other North American medical school students joined the IU-MU exchanges, culminating in the formation of the America/sub-Saharan Africa Network for Training and Education in Medicine (ASANTE) Consortium (see **Exhibit 4** for list of ASANTE members).

By 2000 the IU-MU Partnership gave more scholarships -- an average of 50 need-based, full-tuition scholarships--to African medical students than any other school in Africa. ASANTE partners also contributed funding to provide academic achievement scholarships and work-study programs for MUSM students. The IU-MU Partnership supported an average of 16 MUSM students to participate in international exchange programs abroad at ASANTE Consortium partner institutions per year.

Financing for the IU-MU partnership came from various sources. Room rates were charged to cover general expenses, including all non-faculty administrative positions. Small dues that ASANTE member schools paid also contributed. Most medical centers hosted visiting Kenyan students in-kind, and the Division of General Medicine paid the salaries and benefits for faculty Team Leaders abroad in Kenya. The IU-MU Partnership received private philanthropic dollars as well, especially to pay for Kenyan students to study abroad in Indianapolis.

Confronting the HIV Epidemic

Despite their progress, by 2000 the IU-MU Partnership was in the midst of a crisis: the entire Kenyan public health system was buckling under the weight of HIV/AIDS. Patients with late-stage AIDS occupied over half of all hospital beds nationwide, and there were often two or three patients to a bed at MTRH.[7] While there had been 85 HIV-related deaths on the medicine wards at MTRH in 1992, there were over 1,000 deaths in 2000. Neither MTRH nor any other public sector facility had initiated ART for any of its patients. No IU-MU Partnership physicians were trained in infectious disease; drug costs for ART were around USD 10,000 per patient per year while the average Kenyan income was only USD 411 per year; and administering highly active antiretroviral therapy (HAART) would require chronic care, shifting the Partnership's focus and requiring a new delivery system. A number of prominent public health authorities on the international stage were debating the value of providing ARTs to Africans, reinforcing MTRH's concerns.[17]

Around that time, Mamlin retired from his 32 year career as an internist at IUSM and returned to Kenya to serve as Team Leader for the first time since 1992. One evening in September 2000 at the MTRH, Mamlin found one of his MUSM medical students, Bernard Olayo, sitting somberly by an AIDS patient's bed, feeding him with a spoon and speaking to him quietly in his native language of Kiluo. Mamlin asked Bernard if he knew this patient. Bernard responded that he did; the patient's name was Daniel Ochieng, his close friend and medical school classmate. Mamlin was stunned. While Mamlin was aware of the crippling effects HIV/AIDS was having in Eldoret and the severe psychological toll it was taking on the doctors, residents, and students, he was unprepared for Bernard's response. Mamlin recalled:

> Daniel was just one of the faceless, dying people in the ward before we discovered him serendipitously. There were so many others. As far as I was concerned, for IU's involvement with MU, it was either go home or change… I'm not saying the IU-MU program couldn't have continued, but I couldn't, not after I saw Daniel. I just couldn't see a situation where I was supposed to be a teacher and role model to these students, and do nothing and let this young man die in front of his medical peers. It was just such a negative message.

Mamlin discussed his intention to treat Daniel with the leadership at IUSM, MUSM, and MTRH. "The anguish of watching a colleague die of a treatable illness makes us try our best to do something--to do

nothing forsakes hope; yes, the question is where do we draw the line, but perhaps, in our asking, we will find that we should never draw it," Einterz wrote in an email to Mamlin.

Supporters from IUSM and Indianapolis-based AIDS agencies helped Mamlin gather enough medicine to initiate ART for Daniel. Within six weeks, Daniel was strong enough to be released from the hospital. To his friends, Daniel had come back from the dead.

Launching AMPATH

In 2001 the IU-MU Partnership secured a private donation to treat another 40 patients and explore the scale-up potential for ART. Mamlin committed to spend an additional year in Kenya and facilitate the pilot's launch by overseeing medical and counseling care at MTRH and a rural satellite clinic in the nearby village of Mosoriot. This pilot project became known as AMPATH. Mamlin explained:

> From my perspective, if AIDS was the predominant disease we were seeing, and if we were going to accomplish our mission to build primary care, treating HIV – even if it hadn't been done yet – should be something so basic to medical training in Kenya that to not take it on would have made us tangential.

While Mamlin began treating MTRH's first patients from a briefcase full of donated medicines, Dr. Sylvester Kimaiyo, a MUSM internist, was studying at IUSM. Kimaiyo was learning about HIV treatment:

> What you must understand is how terrified everyone was of HIV then in Kenya, even the doctors. No one could afford the treatment, and it was like a death sentence. But I saw it could be treated in the US – and I couldn't wait to get back to take this to Kenya..
>
> I went for two years to IU, which is where I did my first HIV medicine. Then Joe called from Kenya to say we are starting HIV treatment in Eldoret. I was very excited to hear this. Joe was running the pilots almost by himself at the time; I wanted to champion this initiative from the Moi end.

Kimaiyo came back to MUSM in 2002 while AMPATH was transitioning from a regional pioneer into the fastest growing ART provider in Kenya. Cumulative patient enrollment accelerated from 41 patients in 2001, the year AMPATH began ART, to several hundred by 2002. Since AMPATH was one of the first to provide HIV care in sub-Saharan Africa, a significant proportion of its new patients had already developed advanced AIDS. They had extremely low CD4 counts, were wasting, and had sold their assets to purchase medical treatment. While some patients initially paid for treatment and others got support from private donations, by June 2003, the cost of ART had come down to USD 23 per month with generic drug manufacturing, and AMPATH received over USD 1 million to support the costs.

Mamlin extended his stay indefinitely upon Kimaiyo's return. By June 2003, AMPATH had treated 1000 HIV patients.[18] In early 2004, AMPATH was operating out of eight Ministry of Health (MOH) health centers and received a five-year, USD 15 million grant as part of a multicountry PEPFAR award.[19],[20] Patients began entering treatment earlier and coming to AMPATH with higher CD4 counts (see **Exhibit 5** for more on the change in the patient characteristics).[18]

Building the Foundation

The first 10 years of the IU-MU Partnership were critical to allowing AMPATH to be successful. Einterz explained, "They cemented the basic principles that guided why we were there and how we would behave—this notion that our ego was not on trial. This isn't about us… our job is to do what we can to empower our Kenyan counterparts."

AMPATH did not have a designated legal status as a formal entity in Kenya; it neither owned nor managed its own resources or personnel. IUSM, MUSM, MTRH and MOH shared resources on the basis of

trust. MRTH Director commented, "It has been helpful for AMPATH to work 'between organizations' like the school of medicine and the MTRH. When one organization's policy is a barrier, the other can sometimes create a more flexible environment. In the space between organizations nobody is really 'in charge' and the program can make progress really rapidly."[21]

AMPATH effectively was able to hire its own dedicated staff through a seconding process. Seconding involved recruiting health professionals from the MOH and MUSM and paying the MOH to support an additional MOH position. This newly created ministry position either assumed the seconded health professional's previous clinical responsibilities or directly assumed the new AMPATH responsibilities. Salaries for AMPATH staff at all levels were usually comprised of a combination of base salary and performance-based incentives for high quality work. Staff members were happy to be part of AMPATH since they felt it was "an organization that really worked." They had strong relationships with one another and with their patients.[21]

By 2008, AMPATH supported 951 employees (see **Exhibit 6** for AMPATH staff numbers and breakdown). Seventy-six percent of all AMPATH staff worked in AMPATH's clinical care or support service programs. Of AMPATH's 465 clinical staff, only seven were medical doctors. Medical officers (MOs) were accessible by telephone at any time of day; they monitored and supported clinical officers (COs) through site visits once or twice a week and were responsible for the most clinically complex patients. Half of all AMPATH clinical care staff were COs or nurses. COs and nurses functioned as AMPATH's primary clinical care providers and managed over 90% of AMPATH's patients. COs prescribed and monitored most of the ART to patients. Over 98% of all personnel designated to AMPATH were Kenyan. Einterz explained, "We are about creating opportunities. Unless we are able to do that, we are not going to get the Kenyan leadership we need. Perhaps the scarcest resource we see, and that Kenyans face, is leadership." AMPATH programs were either led directly by Kenyan staff or co-directed by Kenyan and expatriate ASANTE Partner staff (see **Exhibit 7** for team leader bios).

AMPATH Care Delivery

Care and Services

Clinical Services AMPATH offered voluntary and provider-initiated HIV counseling and testing services, ART and treatment for opportunistic infections, oncology, drug adherence monitoring and follow up, reproductive health interventions and antenatal care, and TB testing and treatment services. Using an integrated care model, AMPATH clinical care providers worked closely with social workers, nutritionists, psychosocial support counselors, and micro-enterprise development officers (see **Exhibit 8** for organizational chart)..

Psychosocial Support and Outreach Each AMPATH site had a network of support groups for people living with AIDS, discordant couples, and families affected by HIV/AIDS. Daniel Ochieng and Claris Abiero, two of AMPATH's first patients led the support groups and were responsible for counseling, adherence monitoring, and follow-up. Due to the increased patient enrollment, in 2005 the group separated into Psychosocial Support and Adherence Monitoring departments known together as the Outreach Group.

Prevention of Mother-To-Child Transmission (PMTCT) In 2007 AMPATH screened roughly 35,000 pregnant women for HIV and provided PMTCT services at nine of its clinics. COs, nutritionists, and nurses worked with traditional birth attendants in remote communities to promote PMTCT. All HIV-positive mothers started full-course ART during childbirth; mothers with CD4 counts above 350 were stopped after the baby was weaned. Once the child was born, AMPATH-trained traditional birth attendants and PMTCT

personnel provided mothers with information on infant feeding practices to reduce the risk of HIV transmission. Until 2008, AMPATH PMTCT offered all mothers free formula to encourage formula feeding of infants. AMPATH's formula-feeding program was discontinued due to the high costs of formula, emerging research in other parts of sub-Saharan Africa, and the lack of access to clean water. AMPATH closely monitored exposed babies for evidence of HIV seroconversion.

TB Control Formal TB control efforts began in 2004 with the TB Projects Office, a research and care initiative led by Brown University Medical School, the Department of Tuberculosis and Lung Disease (DLTLD) and AMPATH. Dr. Jane Carter, a pulmonologist at Brown, and Dr. Bernard Langat of the DLTLD oversaw all TB Projects Office efforts. The TB Projects Office focused on TB screening, building lab capacity, and integrating TB care with HIV care services. The TB Projects Office had the same catchment area as AMPATH, and it worked closely with AMPATH. The TB Projects Office was independent of AMPATH, however, and its services covered all persons living with TB in AMPATH's catchment area regardless of their HIV status.

The TB Projects Office used community-based "cough monitors" to actively screen for TB in residential communities. In 2007, the program screened 40,000 people. In AMPATH's catchment area, rapid testing at the DLTLD-designated clinics found that approximately 50-68% of smear-positive patients were co-infected with HIV.

The TB Projects Office relied on AMPATH's vehicles to collect and transport sputum samples throughout its rural locales to a central packing facility at AMPATH. Samples were then aggregated, packed, and shipped to Nairobi for the DLTLD to test at no charge. The TB Projects Office tracked each sputum sample and communicated lab turnaround times, lab results, and new MDR-TB case findings with DLTLD officials in Nairobi. In 2004, the TB Projects Office opened its own Mycobacteriology Reference Lab at AMPATH and MTRH, creating the second TB culture facility in Kenya. Total monthly costs for all TB Projects Office services were approximately USD 10,000.

Social Work Social workers in each AMPATH clinic screened patients for eligibility of enrollment into AMPATH's food, economic, and social support programs. Though most social work encounters were clinic-based, social workers made follow-up visits at patients' homes. A total of 216 field trips were made by 18 social workers per month on average, visiting between three to 12 homes per trip, depending on the distance between homes. Only patients living within AMPATH's catchment zones were eligible for home visits due to geographical barriers.

Orphans and Vulnerable Children To address the needs of the growing population of children orphaned by AIDS, AMPATH created the Orphans and Vulnerable Children (OVC) program in 2006. Programs included provision of school fees, clothing, food, medicine, and shelter for children and training of caregivers and community leaders. In April 2008, OVC provided support for approximately 9,000 children.

Food Security and Nutritional Support AMPATH realized early on that malnutrition was a significant hurdle.[22] Social workers and nutritionists found approximately 20-50% of new AMPATH patients lacked an adequate food supply, depending on the area.[23] The group began providing nutritional "prescriptions" for its patients in 2002 through its HAART and Harvest Initiative (HHI).

AMPATH operated three HHI production farms covering a total of 25 acres. Alongside UN World Food Program donations, AMPATH's HHI farms fed approximately 30,000 people per week. Patients collected the food once a week from food distribution points throughout AMPATH's catchment area. AMPATH Food Distribution Group operated its own fleet of cold storage trucks and an information system

designed by Purdue University industrial engineers and was responsible for all distribution and monitoring logistics.

A standard food package consisted of 1.5kg corn, 0.45kg legumes, 0.13kg vegetable oil, 500mL milk, and 0.375kg of high-nutrient corn-soy blend per person per week. Additionally, HHI provided 1.5kg green vegetables, 0.25kg of other vegetables such as carrots and tomatoes, and 3-12 eggs per eligible household each week. All vegetables and perishable foods were sourced from HHI production farms and the patient out-grower network. The UN World Food Program supplied dry goods. Daily per patient cost was USD 0.27 considering the value of the food and fixed costs.

Nutritionists at each AMPATH clinic assessed incoming patients' body mass index (BMI), level of immune suppression, socioeconomic status, and access to food in terms of quantity and quality. They used this assessment to prescribe food packages to food insecure patients as well as their family members for six months.[22] Nutritionists assessed over 130,000 patients and their dependents in 2007; they counseled 61,535 of them and enrolled 9623 new patients into the food program.[22] Patients were not withdrawn from the HHI program until they could provide food for themselves and their families without AMPATH assistance. Eighty-three percent of patients over 19 years of age were successfully discharged from the food program after the first six months.[22]

Economic Security The Family Preservation Initiative (FPI) was responsible for economically vulnerable patients and for weaning patients off nutritional support after six months. Approximately 5,500 patients participated in FPI in 2007. Social workers, nutritionists, and nurses were all authorized to refer patients to FPI. FPI provided a variety of services to enable self-sufficiency. As most rural patients' primary incomes were derived from agriculture, FPI's rural services focused on crop selection advice for high value crops, agricultural extension support, and facilitating linkages to higher value markets for small scale growers. FPI used AMPATH's Food Distribution collection points to collect patient farmers' goods and used vehicle infrastructure to help patient farmers access markets they otherwise could not. Patients enrolled in FPI's agriculture programs averaged between over USD 805 and USD 2,211 per quarter acre per growing season, a substantial increase over their prior activities.

For urban patients, FPI provided microfinance services and business-skills training to enable small businesses. Finally, FPI also directly managed small enterprises that provided employment to patients such as a handicraft workshop and a restaurant, and it facilitated employment for patients on AMPATH's HHI farms and contracts for patients to supply HHI farms.

Information Management

As AMPATH developed, it invested heavily in internal logistics capabilities and developing information management technology. Einterz recognized, "We would never move forward ourselves unless there was fundamental control over the administrative processes."

The Data Management Group at AMPATH initially adapted the IU-MU Partnership's Access database created in the late 1990s to create AMPATH's chief information system, what became known as the AMPATH Electronic Medical Record system (AMRS). AMRS was the first of its kind in sub-Saharan Africa. AMPATH clinicians recorded information from each clinical visit at AMPATH on paper encounter forms, including adherence, medications, symptoms, physical exam findings, missed appointments, HIV risk behaviors, co-morbid conditions and treatments, and socioeconomic data. Vehicles transported the paper encounter forms to a centralized data entry office at the AMPATH Center. Average turnaround time for paper encounter form data to be entered into AMRS was one to two days.

In 2006 AMRS was redesigned to allow geographically remote clinical sites to efficiently share summary data and clinical information Also that year, the team started working in collaboration with software developers from the Medical Research Council of South Africa and Partners In Health to create a shareware electronic medical record system called Open MRS, a framework other programs in the developing world could build on for clinical and research purposes.[20, 24] AMPATH began moving data entry to each clinical site. The database could generate reminders, identify patients with missed appointments, and provide follow-up information for adherence monitors to track patients.

AMPATH data management staff used AMRS to generate monthly summary reports for care provider teams (see **Exhibit 9** for monthly enrollment report) and AMPATH management used AMRS data to identify patient trends, inform strategic activities, build research capacity, and support new funding requests. When AMPATH noticed a trend in data showing high rates of rabies in one community, a lack of vaccinations in another, and a cluster of STDs, the group found the rabid dog, sent a nurse to provide education and immunizations where it was lacking, and identified and treated the man at the center of the STD ring.[25]

In 2007 AMRS had 20 million distinct observations on record for over 700,000 AMPATH visits. "Some people see money or time spent on medical records system as taking away from drugs and treatment, but that is a false dichotomy," AMPATH's director of research said. "Records are part of a health system—take away records from health care and it is like building a locomotive but making no track for it to run on."[25] One challenge to AMRS was that many departments had independent databases not integrated with other departments. The lack of internet and electricity infrastructure in Western Kenya were additional challenges to AMRS integration efforts.

Logistics

MTRH in collaboration with the Purdue University School of Pharmacy supported the AMPATH Pharmacy. The Pharmacy Department Head had a team of six assistants and 22 technicians. PEPFAR funded over 98% of ART needs. The Mission for Essential Drugs and Supplies (MEDS) provided procurement and delivery logistics for PEPFAR-supported ART, and, with the exception of emergency cases, MEDS primarily shipped ART drugs to the AMPATH Center in Eldoret. AMPATH procured non-PEPFAR funded medication from in-country suppliers.

AMPATH stored ART supplies in the basement of the AMPATH Center. Staff repackaged ART supplies into smaller volumes for distribution to the HAART Pharmacy, which served Eldoret-based patients from the first floor of the AMPATH Center, and to storage facilities located at each rural clinical site.

AMPATH Pharmacy kept a one- to two-month safety stock of ART at all clinics. Pharmacy technicians at each rural clinic recorded beginning and ending drug inventory levels and were responsible for forwarding regular inventory reports to the HAART Pharmacy. The HAART Pharmacy input the data into an IT system developed by Management Sciences for Health (MSH) that forecasted inventory needs. Forecasts were based on the actual number of patients seen and on consumption data for the month and were sent to MSH when complete. MSH administered all approval processes for ART reorders with MEDS on behalf of AMPATH.

During the post-election riots in late 2007 and early 2008, AMPATH was able to provide ART to all patients who visited its clinics and maintain its record of never having a stockout. However, many of the roads between clinics were blocked, leaving clinics dependent on safety stock until vehicles were able to resume transportation. ART medication reorders had been filled within 24 to 48 hours. In early 2008, the AMPATH Pharmacy began to decentralize its drug supply to minimize its supply chain exposure to

external shocks and to decrease fuel costs. Deliveries were reduced from once per day to once per week. In response, all rural clinics increased the ART storage volume at their sites. By April 2008, rural clinics averaged six weeks inventory, with more remote clinics approaching inventory levels of two months.

AMPATH managed a fleet of 40 vehicles and two motorcycles for the transport of all drugs, lab samples, clinical forms and food between Eldoret and rural satellite clinics. Vehicles also aided in emergency care and transported clinical, social worker, outreach, and FPI personnel. Monthly operational costs in 2008 were approximately USD 19,355 in fuel and an additional USD 24,194 in service, maintenance, and insurance expenses.

AMPATH Center Patient Flow

Patient Referrals Most AMPATH patients came from five sources: MTRH affiliated primary care clinics, antenatal clinics, community testing services, MOH-administered voluntary counseling and testing (VCT) facilities and TB clinics, and independent referrals from other area care providers. AMPATH and MTRH used provider-initiated testing and counseling (PITC) protocols at all their affiliated clinical sites. AMPATH's Community Mobilization and Prevention Group tested a smaller number of patients through community-based outreach efforts. The group primarily worked in rural centers and residential slums surrounding Eldoret. In addition, during concerts and sporting events, 10-12 AMPATH counselors educated, counseled, and tested an average of 800 residents about HIV/AIDS, referring those who were HIV positive for treatment.

Registration Patients seeking HIV testing entered an AMPATH clinic and were referred to a central registration desk. At the desk, a data clerk assigned each patient with a unique patient identification number which was later input to AMRS. Upon registration, a counseling nurse did a rapid HIV test. After 10 minutes, the patient was given the results. If the patient was negative, he or she was counseled about risk prevention and sent home. If the patient was positive, the nurse provided counseling about HIV and treatment. Depending on the patient, this could take a few minutes to a half hour. Children under 13 were assigned to the AMPATH Center's pediatric care program. All eligible pregnant women were immediately referred to PMTCT.

Outreach Desk The patient was then sent to the Outreach Desk, where he or she showed the results of the test to an Outreach staff member. The patient filled out an Outreach Adult Locator Form with contact information in case it was necessary to follow-up with home visits. This step typically took 10-20 minutes. Outreach staff members were themselves AMPATH patients and provided the new patient with adherence counseling and information about AMPATH services.

Nurses' Station If the patient was very sick, he or she went directly to a care provider. The nurse took the patient's vital signs, triaged the patient, and assessed adherence potential. A nutritionist measured the patient's BMI. The time at the nurses' station took approximately 10 minutes.

Clinician The patient was then sent to a clinician who conducted necessary exams and filled out a comprehensive Initial Encounter Form. This form was sent to AMRS to be entered into the database system. The meeting with the clinician was generally the longest part of the initial appointment, taking approximately 20 minutes.

Laboratory After meeting with the clinician, the patient went to the MRTH lab for Round One tests, which included a complete blood count, creatinine (kidney function), SGPT (liver function), CD4 count, VDRL (syphilis), and chest X-rays, all at no cost. These tests took approximately 20 minutes, and turnaround times for results ranged from same-day to 72 hours, with an average time of 24 hours. The results were

given to the patient at the second appointment, which was two weeks after the initial appointment. Both urban and rural sites utilized the central lab and outreach and support offices at the AMPATH Center.

Pharmacy If a patient needed medicine for TB or other OI, she or he was sent to the HAART Pharmacy to pick up his or her prescription.

Social Worker Patients who reported urgent social or economic needs were referred that day to a social worker for an assessment. Waiting for referrals could take up to 60 minutes. Social workers then scheduled a visit to the patient's home at a later date to assess what social or economic services were required for the patient to best manage the disease. If the situation was not urgent, the CO or MO suggested that the patient see a social worker on the second visit. After a full day of meetings and tests, newly enrolled patients were ready to leave the clinic. AMPATH provided public transportation fare for patients who could not afford the journey home.

Disease Management Throughout the duration of treatment, the patient made periodic visits to clinics to monitor health, adherence to medication, need for social assistance, and side-effects. The clinics also provided patients with an opportunity to connect with each other through support meetings and skill-building trainings. At follow-up visits, the patient would meet with staff from FPI, HHI, and Psychosocial. In 2006, AMPATH incorporated community care coordinators (CCCs) into its disease management process to lengthen the time between clinic visits for stable patients to every three months, increase community presence, and decrease loss-to-follow-up. CCCs underwent a weeklong training in basic health skills and use of personal digital assistants (PDAs) followed by a month of mentorship in the ART clinic. CCCs then conducted monthly visits to gather clinical information, deliver medication, and facilitate follow-up.[26]

Adherence Monitoring Patients who had not returned to AMPATH clinics within three days of a scheduled appointment and who did not have a CCC were either called or visited using AMRS tracer data, which included maps of patients' neighborhoods, in order to reduce loss-to-follow-up. AMPATH defined loss-to-follow-up as those on ART who had not visited an AMPATH clinic within the past six months and those not on ART who had not visited a clinic within the past 12 months (see **Exhibit 10** for AMPATH loss to follow up information). This statistic fell from 2.5% per month between 2002 and 2006 to 1.6% between January and June 2007. Self-reported adherence data for 7,381 adult AMPATH patients on ART from July 2003 to February 2006 showed 77% of patients had taken 100% of their ART after one year of treatment, 75% at two years, and 80% at three years. The percentage of patients keeping at least 90% of their clinic visits in a given year was 89% after one year in the program, 91% for patients with two years in the program, and 96% for those with three years. An estimated 1,343 patients at AMPATH were on second-line ART in 2008.

Growth

AMPATH's operations spanned three provinces in Western Kenya. A network of 17 rural clinics were anchored by the AMPATH Center, an 80,000ft^2 care, training, and research facility built in 2005 at the MUSM/MTRH campus in Eldoret (see **Exhibit 11** for map of clinic locations). The AMPATH Center was the only dedicated HIV control facility in Kenya (see **Exhibit 12** for photo of facility). IUSM raised private external donor funds to build the Center, but like all facilities developed through IU-MU Partnership activities, it was owned by the MOH.

By 2008 AMPATH had a total estimated population of 1.8 million people in its catchment area in Western Kenya, and it had become the largest ART provider in the country. Cumulative enrollment at AMPATH grew to approximately 68,711 HIV-positive patients by April 2008, and new patient enrollment rates approached averages of 2,000 new HIV-positive patients per month (see **Exhibits 13a** and **13b** for patient enrollment and visit data).[21]

Home-Based Counseling and Testing

Due to social, structural, and psychological barriers, by 2007 approximately 85% of the 1.8 million people in AMPATH's catchment zone still did not know their HIV status despite the availability of VCT (see **Exhibit 14** for data on testing numbers). AMPATH piloted the Home-Based Counseling and Testing model (HCT) in late 2007 to provide door-to-door information, counseling, and testing. Mamlin and Kimaiyo believed AMPATH could reach patients earlier and more effectively encourage safe behavior with HCT. In addition, they viewed HCT as a means to better understand communities and expand treatment to other primary care problems, positioning AMPATH to meet its goal of integrating HIV care into a broader, national primary care agenda.

The pilot HCT program covered Kosirai Division in North Rift Valley Province--a predominantly rural, population dense region of 35,976 people across 9,000 households that included AMPATH's Mosoriot clinic. AMPATH trained and deployed local residents known as "community mobilizers" whose main responsibility was to introduce HCT to households. Counselors would then follow up to provide the information, counseling, and testing. The counselors used PDA and GPS hardware systems to collect data from their visits that could be directly uploaded into a database system.

During the HCT pilot, 95% of the total eligible persons, 19,034 people, accepted counseling about HIV/AIDS. Of these, 96% received HIV tests. All those who tested positive were referred to AMPATH clinics for care, and those who tested negative were counseled on risk-lowering behaviors. Early results showed HCT cost USD 2.59 per HIV patient identified. Pilot results confirmed the potential for AMPATH to determine the HIV status of nearly every person in its catchment area.

What would this mean for AMPATH? Financially, sources of funding for HCT were limited (see **Exhibit 15** for list of expenses) and most considered AMPATH's core competency to be in clinic-based HIV treatment. By increasingly shifting the scope of its services 'upstream,' Kimaiyo and Mamlin believed HCT would allow AMPATH to identify people living with HIV/AIDS earlier in the course of their illness, when interventions were likely to be more effective, and improve HIV prevention. Mamlin and Kimaiyo considered the next steps for AMPATH: how could AMPATH most quickly and efficiently move towards field-based care, and what would be the likely tradeoffs?

Appendix *Abbreviations*

AMPATH	Academic Model for the Prevention and Treatment of HIV/AIDS
AMRS	AMPATH Electronic Medical Record system
APHIA II	AIDS, Population, and Health Integrated Assistance Program
ART	antiretroviral therapy
BMI	body mass index
COs	clinical officers
DLTLD	Department of Leprosy, Tuberculosis, and Lung Disease
DOTS	directly observed treatment short-course
DST	drug susceptibility testing
DTP3	third dose of diphtheria toxoid, tetanus toxoid, and pertussis vaccine
FPI	Family Preservation Initiative
GDP	gross domestic product
HAART	highly active antiretroviral therapy
HCT	Home-Based Counseling and Testing
HHI	HAART and Harvest Initiative
IU-MU Partnership	Indiana University-Moi University Partnership
IUSM	Indiana University School of Medicine
MDR-TB	multidrug-resistant tuberculosis
MEDS	Mission for Essential Drugs and Supplies
MOH	Ministry of Health
MOs	medical officers
MSH	Management Sciences for Health
MTRH	Moi Teaching and Referral Hospital
MUSM	Moi University School of Medicine
NACC	National AIDS Control Council
OI	opportunistic infections
OVC	Orphans and Vulnerable Children
PEPFAR	President's Emergency Plan for AIDS Relief
PITC	provider-initiated testing & counseling
PMTCT	prevention of mother-to-child transmission
PPP	purchasing power parity
STIs	sexually transmitted infections
TB	tuberculosis
USD	United States' dollar
VCT	voluntary counseling and testing
XDR-TB	extremely drug-resistant tuberculosis

Exhibit 1 *Map of Kenya*

Source: United Nations, available at http://www.un.org/Depts/Cartographic/map/profile/kenya.pdf

Exhibit 2 *Composition of Healthcare Workers in Kenya and Africa, 2002*

	Kenya	% of Total	Density per 1000, Kenya	Density per 1000, Africa
Physicians	4,506	7%	0.139	0.217
Nurses and midwives	37,113	55%	1.145	1.172
Dentists and technicians	1,340	2%	0.041	0.035
Pharmacists and technicians	3,094	5%	0.095	0.063
Environmental and public health	6,496	10%	0.2	0.049
Laboratory technicians	7,000	10%	0.216	0.057
Other health workers	5,610	8%	0.173	0.173
Community health workers	n.a.	n.a.	n.a.	0.449
Health management and support	1,797	3%	0.055	0.411
Total	66,956	100%	2.065	2.626

Source: World Health Organization, Country Health System Fact Sheet

Exhibit 3 *Chronology of Infrastructure and Capital Development, 1989-2000*

1989: Indiana and Moi Universities formalized IU-MU Partnership

Medical Exchange:
1990: Einterz arrived in Kenya to lead the first group of 40 students
1993: IUSM students started COBES rotations with Moi students
1993: Scholarship and work study funds for Kenyan students in the U.S. established

Clinical Care:
1997: ASANTE consortium established
1999: Construction of 4 operating rooms and recovery units at MTRH
2000: Expansion of five 'IU Houses' for visiting ASANTE Consortium faculty and residents visiting Eldoret

Research Publications:
1998: NIH grant received to develop rural-based electronic medical records system, pre-cursor to AMRS
2000: From 1989-2000, Number of Kenyan-led publications increased from 0 to 5, co-authored publications from 0 to 4, US PI-led publications from 0 to 9.

Source: created by case writers.

Exhibit 4 *ASANTE Consortium Members*

Institution	Year Joined
Moi University School of Medicine (Moi U. Faculty of Health Sciences) (Kenya)	1990
Indiana University School of Medicine (IN)	1990
Brown University School of Medicine (RI)	1997
Lehigh Valley Hospital (PA)	1997
Portland Providence Medical Center (OR)	1997
University of Utah School of Medicine (UT)	1997
Duke University Medical Center/Hubert-Yeargan Center for Global Health (NC)	2007
University of Toronto Faculty of Medicine (Ontario, Canada)	2007

Source: created by case writers.

Exhibit 5 *Patient Characteristics Over Three Periods of AMPATH Growth*

Factors	Period 1*	Period 2	Period 3
Patients, *n*	1210	971	21353
CD4 cell count median	146	119	172
Lost to follow up at 6 months, %	15.9	22.0	18.0
Lost to follow up at 12 months, %	20.2	27.9	24.3
Death in first 6 months, %	1.5	1.4	2.7
Perfect Adherence, %	73.0	73.3	70.3

*Period 1 began in November 2001 with the initiation of two clinic sites; Period 2 began in June 2003 when ART prices came down and AMPATH received USD 1 million in donations; Period 3 began in March 2004 with the receipt of PEPFAR funding.[18]

Source: Wools-Kaloustian, K., S. Kimaiyo, B. Musick, J. Sidle, et al., The impact of the President's Emergency Plan for AIDS Relief on expansion of HIV care services for adult patients in western Kenya. Aids, 2009. 23(2): p. 195-201.

Exhibit 6 *AMPATH Staff Headcount, April 2008*

Department	Total Staff	% of Total
Data Management	47	5%
Vehicles	35	4%
Research	1	0.1%
Clinical Care	463	49%
Lab	54	6%
Pharmacy	29	3%
Support Services	261	27%
Administrative	58	6%
Other	3	0.3%
TOTAL	**951**	**100%**

Clinical Care Breakdown:	Total Staff	% of Total
CO	116	25%
Nurses	118	25%
MOs	7	2%
pMTCT	79	17%
Outreach	50	11%
Social Work	29	6%
Clinical Consultants	19	4%
Nutrition	33	7%
Other Clinical Care	12	3%
Total	**463**	**100%**

Support Services Breakdown:	Total Staff	% of Total
Income Security	34	13%
Food Security	133	51%
Psychosocial Support	40	15%
Other Support Services	54	21%
Total	**261**	**100%**

Source: AMPATH.

Exhibit 7 *AMPATH Team Leader Bios*

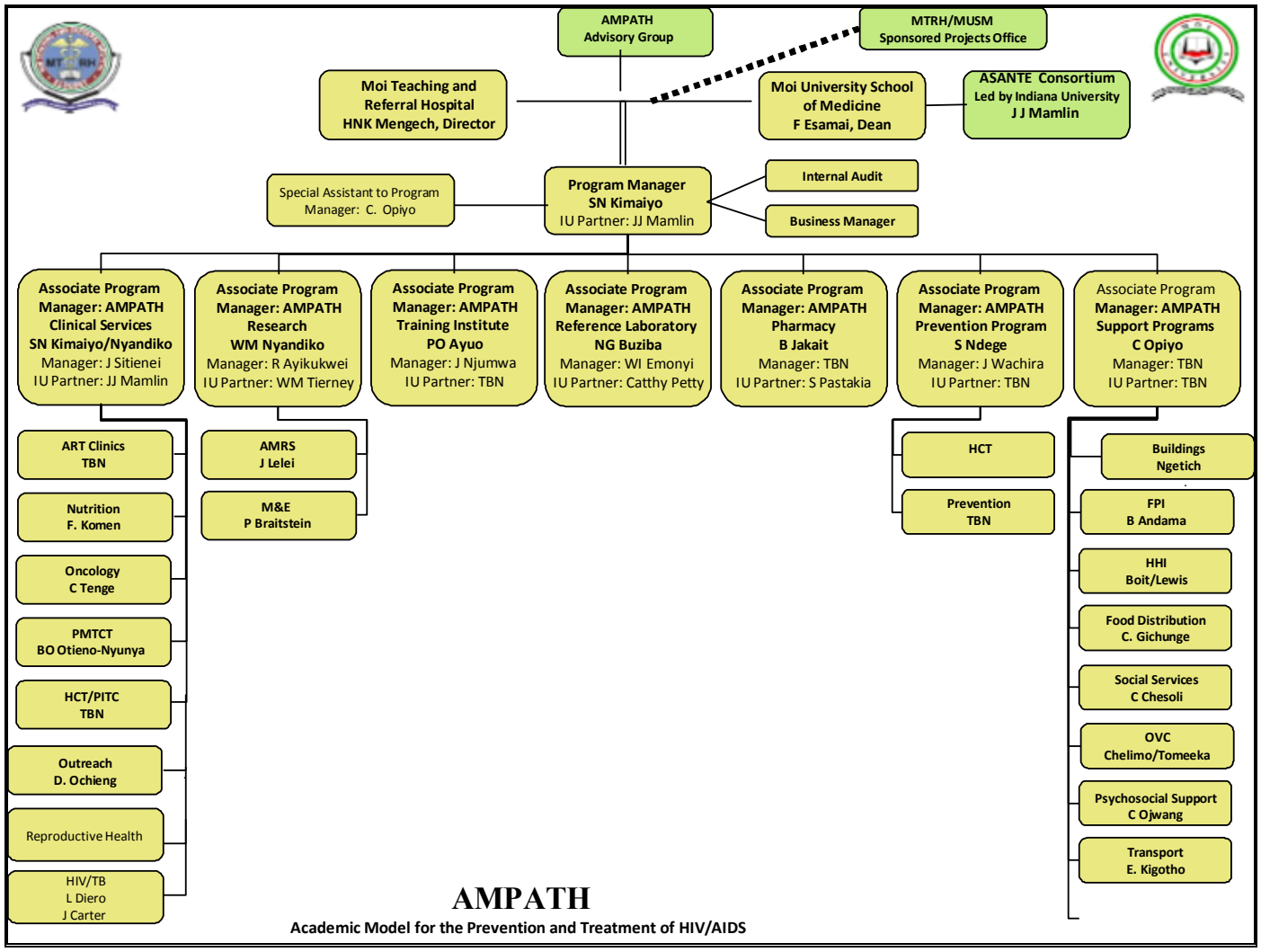
Sylvester Kimaiyo, MBChB, MMed is Program Manager for AMPATH and Senior Lecturer in the Department of Medicine at Moi University School of Medicine. As the Program Manager for AMPATH, Dr. Kimaiyo has overseen all aspects of AMPATH since its inception. He directs all clinical services and is the chairman of the AMPATH Clinical Working Group. He is also the former Chairman of the Department of Medicine at MUSM. A medical doctor for more than 20 years with specialty certification in Internal Medicine and a fellowship in Clinical Pharmacology, Dr. Kimaiyo has been recognized as one of the top clinicians and teachers at Moi University School of Medicine. He practices regularly in the AMPATH clinics and serves as a consultant physician at MTRH. He has served on numerous national HIV/AIDS related committees, including the Kenya National Drugs and Therapeutics Committee.

Joe Mamlin, MD is Professor of Medicine at Indiana University School of Medicine and former Chief of the Division of General Internal Medicine and Geriatrics at Indiana University. Dr. Mamlin has extensive experience working in Africa and in Afghanistan. In the mid-1960s, he served for six years as a Peace Corps volunteer and medical doctor in Afghanistan where he helped establish that country's second medical school. He helped found the IU-MU Partnership and was the principal founder of AMPATH. He served as IUSM's team leader in Eldoret in 1992-93. He currently resides and works in Eldoret, Kenya where he has served for the last seven years as Professor of Medicine in the Moi University Faculty of Health Sciences. Prior to working in Kenya, Dr. Mamlin served as Founding CEO of IU Medical Group—Primary Care, a multi-million dollar primary care corporation based in Indianapolis with more than 200 physicians who care for 135,000 patients in 27 urban and suburban offices. Dr. Mamlin is an advisor to Dr. Kimaiyo and his team; he practices medicine daily in AMPATH's clinics, rounds regularly at MTRH, and is the Field Director for all of Indiana University's activities in Kenya.

Robert Einterz, MD is Professor of Clinical Medicine, Associate Dean for International Affairs at Indiana University School of Medicine, co-founder of the IU-MU Partnership and AMPATH, and founding director of the American-sub-Saharan African Network for Training and Education (ASANTE) Consortium through which Indiana and multiple other medical schools partner with MUSM to enhance the academic missions of all partners. A practicing general internist, Dr. Einterz has more than ten years experience directing an urban, multi-specialty health center in Indianapolis, and he has more than 20 years experience in global health. He directed a comprehensive primary health care program in rural Haiti in 1986-87, served as the coordinator of the MUSM Department of Medicine in 1990-91, and he has been the sole director of the IU-MU Partnership since its inception. Dr. Einterz resides in Indianapolis where he coordinates all activities between IU, MTRH/MUSM, and other US partners and universities.

Source: created by case writers from AMPATH documents.

Exhibit 8 *AMPATH Organizational Chart 2008*



Source: AMPATH.

Exhibit 9 *Selected AMRS Monthly Enrollment Report Data, April 2008*

CUMULATIVE BY CLINICAL SITE TO END APRIL 2008

CLINICAL SITE	MTRH	Mosoriot	Turbo	B/forest	Amukura	Naitiri	Chulaimbo	Webuye	Teso	Kitale	Kapenguria	Mt. Elgon	Iten	Kabarnet	Busia	Port Vict.	Khuyangu	UG -DH	TOTAL
CURRENTLY ENROLLED PATIENTS PER SITE *(Excludes Deceased, Transfers & Discontinued)*																			
Adult Male	4,792	1,167	821	563	358	236	1,927	891	392	1,387	288	120	162	254	1,546	606	502	56	16,068
Adult Female	8,893	2,755	2,095	1,372	870	725	4,560	2,563	996	3,565	645	437	403	584	3,469	1,409	1,304	111	36,756
Subtotal, Adult Enrollment	**13,685**	**3,922**	**2,916**	**1,935**	**1,228**	**961**	**6,487**	**3,454**	**1,388**	**4,952**	**933**	**557**	**565**	**838**	**5,015**	**2,015**	**1,806**	**167**	**52,824**
Peds Male	1,524	305	313	204	139	121	537	332	160	556	106	58	69	80	465	181	186	11	5,347
Peds Female	1,525	364	320	255	153	165	591	342	176	588	115	80	63	105	497	193	179	17	5,728
Subtotal, Peds Enrollment	**3,049**	**669**	**633**	**459**	**292**	**286**	**1,128**	**674**	**336**	**1,144**	**221**	**138**	**132**	**185**	**962**	**374**	**365**	**28**	**11,075**
Total Patient Enrollment	**16,734**	**4,591**	**3,549**	**2,394**	**1,520**	**1,247**	**7,615**	**4,128**	**1,724**	**6,096**	**1,154**	**695**	**697**	**1,023**	**5,977**	**2,389**	**2,171**	**195**	**63,899**
CURRENTLY ACTIVE PATIENTS *(Excludes Deceased, Transfers , Discontinued & LTFU over the entire 5 years)*																			
On ARVs	6,512	1,862	1,394	987	668	494	3,120	1,780	683	2,545	429	303	313	495	1,964	806	787	84	**25,226**
NOT on ARVs	6,494	1,604	1,426	766	745	534	2,644	1,705	910	2,651	574	319	341	499	3,402	1,437	1,354	126	**27,531**
Total Currently Active Patients	**13,006**	**3,466**	**2,820**	**1,753**	**1,413**	**1,028**	**5,764**	**3,485**	**1,593**	**5,196**	**1,003**	**622**	**654**	**994**	**5,366**	**2,243**	**2,141**	**210**	**52,757**
NUMBER OF PATIENTS EVER STARTED ON ART																			
Adults	7,991	2,356	1,753	1,278	761	567	3,644	2,027	815	2,513	488	284	341	535	2,113	871	717	70	**29,124**
Peds	820	209	166	182	44	68	249	143	102	263	57	44	36	56	126	51	42	2	**2,660**
Total Number of Patients Ever Started on ART	**8,811**	**2,565**	**1,919**	**1,460**	**805**	**635**	**3,893**	**2,170**	**917**	**2,776**	**545**	**328**	**377**	**591**	**2,239**	**922**	**759**	**72**	**31,784**
PATIENTS CURRENTLY ON ARV TREATMENT																			
Adults	7,358	1,932	1,461	1,090	676	483	3,081	1,775	677	2,444	432	272	299	490	2,088	874	645	70	**26,147**
Peds	773	197	165	159	38	60	239	133	66	230	49	42	30	54	98	47	50	2	**2,432**
Total Patients Currently on ART	**8,131**	**2,129**	**1,626**	**1,249**	**714**	**543**	**3,320**	**1,908**	**743**	**2,674**	**481**	**314**	**329**	**544**	**2,186**	**921**	**695**	**72**	**28,579**
Total ART Patients less deceased, transfers, discontinued, LTFU	*6,512*	*1,862*	*1,394*	*987*	*668*	*494*	*3,120*	*1,780*	*683*	*2,545*	*429*	*303*	*313*	*495*	*1,964*	*806*	*787*	*84*	**25,226**
DECEASED PATIENTS																			
Adults	510	284	366	185	191	153	502	431	226	271	92	60	59	98	231	119	140	0	**3,918**
Peds	111	18	25	17	29	23	70	41	30	64	16	8	2	10	39	35	21	0	**559**
Total Deceased Patients	**621**	**302**	**391**	**202**	**220**	**176**	**572**	**472**	**256**	**335**	**108**	**68**	**61**	**108**	**270**	**154**	**161**	**0**	**4,477**
DISCONTINUED PATIENTS																			
Withdrew (Adult)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Adults HIV negative	15	6	11	6	6	5	6	5	1	0	2	4	0	3	0	1	2	0	**73**
Peds HIV negative	213	59	6	12	15	6	40	3	5	12	4	0	2	4	1	1	11	0	**394**
Total Discontinued Patients	**229**	**65**	**17**	**18**	**21**	**11**	**46**	**8**	**6**	**12**	**6**	**4**	**2**	**7**	**1**	**2**	**13**	**0**	**468**

April 2008

CLINICAL SITE	MTRH	Mosoriot	Turbo	B/forest	Amukura	Naitiri	Chulaimbo	Webuye	Teso	Kitale	Kapenguria	Mt. Elgon	Iten	Kabarnet	Busia	Port Vict.	Khuyangu	UG -DH	TOTAL
NEW PATIENT ENROLLMENT																			
Adult Male	90	6	19	8	11	7	33	23	15	35	13	6	8	10	61	22	32	18	417
Adult Female	181	36	43	32	20	19	47	58	35	91	17	12	10	26	112	35	64	17	855
Subtotal, Adult Enrollment	**271**	**42**	**62**	**40**	**31**	**26**	**80**	**81**	**50**	**126**	**30**	**18**	**18**	**36**	**173**	**57**	**96**	**35**	**1,272**
Adult Male	31	10	8	9	4	2	12	7	11	22	3	1	2	7	19	10	12	2	172
Adult Female	40	12	10	7	9	2	10	8	5	26	2	0	0	4	29	16	10	2	192
Subtotal, Peds Enrollment	**71**	**22**	**18**	**16**	**13**	**4**	**22**	**15**	**16**	**48**	**5**	**1**	**2**	**11**	**48**	**26**	**22**	**4**	**364**
Total Month Patient Enrollment	**342**	**64**	**80**	**56**	**44**	**30**	**102**	**96**	**66**	**174**	**35**	**19**	**20**	**47**	**221**	**83**	**118**	**39**	**1,636**
DECEASED PATIENTS																			
Adults	13	6	10	2	3	1	16	4	6	7	5	4	1	6	16	7	9	0	116
Peds	6	0	3	0	1	0	1	1	0	2	1	0	0	1	0	1	2	0	19
Total Deceased Patients Reported	**19**	**6**	**13**	**2**	**4**	**1**	**17**	**5**	**6**	**9**	**6**	**4**	**1**	**7**	**16**	**8**	**11**	**0**	**135**
PATIENTS STARTED ON ART																			
Adults	171	17	24	19	14	16	35	39	19	70	20	2	11	9	52	22	31	10	**581**
Adults, non pMTCT	142	15	20	17	9	13	32	36	13	61	19	1	8	8	41	15	25	9	484
Adults, pMTCT	29	2	4	2	5	3	3	3	6	9	1	1	3	1	11	7	6	1	97
Peds	10	2	4	2	1	0	3	3	2	10	4	2	2	3	8	3	5	0	**64**
Total Patients Started on ART	**181**	**19**	**28**	**21**	**15**	**16**	**38**	**42**	**21**	**80**	**24**	**4**	**13**	**12**	**60**	**25**	**36**	**10**	**645**

Source: Adapted from AMRS April 2008 report. Approximate figures only.

Exhibit 10 *AMPATH Patients Lost to Follow Up (LTFU)*

PATIENTS LOST TO FOLLOW UP (AS OF APRIL 2008)

CLINICAL SITE	MTRH	Mosoriot	Turbo	B/forest	Amukura	Naitiri	Chulaimbo	Webuye	Teso	Kitale	Kapenguria	Mt. Elgon	Iten	Kabarnet	Busia	Port Vict.	Khuyangu	UG -DH	TOTAL
Based on ARV Patients & missing encounter 6 months ago												%							
Missed appointment 6 months ago	57	30	15	27	4	1	31	17	4	40	5	1	4	5	20	9	9	0	**279**
Current Active No. on ARVs	6,512	1,862	1,394	987	668	494	3,120	1,780	683	2,545	429	303	313	495	1,964	806	787	84	**25,226**
% patients LTFU, Current Month	**0.9%**	**1.6%**	**1.1%**	**2.7%**	**0.6%**	**0.2%**	**1.0%**	**1.0%**	**0.6%**	**1.6%**	**1.2%**	**0.3%**	**1.3%**	**1.0%**	**1.0%**	**1.1%**	**1.1%**	**0.0%**	**1.1%**
% patients LTFU, Previous Month	*0.9%*	*1.3%*	*0.6%*	*0.8%*	*0.2%*	*2.0%*	*1.5%*	*1.3%*	*1.3%*	*1.0%*	*1.7%*	*0.7%*	*0.7%*	*1.2%*	*1.2%*	*1.6%*	*0.4%*	*0.0%*	
Based on Patients NOT on ARVS & missing encounter 12 mo. ago																			
Missed appointment 12 months ago	135	29	23	25	4	14	74	35	13	81	18	11	3	9	54	37	27	0	**592**
Current Active No. NOT on ARVs	6,494	1,604	1,426	766	745	534	2,644	1,705	910	2,651	574	319	341	499	3,402	1,437	1,354	126	**27,531**
% patients LTFU, Current Mo.	**2.1%**	**1.8%**	**1.6%**	**3.3%**	**0.5%**	**2.6%**	**2.8%**	**2.1%**	**1.4%**	**3.1%**	**3.1%**	**3.4%**	**0.9%**	**1.8%**	**1.6%**	**2.6%**	**2.0%**	**0.0%**	**2.2%**
% patients LTFU, Previous Mo.	*1.7%*	*2.4%*	*1.9%*	*2.1%*	*1.2%*	*2.1%*	*1.9%*	*1.2%*	*1.7%*	*1.6%*	*2.4%*	*1.6%*	*2.0%*	*1.7%*	*2.0%*	*2.4%*	*1.3%*	*0.0%*	

ANNUAL LOST TO FOLLOW UP Rate (LTFU)

YEAR	2001	2002	2003	2004	2005	2006	2007
Enrolled patients per year	30	510	1,303	5,241	12,307	20,155	22,769
Total patients LTFU per year	0	99	317	1,256	2,051	4,746	4,025
Percentage LTFU per year	**0.00%**	**19.41%**	**24.33%**	**23.96%**	**16.67%**	**23.55%**	**17.68%**

Source: Adapted from AMRS April 2008 report. Approximate figures only.

Exhibit 11 *AMPATH Geographic Catchment Area and Clinic Locations*

Source: AMPATH.

Exhibit 12 *AMPATH Center in Eldoret, Kenya*

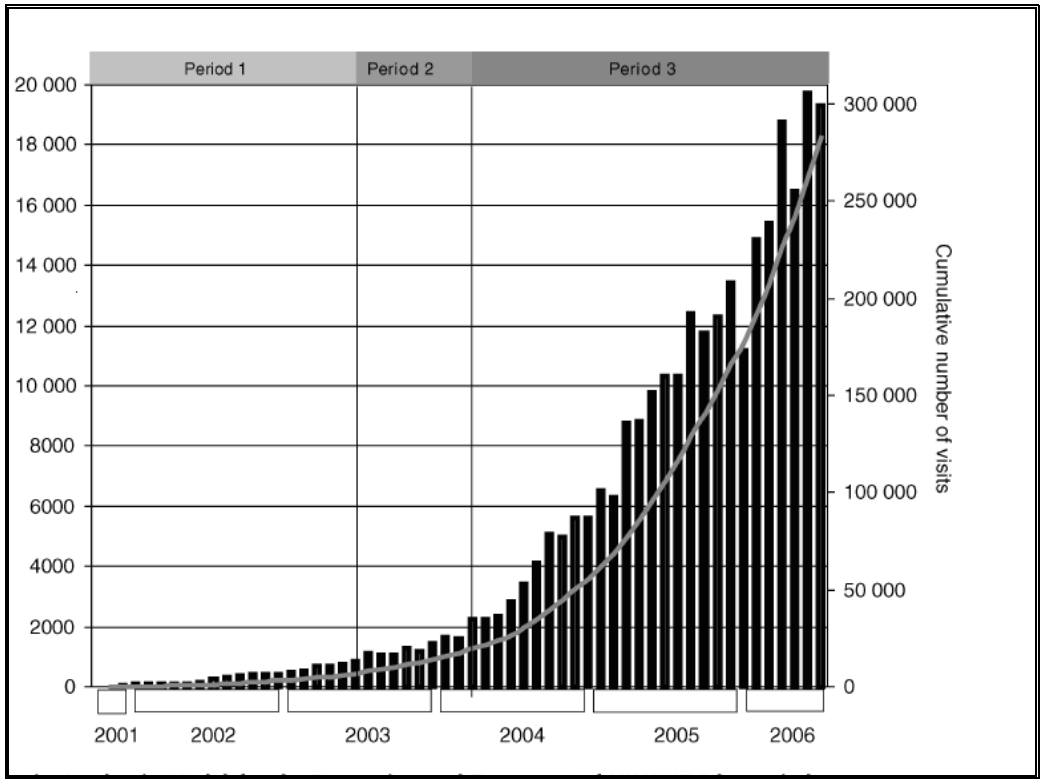
Source: Case writer.

Exhibit 13a *AMPATH Patient Enrollment and Visits, 2001-2007*

	2001	2002	2003	2004	2005	2006	2007
Annual Enrollment	41	781	1,667	5,932	12,389	20,560	22,638
Cumulative Enrollment	41	822	2,489	8,421	20,810	41,370	64,008
Annual Visits	66	2,961	11,463	42,295	123,095	253,891	396,210
Cumulative Visits	66	3,027	14,490	56,785	179,880	433,771	829,981
Compound Annual Growth Rate	**2001 to 2007**	**2002 to 2007**					
Enrollment	186%	96%					
Visits	326%	166%					

Source: AMPATH Documents (AMRS), accessed April 2008.

Exhibit 13b *Enrollment in AMPATH by Period*



Source**:** Wools-Kaloustian, K., S. Kimaiyo, B. Musick, J. Sidle, et al., The impact of the President's Emergency Plan for AIDS Relief on expansion of HIV care services for adult patients in western Kenya. Aids, 2009. 23(2): p. 195-201.

Exhibit 14 *AMPATH Provider Initiated Testing and Counseling Report: 2007 and 2008*

	NUMBERS TESTED				NUMBERS POSITIVE			
Years	**Males**	**Females**	**Children**	**Totals**	**Males**	**Females**	**Children**	**Total**
2007	30,144	31,490	5,534	67,168	3,967	6,594	1,069	11,630
Jan-March 2008	3,753	3,476	531	7,760	502	826	224	1,552
TOTALS	**33,897**	**34,966**	**6,065**	**74,928**	**4,469**	**7,420**	**1,293**	**13,182**

*__Notes__: The report for the year 2007 is for only nine (9) sites, who submitted their reports. The reports for the year 2008 are for seven sites between January and March 2008.

Source: Compiled and submitted by Margaret Wandabwa and Asha Owuor.

Exhibit 15 *AMPATH Expenses, October 2007-September 2008 (PEPFAR-Related Expenses)*

Total AMPATH Expenditures	Actual Expenditures (Oct. '07- Apr.'08)			Projected Expenditures (Apr. '08 - Sept. '08)		
Oct 2007 - Sept 2008	Personnel (KSh)	Total (KSh)	Total (US$)	Personnel (KSh)	Total (KSh)	Total (US$)
General Administrative	7,086,617	11,101,096	$178,757	3,541,800	4,567,441	$76,124
Data Management	12,481,373	16,501,788	$266,631	8,698,526	9,402,343	$156,706
Lab	0	52,864,475	$859,725	0	40,156,800	$669,280
Pharmacy	4,869,064	15,121,845	$243,474	3,250,514	3,383,354	$56,389
Vehicles	8,869,112	35,933,521	$583,002	6,167,147	19,059,748	$317,662
Clinical Care						
Aggregate Clinical Care						
MOs/Faculty/Consultants	22,157,057	22,157,057	$355,006	12,522,373	12,522,373	$208,706
pMTCT	9,661,924	10,814,305	$174,858	5,546,188	5,717,038	$95,284
Formula	0	19,851,530	$322,566	0	0	$0
Outreach	8,984,155	9,914,450	$160,124	5,707,345	6,273,375	$104,556
Social Work	1,729,840	2,912,415	$47,223	1,000,794	1,529,174	$25,486
Nutrition	864,547	1,312,672	$21,236	485,540	603,320	$10,055
Site-Specific Clinical						
Eldoret Clinics	24,421,557	25,113,357	$403,880	16,687,585	16,908,585	$281,810
Other (Rural) Clinics	68,626,592	73,095,198	$1,182,354	44,125,642	45,200,900	$753,348
Nonclinical Support Services						
Income Security	8,950,021	10,591,879	$170,622	6,273,617	6,381,257	$106,354
Food Security	10,333,334	14,551,914	$235,275	7,087,221	7,759,558	$129,326
Psychosocial Support	3,234,117	3,780,240	$61,055	2,201,737	2,436,737	$40,612
Community Mobilization	3,628,718	4,946,253	$79,934	2,570,993	3,251,353	$54,189
OVC	1,010,284	7,060,022	$114,196	804,550	1,081,027	$18,017
Other	6,862,007	8,711,807	$140,978	3,328,857	3,561,517	$59,359
Total Expenditures	**203,770,318**	**346,335,826**	**$5,600,895**	**130,000,428**	**189,795,899**	**$3,163,265**

Source: Adapted from AMPATH internal documents. Approximate figures only.

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